Chapter 2

FORECASTS

The definition of demand that may reasonably be expected to occur during the useful life of an airport's key components (e.g., runways, taxiways, terminal buildings, etc.) is an important factor in facility planning. In airport master planning, this involves projecting potential aviation activity for at least a 20-year timeframe. Aviation demand forecasting for Merrill Municipal Airport (RRL) will primarily consider based aircraft, aircraft operations, peak activity periods, and the critical aircraft.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. Historically, the FAA reviewed individual airport forecasts with the objective of comparing them to its *Terminal Area Forecasts* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). Even though the TAF is updated annually, there was almost always a disparity between the TAF and master planning forecasts. This was primarily because the TAF forecasts are the result of a top-down model that does not consider local conditions or recent trends. While the TAF forecasts are a point of comparison for master plan forecasts, they serve other purposes, such as asset allocation by the FAA.

When reviewing a sponsor's forecast (from the master plan), the FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecast methods. According to the FAA, forecasts should be:

- Realistic;
- Based on the latest available data;
- Reflective of current conditions at the airport (as a baseline);
- Supported by information in the study; and
- Able to provide adequate justification for airport planning and development.

New guidance for forecast review and approval was issued in an FAA Memorandum dated August 12, 2024. The memo outlines primary principles for approving forecasts and makes a distinction between forecasts developed for towered airports and non-towered, low-activity airports. At these non-towered facilities, where current activity levels do not exceed 90,000 annual operations nor are they expected to over the 20-year planning period, preparation of a detailed forecast is not necessary. Rather, the key forecasting component is the identification of critical aircraft, which is the most physically demanding aircraft operating at the airport at least 500 times per year.

The forecast process for an airport master plan consists of a series of basic steps that vary in complexity depending upon the issues to be addressed and the level of effort required. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and documentation and evaluation of the results. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines seven standard steps involved in the forecast process, including:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.
2) **Review Previous Airport Forecasts**: May include the FAA *Terminal Area Forecast*, state or regional system plans, and previous master plans.
3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.
4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.
5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.
6) **Summarize and Document Results**: Provide supporting text and tables as necessary.
7) **Compare Forecast Results with FAA's TAF**: Based aircraft and total operations are considered consistent with the TAF if they meet the following criteria:
   - Forecasts differ by less than 10 percent in the five-year forecast period, and 15 percent in the 10-year forecast period, or
   - Forecasts do not affect the timing or scale of an airport project, or
   - Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.5, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS) *and the Airports Capital Improvement Plan* (ACIP).

Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The following forecast analysis for the airport was produced following these basic guidelines. Existing forecasts are examined and compared against current and historic activity. The historic aviation activity is then examined along with other factors and trends that can affect demand. The intent is to provide an updated set of aviation demand projections for the airport that will permit airport management to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

The forecasts for this master plan will utilize a base year of 2023 with a long-range forecast out to 2043.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet the budget and planning needs of the FAA and provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition upon preparation of this chapter was *FAA Aerospace Forecast – Fiscal Years 2023-2043*, published in May 2023. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the *FAA Aerospace Forecast*.

Since its deregulation in 1978 and the Great Recession of 2007-2009, the U.S. commercial air carrier industry has been characterized by boom-to-bust cycles. The volatility associated with these cycles was thought by many to be a structural feature of an industry that was capital intensive but cash poor; however, the Great Recession of 2007-2009 marked a fundamental change in the operations and finances of U.S. airlines. Since the end of the recession in 2009, U.S. airlines have revamped their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket. The industry experienced an unprecedented period of consolidation, with three major mergers occurring within five years. The results of these efforts were impressive: 2019 marked the eleventh consecutive year of profitability for the U.S. airline industry.

The COVID-19 pandemic in 2020 effectively ended those boom years, with airline activity and profitability plummeting almost overnight. In response, airlines cut capacity and costs, and most were able to weather the storm. Some small regional carriers ceased operations as a result of the pandemic, but no mainline carriers did. Some segments of aviation were less impacted: cargo activity surged, boosted by consumer purchases, and general aviation generally maintained pre-pandemic levels of activity. By the middle of 2021, leisure travel began to rebound with the introduction of vaccines and the lifting of some local restrictions. Two new low-cost carriers were formed and one regional carrier that had ceased operations in 2020 was revived. By the third quarter of 2021, industry profitability neared the breakeven point, and by the end of 2022, U.S. airlines reported that business demand had recovered to 70-80 percent of pre-pandemic levels. Higher fares accompanied the strong rebound in leisure demand, leading to positive financial results. The top nine U.S. passenger carriers posted operating and net profits, proving strong success for the new business models air carriers have been utilizing to weather the pandemic.

The business changes that airlines implemented due to the pandemic will shape the industry long after recovery is complete. Airlines retired older, less fuel-efficient aircraft and encouraged voluntary employee separations. This has led to airlines seeking newer aircraft investments while meeting the current demand for the rebuilding of business and international travel, which has lagged behind leisure traffic during the recovery. There is confidence that U.S. airlines can generate solid returns on capital and sustained profits; however, over the long term, aviation demand will be driven by economic activity as the growing U.S. and world economies provide the basis for aviation growth.

ECONOMIC ENVIRONMENT

According to the FAA forecast, the annual gross domestic product (GDP) of the U.S. is expected to increase by 1.8 percent over the next 20 years. U.S. carriers posted an unexpected profit in 2022, and the FAA expects carriers to remain profitable over the next few years as demand rises, despite higher fares which offset the raised labor and fuel costs. As yields stabilize and carriers return to levels of capacity consistent with their fixed costs and shed excess debt, consistent profitability should continue. Over the long term, we see a competitive and profitable aviation industry characterized by increasing demand for air travel, and airfares growing more slowly than overall inflation, reflecting growing U.S. and global economies.

Prior to the COVID-19 pandemic, the U.S. economy was recovering from the most serious economic downturn and slow recovery since the Great Depression. Demand for aviation is fundamentally driven by economic activity; as economic growth picks up, so will growth in aviation activity. Overall, the FAA forecast calls for annual passenger growth over the next 20 years to average 2.7 percent. Oil prices surged to $93 per barrel in 2022 – largely due to the Russian invasion of Ukraine – after averaging $55 per barrel over the five-year period from 2016 to 2021. Prices are expected to ease over the next two years before slowly climbing to $113 per barrel by the end of the forecast period in 2043.

FAA GENERAL AVIATION FORECASTS

The long-term outlook for general aviation (GA) is promising, as growth at the high end of the segment offsets continuing retirements at the traditional low end. The active general aviation fleet is forecast to remain relatively stable between 2023 and 2043, increasing by just 0.2 percent. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed-wing piston aircraft – continues to shrink over the forecast period.

The FAA forecasts the fleet mix and hours flown for single-engine piston (SEP) aircraft; multi-engine piston (MEP) aircraft; turboprops; business jets; piston and turbine helicopters; and light sport, experimental, and other aircraft (e.g., gliders and balloons). The FAA forecasts active aircraft, not total aircraft. An active aircraft is one that is flown at least one hour during the year. From 2010 through 2013, the FAA undertook an effort to have all aircraft owners re-register their aircraft. This effort resulted in a 10.5 percent decrease in the number of active general aviation aircraft, mostly in the piston category. **Table 2A** shows the primary general aviation demand indicators as forecast by the FAA.

TABLE 2A | FAA General Aviation Forecast			
Demand Indicator	**2023**	**2043**	**CAGR**
General Aviation Fleet			
Total Fixed-Wing Piston	136,290	118,975	-0.7%
Total Fixed-Wing Turbine	26,645	39,740	2.0%
Total Helicopters	10,320	13,870	1.5%
Total Other (experimental, light sport, etc.)	35,840	43,810	1.0%
Total GA Fleet	**209,095**	**216,395**	**0.2%**
General Aviation Operations			
Local	14,801,816	16,622,293	0.6%
Itinerant	15,077,947	16,704,132	0.5%
Total General Aviation Operations	**29,879,763**	**33,326,425**	**0.5%**
CAGR = Compound Annual Growth Rate (2023-2043)			
Source: FAA Aerospace Forecast – FY 2023-2043			

General Aviation Fleet Mix

For 2023, the FAA estimates there are 136,290 piston-powered fixed-wing aircraft in the national fleet. That number is forecast to decline by 0.7 percent by 2043, resulting in 118,975 aircraft. This includes a decline of 0.7 percent in SEP aircraft and a decline of 0.2 percent in MEP aircraft.

Total turbine aircraft are forecast to grow at an annual rate of 2.0 percent through 2043. The FAA estimates there are 26,645 fixed-wing turbine-powered aircraft in the national fleet in 2023 and there will be 39,740 by 2043. Turboprops are forecast to grow by 0.8 percent annually, while business jets are projected to grow by 2.7 percent annually through 2043.

Total helicopters are projected to grow by 1.5 percent annually in the forecast period. There are an estimated 10,320 total helicopters in the national fleet in 2023, and that number is expected to grow to a total of 13,870 by 2043. This includes annual growth rates of 0.5 percent for piston helicopters and 1.8 percent for turbine helicopters.

The FAA also forecasts experimental aircraft, light sport aircraft (LSA), and others. Combined, there are an estimated 35,840 other aircraft in 2023 that are forecast to grow to 43,810 by 2043, for an annual growth rate of 1.0 percent.

General Aviation Operations

The FAA also forecasts total operations based on activity at control towers across the United States. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military. While the fleet size remains relatively level, the number of general aviation operations at towered airports is projected to increase from 29.9 million in 2023 to 33.3 million in 2043, with an average increase of 0.5 percent per year as growth in turbine, rotorcraft, and experimental hours offsets a decline in fixed-wing piston hours. This includes annual growth rates of 0.6 percent for local general aviation operations and

0.5 percent for itinerant general aviation operations. **Exhibit 2A** presents the historical and forecast U.S. active general aviation aircraft and operations.

General Aviation Aircraft Shipments and Revenue

On an annual basis, the General Aviation Manufacturers Association (GAMA) publishes an aviation industry outlook that documents past and current trends and provides an assessment of the future condition of the general aviation industry. **Table 2B** presents historical data related to general aviation aircraft shipments.

Worldwide shipments of general aviation airplanes increased in the year 2022, with a total of 2,818 units delivered around the globe, compared to 2,646 units in 2021 – the second year in a row to experience an increase after the drop during 2020, when only 2,408 units were delivered. Worldwide general aviation billings were the highest in 2014. In 2022, an increase in new aircraft shipments generated more than $22 billion, compared to $21.6 billion in the previous year. North America continues to be the largest market for general aviation aircraft and leads in the manufacturing of piston, turboprop, and jet aircraft. The Asia-Pacific region is the second largest market for piston-powered aircraft, while Latin America is the second leading in the turboprop market. Europe leads in business jet deliveries.

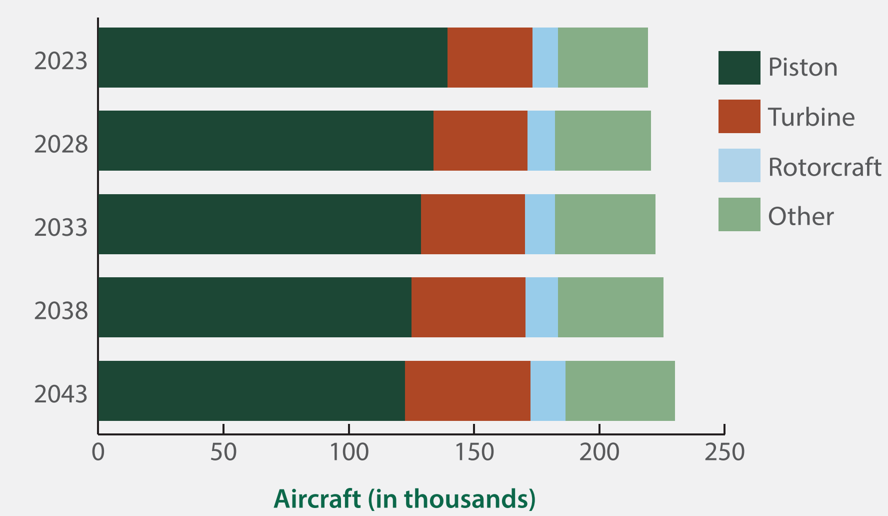
TABLE 2B | Annual General Aviation Airplane Shipments

Manufactured Worldwide and Factory Net Billings						
Year	**Total**	**SEP**	**MEP**	**TP**	**J**	**Net Billings ($ million)**
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,962	1,999	52	319	592	12,093
2005	3,590	2,326	139	375	750	15,156
2006	4,054	2,513	242	412	887	18,815
2007	4,277	2,417	258	465	1,137	21,837
2008	3,974	1,943	176	538	1,317	24,846
2009	2,283	893	70	446	874	19,474
2010	2,024	781	108	368	767	19,715
2011	2,120	761	137	526	696	19,042
2012	2,164	817	91	584	672	18,895
2013	2,353	908	122	645	678	23,450
2014	2,454	986	143	603	722	24,499
2015	2,331	946	110	557	718	24,129
2016	2,268	890	129	582	667	21,092
2017	2,324	936	149	563	676	20,197
2018	2,441	952	185	601	703	20,515
2019	2,658	1,111	213	525	809	23,515
2020	2,408	1,164	157	443	644	20,048
2021	2,646	1,261	148	527	710	21,603
2022	2,818	1,366	158	582	712	22,866

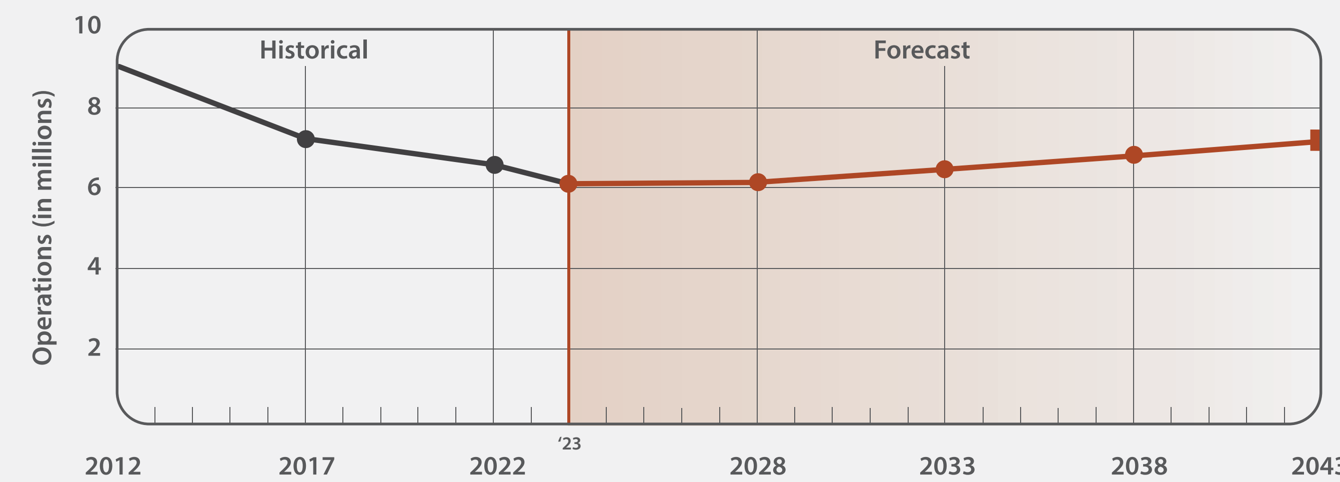
SEP = Single-Engine Piston
MEP = Multi-Engine Piston
TP = Turboprop
J = Jet

Source: General Aviation Manufacturers Association (GAMA) 2022 Annual Report

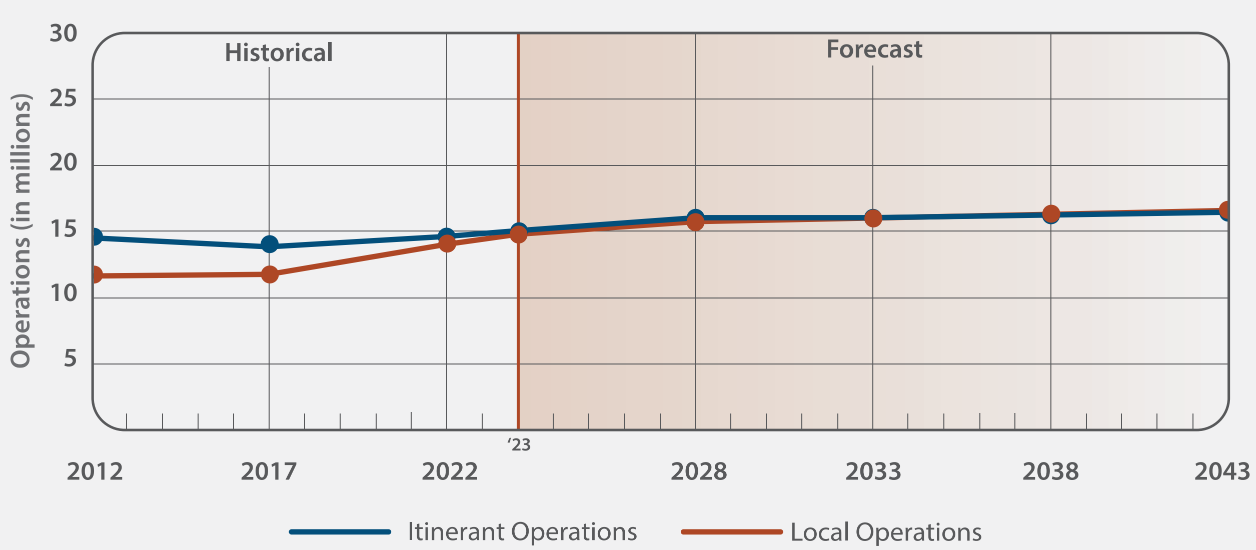
U.S. Active General Aviation Aircraft



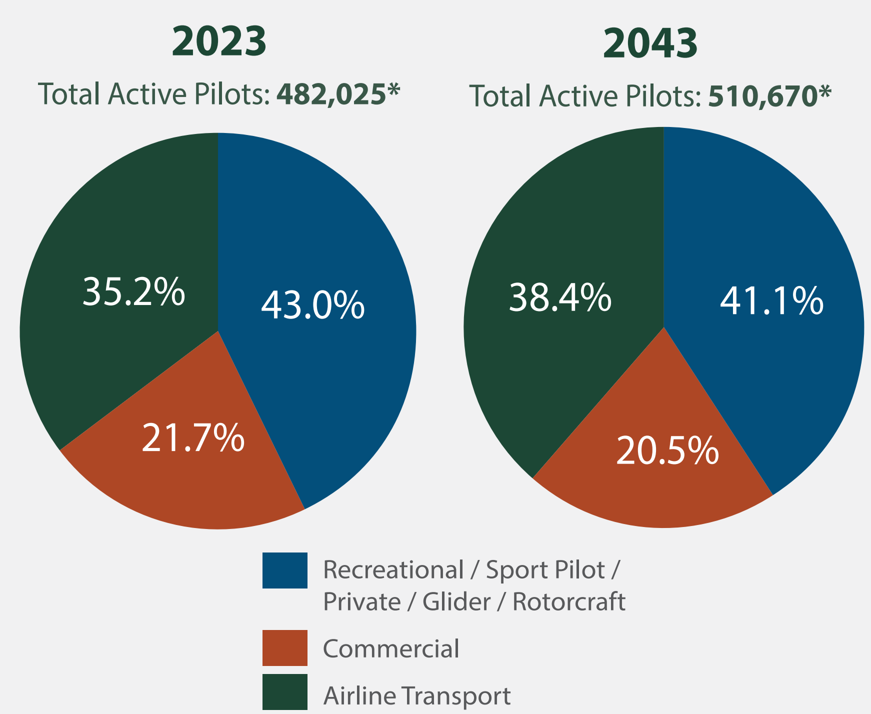
U.S. Air Taxi Operations



U.S. General Aviation Operations



Active Pilots By Certificate



Excludes Student Pilot Certificates

Source: FAA Aerospace Forecasts FY2023-2043

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Business Jets | Business jet deliveries increased from 710 units in 2021 to 712 units in 2022. The North American market accounted for 67.6 percent of business jet deliveries, which is a 1.7 percent increase in market share compared to 2021.

Turboprops | Turboprop shipments increased from 527 in 2021 to 582 in 2022. North America's market share of turboprop aircraft increased by 3.1 percent in the last year. The European, Middle East and Africa, and Asia-Pacific market shares decreased, while the market share of Latin American markets increased.

Pistons | In 2022, piston airplane shipments increased to 1,524 units from 1,409 units in the prior year. North America's market share of piston aircraft deliveries rose 1.2 percent from the year 2021. The European, Latin American, and Middle East and Africa regions experienced a positive rate in market shares during the past year, while the Asia-Pacific market saw a decline.

U.S. PILOT POPULATION

There were 476,346 active pilots certificated by the FAA at the end of 2022, with 482,025 active pilots projected in 2023. All pilot categories – except private and recreational-only certificates – are expected to continue to increase for the forecast length. Excluding student pilots, the number of active pilots is projected to increase by about 28,645 (up 0.3 percent annually) between 2023 and 2043. The airline transport pilot (ATP) category is forecast to increase by 26,200 (up 0.7 percent annually). Sport pilots are predicted to increase by 2.5 percent, commercial pilots will remain steady over the forecast period, and private pilot certificates are projected to decrease at an average annual rate of 0.2 percent through 2043. The FAA has currently suspended the student pilot forecast.

RISKS TO THE FORECAST

While the FAA is confident that its forecasts for aviation demand and activity can be reached, they are dependent on several factors, including the strength of the global economy, security (including the threat of international terrorism), and oil prices. Higher oil prices could lead to further shifts in consumer spending away from aviation, dampening a recovery in air transport demand. The COVID-19 pandemic introduced a new risk, and although the industry has rebounded, the threat of future global health emergencies and potential economic fallout remains.

AIRPORT SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area for various segments of aviation. The service area is determined primarily by evaluating the location of competing airports, their capabilities, their services, and their relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to identify the role of the airport, as well as the specific areas of aviation demand the airport is intended to serve. Merrill Municipal Airport is classified as a Local General Aviation (GA) airport within the NPIAS, meaning that its primary role is to provide the community with access to local and regional markets. Within the 2030 *Wisconsin State Aviation System* Plan, the airport is classified as a medium GA Community airport, meaning its role is to accommodate most single and multi-engine GA aircraft and support regional and in-state air transportation needs. General aviation, which includes all segments of the aviation industry except commercial air carriers and the military, is the largest component of the national aviation system. It includes activities such as pilot training, recreational flying, and the use of sophisticated turboprop and jet aircraft for business and corporate use.

The service area for an airport is a geographic region from which an airport can be expected to attract the largest share of its activity. The definition of the service area can then be used to identify other factors, such as socioeconomic and demographic trends, that influence aviation demand at an airport. Aviation demand will be impacted by the proximity of competing airports, the surface transportation network, and the strength of general aviation services provided by an airport and competing airports.

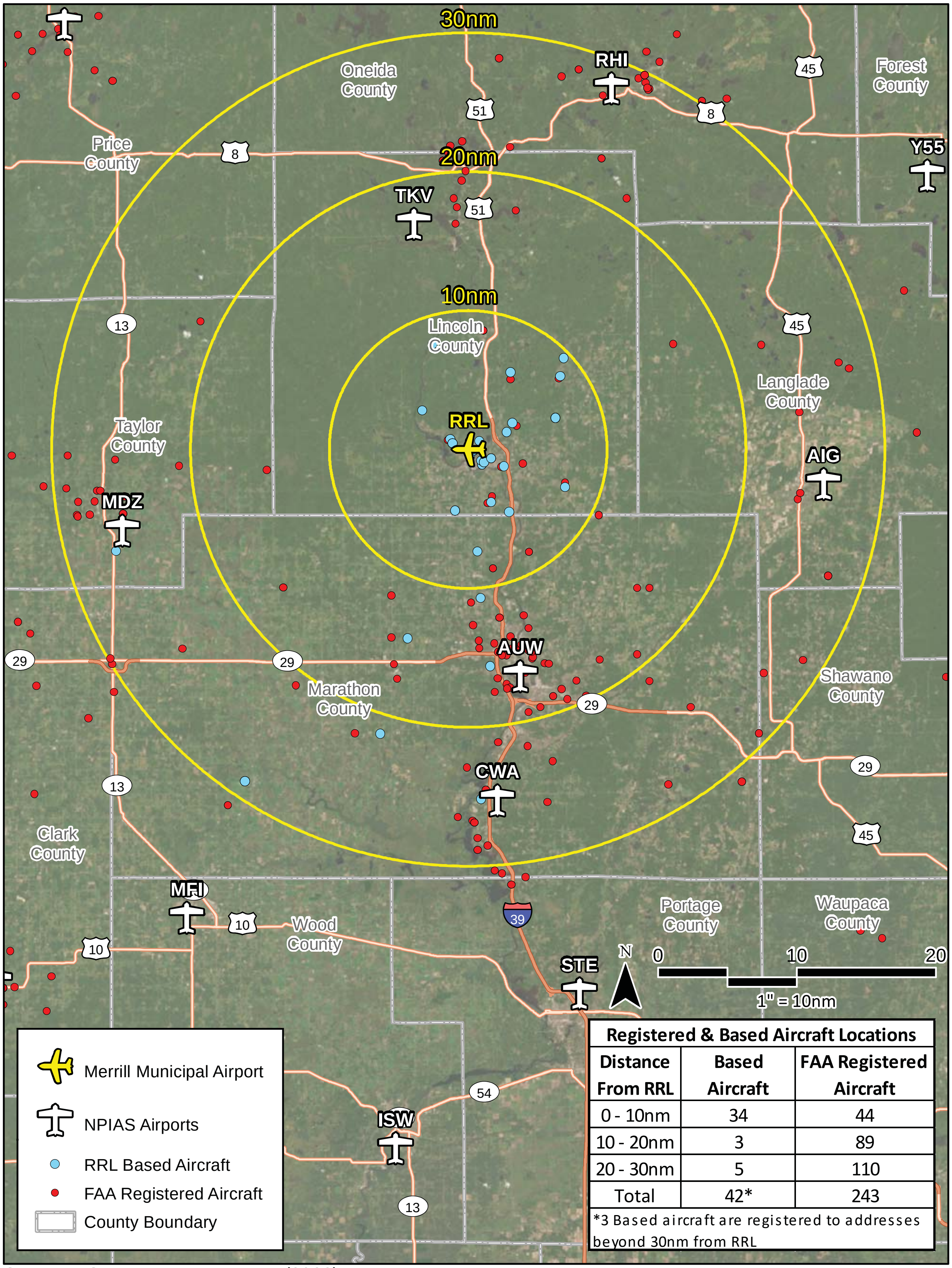
As in any business enterprise, the more attractive the facility is in terms of service and capabilities, the more competitive it will be in the market. If an airport's attractiveness increases in relation to nearby airports, so will the size of its service area. If facilities and services are adequate and/or competitive, some level of aviation activity might be attracted to an airport from more distant locales.

As a Local GA airport, Merrill Municipal Airport's service area is driven by aircraft owners/operators and where they choose to base their aircraft. The primary consideration of aircraft owners/operators when choosing where to base their aircraft is convenience (i.e., easy access and proximity to the airport). As a general rule, an airport's service area can extend up to and beyond 30 miles. The proximity and level of general aviation services are largely a defining factor when describing the general aviation service area. A description of nearby airports was previously completed in Chapter One, as presented on Exhibit 1F. There are six public-use airports within 30 nautical miles (nm) of Merrill Municipal Airport: Tomahawk Regional, Wausau Downtown, Central Wisconsin, Taylor County, Langlade County, and Rhinelander-Oneida County.

When discussing the general aviation service area, two primary demand segments need to be addressed. The first component is the airport's ability to attract based aircraft. Under this circumstance, the most effective method of defining the airport's service area is by examining the number of registered aircraft owners in proximity to the airport. As previously mentioned, aircraft owners typically choose to base at an airport near their home or business. Based on the current registered aircraft data, presented on **Exhibit 2B**, there are 243 registered aircraft within 30 nm of Merrill Municipal Airport. Of these aircraft, 45, or approximately 19 percent, are based at the airport.

The second demand segment to consider is itinerant aircraft operations. In most instances, pilots will opt to utilize airports nearer their intended destination; however, this is also dependent on the airport's capabilities in accommodating the aircraft operator. As a result, airports offering better services and facilities are more likely to attract itinerant operators in the region.

With several competing airports in the region, Merrill Municipal Airport's primary service area is defined by its convenience to its users and its ability to compete for based aircraft. The only other airport in Lincoln County is Tomahawk Regional, which is included as a Basic GA airport in the NPIAS and offers a



Registered & Based Aircraft Locations

Distance From RRL	Based Aircraft	FAA Registered Aircraft
0 - 10nm	34	44
10 - 20nm	3	89
20 - 30nm	5	110
Total	42*	243

*3 Based aircraft are registered to addresses beyond 30nm from RRL

Source: ESRI Basemap Imagery (2022),
FAA Registered Aircraft Database.

Exhibit 2B
AIRPORT SERVICE AREA

single 4,400-foot runway and limited services. Neighboring counties are home to more substantial facilities, including Wausau Downtown Airport and Central Wisconsin Airport in Marathon County and Rhinelander-Oneida County Airport in Oneida County. Each of these airports offers at least two runways and a full array of aviation services and amenities. For this reason, the primary service area for Merrill Municipal Airport is established as Lincoln County, which RRL is well-equipped to serve and from which the airport currently draws the majority of its based aircraft owners.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/ time-series projections, correlation/regression analysis, and market share analysis. The forecast analyst may elect not to use certain techniques depending on the reasonableness of the forecasts produced using other techniques.

Trend line/time-series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical data, then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of direct relationship between two separate sets of historical data. Should there be a reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

Regression analysis measures statistical relationships between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the changes in the dependent variable and the independent variable(s). If the "r^2" value (coefficient determination) is greater than 0.95, it indicates good predictive reliability. A value less than 0.95 may be used, but with the understanding that the predictive reliability is lower.

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections but can provide a useful check on the validity of other forecasting techniques.

Forecasts will age, and the farther one is from the base year, the less reliable a forecast may become, particularly due to changing local and national conditions. Nonetheless, the FAA requires that a 20-year forecast be developed for long-range airport planning. Facility and financial planning usually require at least a ten-year view since it often takes more than five years to complete a major facility development program; however, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

A wide range of factors is known to influence the aviation industry and can have significant impacts on the extent and nature of aviation activity in both the local and national markets. Historically, the nature and trend of the national economy has had a direct impact on the level of aviation activity. Recessionary periods have been closely followed by declines in aviation activity. Nonetheless, over time, trends emerge and provide the basis for airport planning.

Future facility requirements, such as hangar, apron, and terminal needs, are derived from projections of various aviation demand indicators. Using a broad spectrum of local, regional, and national socioeconomic and aviation information, and analyzing the most current aviation trends, forecasts are presented for the following aviation demand indicators:

- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations
- Air Taxi and Military Operations
- Operational Peaks

EXISTING FORECASTS

Consideration is given to any forecasts of aviation demand for the airport that have been completed in the recent past. For Merrill Municipal Airport, the previous forecasts reviewed are those in the FAA *Terminal Area Forecast* (TAF), the 2009 Merrill Municipal Airport Layout Plan (ALP) Update & Narrative, and the 2030 *Wisconsin State Aviation System Plan* (SASP) that used a base year of 2010.

FAA *TERMINAL AREA FORECAST*

The FAA publishes the TAF for each airport included in the *National Plan of Integrated Airport Systems* (NPIAS) on an annual basis. The TAF is a generalized forecast of airport activity used by the FAA for internal planning purposes primarily. It is available to airports and consultants to use as a baseline projection and important point of comparison while developing local forecasts. The current TAF was published in February 2023 and is based on the federal fiscal year (October-September).

As presented in **Table 2C**, the TAF projects general aviation activity at the airport to remain static over the next 20 years which is the common practice by FAA for airports not served by an airport traffic control tower (ATCT). Given that there is currently no commercial service activity at Merrill Municipal Airport, the TAF does not reflect any existing and/or forecast air carrier operations; however, the TAF does reflect 700 air taxi operations over the forecast period. Operations are projected to be dominated by local and itinerant GA operations, which are estimated to account for 96 percent of the total operations over the planning period. Military operations are projected to account for less than one percent of total operations, with 10 operations projected for each of the plan years. Based aircraft are also projected to remain flat at 23 aircraft over the next 20 years, which again is a common practice for non-towered general aviation airports. As noted previously, even though the TAF is generic and presents no real forecast growth, the FAA will compare the new forecasts developed for this master plan to the TAF.

Table 2C | 2023 FAA Terminal Area Forecast – Merrill Municipal Airport

	2023	2028	2033	2043	CAGR 2023-2043
ANNUAL OPERATIONS					
Itinerant					
Air Carrier	0	0	0	0	0.0%
Air Taxi	700	700	700	700	0.0%
General Aviation	9,000	9,000	9,000	9,000	0.0%
Military	10	10	10	10	10
Total Itinerant	*9,710*	*9,710*	*9,710*	*9,710*	*0.0%*
Local					
General Aviation	9,000	9,000	9,000	9,000	0.0%
Military	0	0	0	0	0.0%
Total Local	*9,000*	*9,000*	*9,000*	*9,000*	*0.0%*
Total Operations	***18,710***	***18,710***	***18,710***	***18,710***	0.0%
BASED AIRCRAFT					
Based Aircraft	***23***	***23***	***23***	***23***	0.0%

Source: FAA Terminal Area Forecast (TAF), February 2023

PREVIOUS FORECASTS

Forecasts of aviation activity at Merrill Municipal Airport were previously prepared within older, less currently relevant documents including the 2009 ALP Update & Narrative and the 2030 SASP. **Table 2D** summarizes the forecasts of operations and based aircraft at Merrill Municipal Airport that were prepared for these studies. It should be noted that, since the completion of the previous planning, a national recession caused a significant reduction in aviation activity not only at Merrill Municipal Airport but across the country. As a result, the projections from the previous study are no longer relevant.

The SASP projections were prepared more recently and account for the effects of the recession. The SASP, which used a base year of 2010, forecasted total operations to grow from 21,800 in 2010 to 25,640 by 2030, and based aircraft to increase slightly from 26 to 31 by 2030. In terms of based aircraft, the airport has exceeded these projections, with 45 validated based aircraft at the time of this writing (January 2024). Based on recent activity trends at Merrill Municipal Airport and in the region, along with the time that has passed since the preparation of these previous forecasts, it is necessary to develop new forecasts utilizing the most current information available.

Table 2D | Previous Forecasts – Merrill Municipal Airport

Year	Itinerant Operations	Local Operations	Total Operations	Based Aircraft
2009 ALP Update & Narrative (2008 Base Year)				
2008	9,569	13,771	23,340	30
2013	10,845	15,607	26,452	34
2018	13,078	18,820	31,898	41
2028	14,673	21,115	35,788	46
2030 *Wisconsin State Aviation System Plan* Update (2010 Base Year)				
2010	NA	NA	21,800	26
2015	NA	NA	22,380	27
2020	NA	NA	23,040	27
2030	NA	NA	25,640	31
Note: The SASP forecast includes total operations only; forecasts were not developed for itinerant and local operations separately				

Sources: 2009 ALP Update & Narrative; 2030 Wisconsin State Aviation System Plan Update

GENERAL AVIATION FORECASTS

The following forecast analysis examines each of the aviation demand categories expected at Merrill Municipal Airport over the next 20 years. Each segment will be examined individually, and then collectively, to provide an understanding of the overall aviation activity at the airport through 2043. Forecasts for airport activities include the following:

- Service Area Registered Aircraft
- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations – Local and Itinerant
- Air Taxi and Military Operations
- Peaking Conditions
- Critical Aircraft

The remainder of this chapter will examine historical trends with regard to these areas of general aviation and project future demand for these segments of general aviation activity at the airport. These forecasts, once approved by the FAA, will become the basis for planning future facilities, both airside and landside.

REGISTERED AIRCRAFT FORECASTS

The most basic indicator of general aviation demand at an airport is the total number of aircraft based at the facility. Before a projection of based aircraft can be developed, however, it is important to first ascertain the number, or pool, of aircraft in the market area from which RRL based aircraft will be generated. The methodology for identifying the market pool is to offer an examination and forecast of registered aircraft in the airport's service area.

Table 2E presents the historical registered aircraft for Lincoln County for 2003 through 2023. These figures are derived from the FAA aircraft registration database that categorizes aircraft registrations by county based on the zip code of the aircraft owner. Although this information generally provides a correlation to based aircraft, it is not uncommon for some aircraft to be registered in the county but be based at an airport outside the county or vice versa.

Table 2E | Historic Registered Aircraft – Lincoln County

Year	Single-Engine Piston	Multi-Engine Piston	Turboprop	Jet	Helicopter	Other[1]	Total
2003	76	3	5	0	1	2	87
2004	72	3	5	0	1	2	83
2005	75	3	5	0	1	2	86
2006	74	4	2	0	1	2	83
2007	72	4	2	0	1	2	81
2008	78	5	1	0	1	2	87
2009	79	4	1	0	1	2	87
2010	80	2	2	0	1	3	88
2011	82	3	2	0	1	4	92
2012	82	3	2	0	1	4	92
2013	73	3	1	0	0	3	80
2014	73	3	1	0	0	3	80
2015	68	3	1	0	0	3	75
2016	68	3	1	0	1	3	76
2017	68	3	1	0	1	3	76
2018	68	3	1	0	0	2	74
2019	68	3	0	0	0	2	73
2020	64	3	0	0	0	3	70
2021	61	3	1	0	0	3	68
2022	63	3	0	0	0	3	69
2023[2]	64	4	0	0	0	3	71

[1] The 'Other' aircraft category includes aircraft such as gliders, electric aircraft, balloons, and dirigibles
[2] As of 11/14/2023

Source: FAA Aircraft Registration Database

The registered aircraft in the service area show a somewhat declining trend over the last several years, with the historic high recorded in 2011 and 2012 with 92 registered aircraft. As previously stated, the FAA required aircraft owners to re-register their aircraft during this timeframe, which likely accounts for the notable decrease from 92 registered aircraft in 2012 to 80 in 2013. Since then, registered aircraft in Lincoln County generally dropped until 2022. The most recent count for 2023 shows 71 reported registrations in the county.

Although there are no recently prepared forecasts for Lincoln County regarding registered aircraft, one was prepared for this study using market share, ratio, and historic growth rate projection methods. Several regression forecasts were considered as well, including single- and multi-variable regressions examining registered aircraft's correlation with the service area population, employment, income, and gross regional product, and with U.S. active general aviation aircraft. Regression analysis measures the statistical relationship between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's 'r') measure associations between the changes in a dependent variable and independent variable. If the r^2 value is greater than 0.90, it indicates good predictive reliability. **Table 2F** details the results of this analysis, which considered the correlation between registered aircraft (dependent variable) and several independent variables, as described above.

Only one of the regressions resulted in an r^2 value greater than 0.90 – the relationship between registered aircraft and historic county income. A forecast based on this regression resulted in the following projections: 65 registered aircraft in 2028, 60 registered aircraft in 2033, and 50 registered aircraft in 2043. This is reflective of a -1.70 percent CAGR.

Table 2F | Regression Analysis

Independent Variable	r^2
Year	0.85
Population	0.58
Employment	0.55
Income	0.94
Gross Regional Product	0.01
U.S. Active Aircraft	0.12

Source: Coffman Associates analysis

Table 2G and **Exhibit 2C** present several other projections of registered aircraft for the service area, with a goal of presenting a planning envelope that shows a range of projections based on historic trends. The first set of forecasts is based on market share, which considers the relationship between registered aircraft located in Lincoln County and active aircraft within the United States. The next set of projections is based on a ratio of the number of aircraft per 1,000 county residents. Lastly, a projection based on the 10-year historic growth rate was also prepared.

Market Share Projections

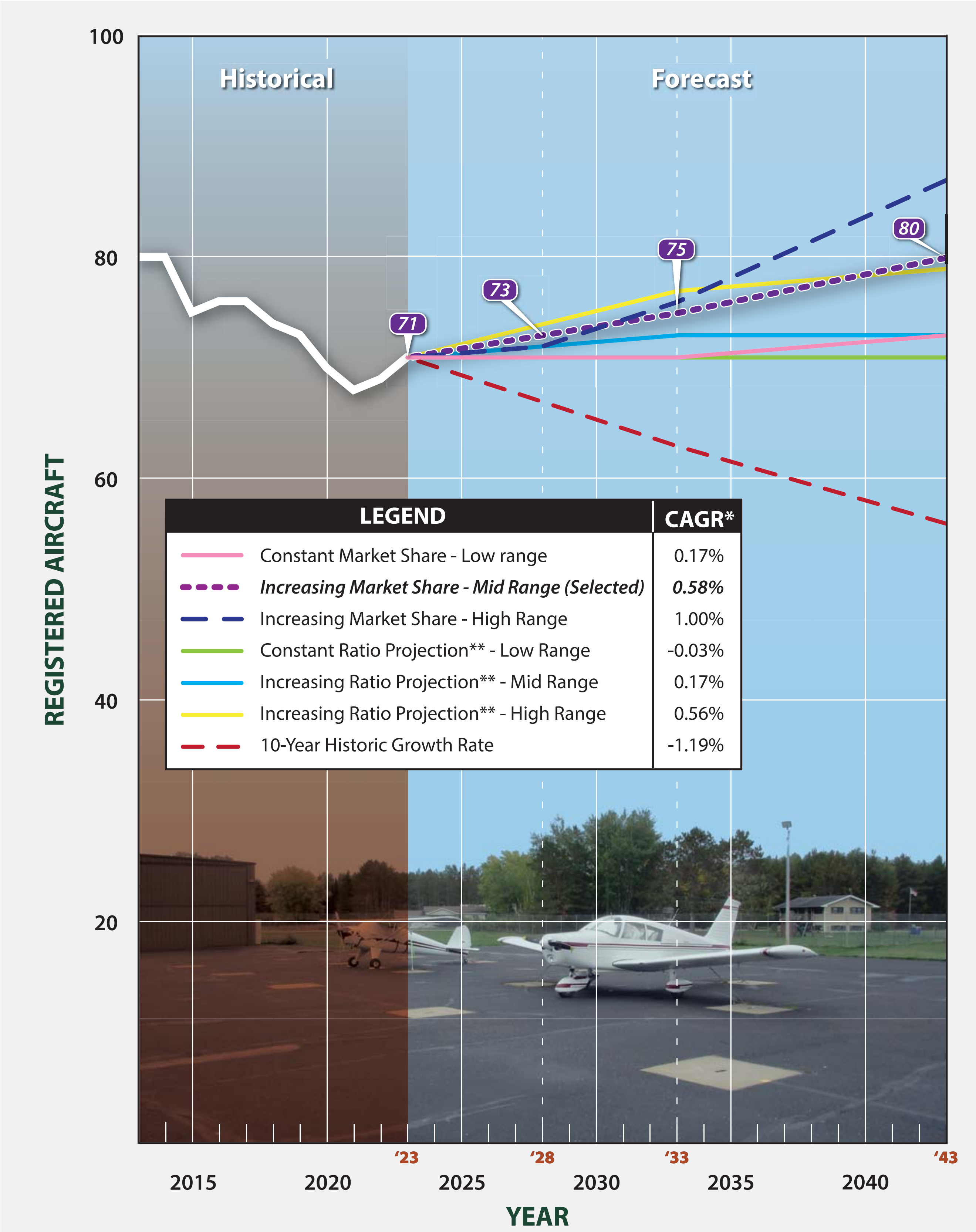
- ***Constant Market Share*** – This forecast maintains the 2023 market share of county residents (0.0340%) throughout the planning period. The result is no growth in registrations in the short and intermediate terms, followed by the addition of two aircraft by the long term. This results in 73 registered aircraft projected for 2043 and a CAGR of 0.17 percent.
- ***Increasing Market Share*** – Two increasing market share forecasts were also considered. The first evaluated a high-range market share forecast based upon a return to the county's record high market share, which occurred in 2013 with 0.0400 percent. This produced a CAGR of 1.00 percent, or 87 registered aircraft in the county by 2043. A mid-range scenario based on the median CAGR between the constant and high-range scenarios was also considered, which increased the market share to 0.0369 percent, resulting in 80 registered aircraft in Lincoln County by the end of the planning period at a CAGR of 0.58 percent.

Ratio Projections

- ***Constant Ratio*** – In 2023, there were 2.50 registered aircraft per 1,000 county residents. Carrying this ratio forward through the plan years results in no change to the number of registrations in the county, with 71 aircraft projected for each of the plan years.
- ***Increasing Ratio*** – Mid- and high-range increases were also projected. The mid-range projection was based on the historic average ratio and resulted in 73 registered aircraft by 2043, which equates to a CAGR of 0.17 percent. The high-range projection, which is based on a return to the historic high ratio of 2.81, results in 79 aircraft by 2043, for a CAGR of 0.56 percent.

Growth Rate Projection

The historic growth rate was also examined. Over the last 10 years, Lincoln County aircraft registrations have generally declined at a rate of -1.19 percent. If this trend is applied to the forecast years, there is



*CAGR - Compound Annual Growth Rate ** per 1,000 County Residents

Sources: FAA Aircraft Registration Database, FAA Aerospace Forecast - Fiscal Years 2023-2043, Woods & Poole 2023

Exhibit 2C
REGISTERED AIRCRAFT PROJECTIONS

an obvious reduction in county aircraft registrations, from 71 aircraft in the base year to 56 by the end of the planning period.

Table 2G | Registered Aircraft Projections - Lincoln County

Year	Service Area Registrations	U.S. Active Aircraft	Market Share of U.S. Aircraft	Service Area Population	Aircraft per 1,000 Residents
2013	80	199,927	0.0400%	28,560	2.80
2014	80	204,408	0.0391%	28,450	2.81
2015	75	210,031	0.0357%	28,296	2.65
2016	76	211,794	0.0359%	28,362	2.68
2017	76	211,757	0.0359%	28,349	2.68
2018	74	211,749	0.0349%	28,376	2.61
2019	73	210,981	0.0346%	28,373	2.57
2020	70	204,140	0.0343%	28,429	2.46
2021	68	209,194	0.0325%	28,453	2.39
2022	69	209,140	0.0330%	28,376	2.43
2023	71	209,095	0.0340%	28,404	2.50
Constant Market Share of U.S. Active Aircraft - Low Range (CAGR 0.17%)					
2028	71	209,510	0.0340%	28,500	2.50
2033	71	210,455	0.0340%	28,508	2.51
2043	73	216,395	0.0340%	28,250	2.60
Increasing Market Share of U.S. Active Aircraft - High Range (CAGR 1.00%)					
2028	72	209,510	0.0345%	28,500	2.54
2033	76	210,455	0.0360%	28,508	2.66
2043	87	216,395	0.0400%	28,250	3.07
Increasing Market Share of U.S. Active Aircraft - Mid Range (CAGR 0.58%) – Selected Forecast					
2028	73	209,510	0.0349%	28,500	2.56
2033	75	210,455	0.0358%	28,508	2.64
2043	80	216,395	0.0369%	28,250	2.82
Constant Ratio Projection per 1,000 County Residents - Low Range (CAGR -0.03%)					
2028	71	209,510	0.0340%	28,500	2.50
2033	71	210,455	0.0339%	28,508	2.50
2043	71	216,395	0.0326%	28,250	2.50
Increasing Ratio Projection per 1,000 County Residents - High Range (CAGR 0.56%)					
2028	74	209,510	0.0353%	28,500	2.59
2033	77	210,455	0.0364%	28,508	2.69
2043	79	216,395	0.0367%	28,250	2.81
Increasing Ratio Projection per 1,000 County Residents - Mid Range (CAGR 0.17%)					
2028	72	209,510	0.0343%	28,500	2.52
2033	73	210,455	0.0345%	28,508	2.55
2043	73	216,395	0.0339%	28,250	2.60
10-Year Historic Registered Aircraft Growth Rate (CAGR -1.19%)					
2028	67	209,510	0.0319%	28,500	2.35
2033	63	210,455	0.0299%	28,508	2.21
2043	56	216,395	0.0258%	28,250	1.98

Sources: FAA Aircraft Registration Database; FAA Aerospace Forecast - Fiscal Years 2023-2043; Woods & Poole 2023; Coffman Associates analysis

Selected Forecast

Each of these forecasts offers a projection of what aircraft registrations in the service area could look like over the next 20 years. The projection based on the regression analysis included in **Table 2F** and the growth rate forecast provide the low-end projections, and the high-range increasing ratio forecast makes up the top end of the planning envelope. Even though county registrations have generally declined, and the service area population is expected to remain stagnant, it is not unreasonable to expect some level of growth in aircraft registrations over the next 20 years. This is predicated on the anticipated growth in the national fleet of active aircraft, as well as the slow uptick in registrations over the three years. Therefore, the mid-range increasing market share of U.S. active aircraft is considered the most reasonable registered aircraft forecast. At a CAGR of 0.58 percent, this forecast shows slow but steady growth in aircraft registrations in Lincoln County, with the addition of two aircraft by 2028, four by 2033, and nine by 2043, for a total of 80 registered aircraft in the service area in 2043.

The registered aircraft projection is one data point to be used in the development of a based aircraft forecast. The following section will present several potential based aircraft forecasts, as well as the selected based aircraft forecast, to be utilized in this study.

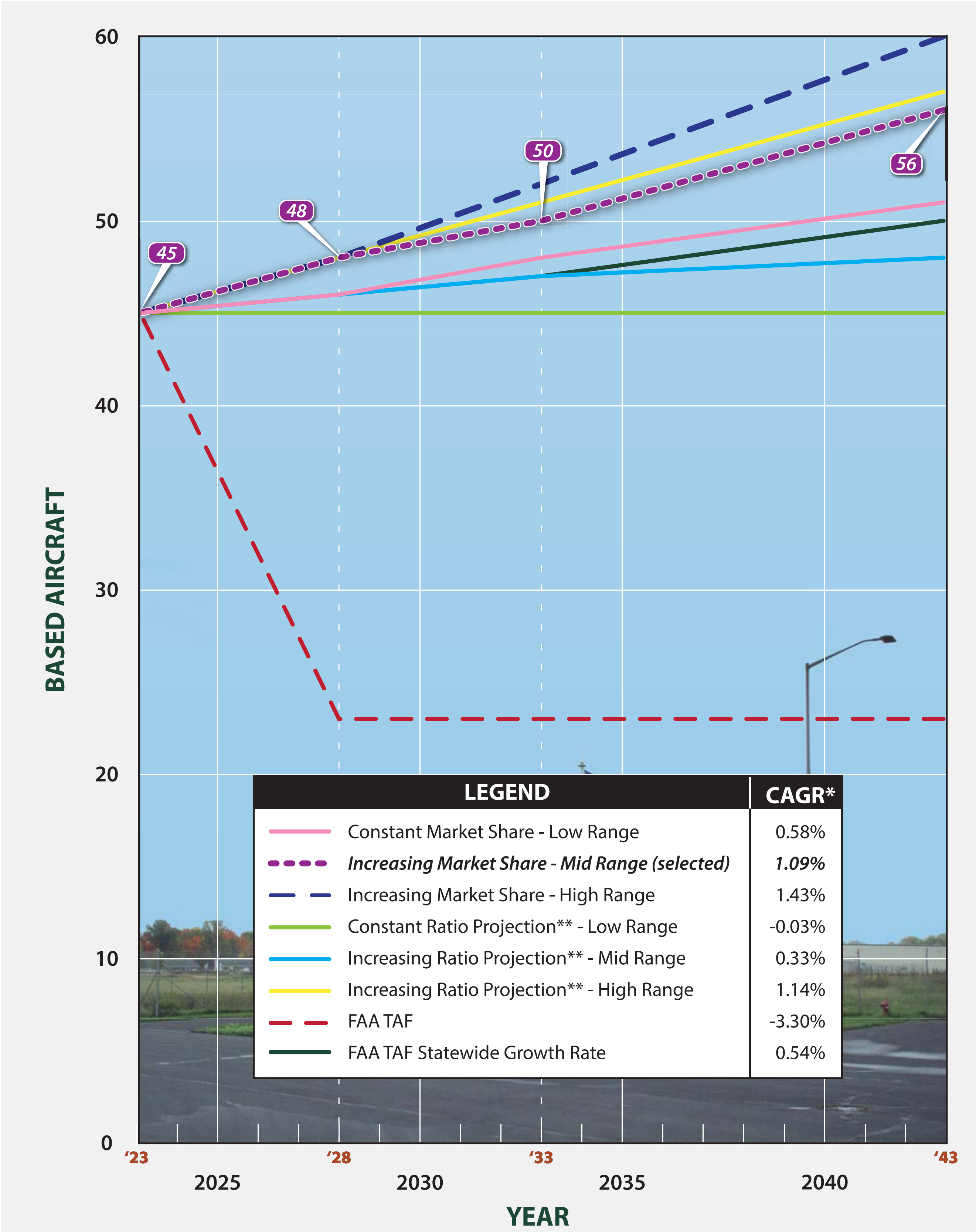
BASED AIRCRAFT FORECAST

Determining the number of based aircraft at an airport can be a challenging task. Aircraft storage can be somewhat transient in nature, meaning aircraft owners can and do move their aircraft. Some aircraft owners may store their aircraft at an airport for only part of the year. For many years, the FAA did not require airports to report their based aircraft counts, nor did they validate based aircraft at airports; however, this has changed in recent years, and now the FAA mandates that airports report their based aircraft levels. These counts are recorded in the National Based Aircraft Inventory program and maintained and validated by the FAA to ensure accuracy.

According to the FAA's database, Merrill Municipal Airport has 44 based aircraft, a count which was most recently confirmed in January 2024. Airport staff indicates that an additional aircraft is currently in the process of being validated as based at RRL. As such, for forecasting purposes, 45 aircraft will serve as the base year count[1].

Like the registered aircraft forecasts, several projections have been made for based aircraft at Merrill Municipal Airport, including market share, ratio, and growth rate forecasts. The market share is based on the airport's percentage of based aircraft as compared to registered aircraft in the service area, while the ratio projection is based on the number of based aircraft per 1,000 county residents. The growth rate projection considers the FAA's TAF projection for the State of Wisconsin. The results of these analyses are detailed in **Table 2H** and depicted graphically in **Exhibit 2D**. It should be noted that there was no historic based aircraft data available; as such, an assumptive analysis was made based on the experience of the forecast preparer and knowledge of regional and national based aircraft trends. The overarching assumption is that RRL will experience some level of growth in based aircraft over the planning period, for the following reasons: 1) this reflects national and state estimates for increased aircraft ownership, as noted in the FAA TAF; 2) there is existing demand for aircraft storage space at RRL; and 3) there

[1] Since the preparation of this chapter in January 2024 and subsequent submittal to WisDOT BOA for approval, three additional aircraft have been added to the airport's records of based aircraft, for a total of 48 aircraft based at RRL as of September 2025. This includes 45 single-engine piston aircraft, two multi-engine piston aircraft, and one jet (Cessna Citation). Additional information concerning the RRL's based aircraft, operations, and services and capabilities are detailed in Appendix D, Forecast Addendum, as supplementary data for future planning purposes.



***CAGR** - Compound Annual Growth Rate **per 1,000 Residents

Sources: basedaircraft.com; 2023 FAA TAF; Woods & Poole CEDDS 2023 are currently several shovel-ready sites available for hangar development, and it is not unreasonable to assume that construction of new aircraft hangars will occur.

Table 2H | Based Aircraft Forecasts for Merrill Municipal Airport

Year	Merrill Municipal Airport Based Aircraft	Service Area Registrations	Market Share	Service Area Population	Aircraft Per 1,000 Residents
2023	45	71	63.4%	28,404	1.58
Constant Market Share - Low Range (CAGR 0.58%)					
2028	46	73	63.4%	28,500	1.63
2033	48	75	63.4%	28,508	1.67
2043	51	80	63.4%	28,250	1.79
Increasing Market Share - Mid Range (CAGR 1.09%) – *Selected Forecast*					
2028	48	73	65.0%	28,500	1.67
2033	50	75	66.7%	28,508	1.76
2043	56	80	70.0%	28,250	1.98
Increasing Market Share - High Range (CAGR 1.43%)					
2028	48	73	66.3%	28,500	1.70
2033	52	75	69.2%	28,508	1.83
2043	60	80	75.0%	28,250	2.12
Constant Ratio per 1,000 Residents (CAGR -0.03%)					
2028	45	73	61.8%	28,500	1.58
2033	45	75	60.0%	28,508	1.58
2043	45	80	56.1%	28,250	1.58
Increasing Ratio per 1,000 Residents - Mid Range (CAGR 0.33%)					
2028	46	73	62.9%	28,500	1.61
2033	47	75	62.2%	28,508	1.64
2043	48	80	60.2%	28,250	1.70
Increasing Ratio per 1,000 Residents - High Range (CAGR 1.14%)					
2028	48	73	65.8%	28,500	1.69
2033	51	75	67.9%	28,508	1.79
2043	57	80	70.8%	28,250	2.00
FAA TAF (CAGR -3.30%)					
2028	23	73	31.5%	28,500	0.81
2033	23	75	30.6%	28,508	0.81
2043	23	80	28.8%	28,250	0.81
FAA TAF Statewide Growth Rate (CAGR 0.54%)					
2028	46	73	63.2%	28,500	1.62
2033	47	75	63.1%	28,508	1.67
2043	50	80	62.8%	28,250	1.77

Sources: Based aircraft records; 2023 FAA TAF; Woods & Poole CEDDS 2023; Coffman Associates analysis

Market Share Projections

- ***Constant Market Share*** – In 2023, the airport had 45 based aircraft, which equates to 63.4 percent of the market share of registered aircraft in Lincoln County. Carrying this percentage throughout the plan years results in a small increase in based aircraft, reflective of a 0.58 percent CAGR. This projection yielded 51 based aircraft by 2043.
- ***Increasing Market Share*** – Two increasing market share forecasts were also evaluated. The mid-range scenario considered a 70.0 percent market share by 2043 and resulted in an increase in based aircraft to 56, or a 1.09 percent CAGR, by the end of the planning period. The high-range

market share forecast evaluated a stronger growth scenario that considered Merrill Municipal Airport holding 75.0 percent of the market share by the end of the planning period. This resulted in 60 based aircraft by 2043, for a CAGR of 1.43 percent.

Ratio Projections

- ***Constant Ratio*** – In 2023, the ratio of based aircraft per 1,000 county residents stood at 1.58. Maintaining this at a constant through 2043 resulted in a no growth in based aircraft, due to the stagnant nature of the county population projections. Under this scenario, the airport would remain at 45 based aircraft over the planning period.
- ***Increasing Ratio*** – Mid- and high-range growth scenarios were also evaluated. The mid-range scenario is based on a slow-growing ratio of 1.70 based aircraft per 1,000 residents by 2043. Applying this figure to the end of the planning period results in 48 based aircraft at the airport by 2043, at a CAGR of 0.33 percent. The high-range scenario considers more aggressive growth, with 2.00 based aircraft per 1,000 residents by the end of the planning period. Applying this ratio produces 57 based aircraft forecast by 2043.

As a point of comparison, the FAA TAF projections for based aircraft at Merrill Municipal Airport are also included. The TAF shows no growth in based aircraft, with the count flatlined at 23 throughout the planning period; this results in a negative CAGR when considering the actual count of based aircraft in 2023. The TAF for the State of Wisconsin was also examined, and the statewide growth rate for based aircraft of 0.54 percent was applied. This resulted in 50 based aircraft at Merrill Municipal Airport by the end of the planning period.

Selected Forecast

The forecasts produce a planning envelope ranging from 23 to 60 based aircraft on the airport by 2043. As of September 2023, there are no hangar vacancies, and 18 individuals are on a wait list for hangar space. This is indicative of strong demand for aircraft storage space at the airport. Combined with favorable trends in aircraft ownership both locally and nationally, along with the clear demand for hangar space and approximately 27 shovel-ready sites for hangar development, it is reasonable to assume a more robust growth rate for based aircraft at RRL. Therefore, the mid-range increasing ratio forecast has been selected as the preferred projection. With a CAGR of 1.09 percent, this forecast shows an increase of 11 based aircraft by the end of the planning period, for a total of 56 aircraft based at RRL by 2043.

Based Aircraft Fleet Mix Forecast

It is important to have an understanding of the current and projected based aircraft fleet mix at an airport. This will ensure the planning of proper facilities in the future. The forecast mix of based aircraft was determined by comparing existing and forecast U.S. general aviation fleet trends to the fleet mix at the airport. The national trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet. Merrill Municipal Airport is capable of accommodating all types of general aviation aircraft, from small piston-powered aircraft up to small- and mid-size business jet aircraft.

As indicated in **Table 2J**, single engine piston aircraft presently make up the majority of the fleet mix at the airport, comprising 98 percent of the aircraft based at the airport. The one multi-engine piston currently based at RRL accounts for the remainder of the fleet mix.

Table 2J | Total Based Aircraft Fleet Mix

	EXISTING		FORECAST					
Aircraft Type	**2023**	**%**	**2028**	**%**	**2033**	**%**	**2043**	**%**
Single Engine Piston	44	98%	46	96%	47	94%	48	86%
Multi-Engine Piston	1	2%	1	2%	1	2%	0	0%
Turboprop	0	0%	1	2%	2	4%	3	5%
Jet	0	0%	0	0%	0	0%	2	4%
Helicopter	0	0%	0	0%	0	0%	1	2%
Other	0	0%	0	0%	0	0%	2	4%
Totals	**45**	**100%**	**48**	**100%**	**50**	**100%**	**56**	**100%**

Source: Airport records; Coffman Associates analysis

The FAA predicts piston-powered aircraft will decline in numbers nationwide, with aircraft ownership trends shifting to the more sophisticated turboprops and jets. However, it is anticipated that piston aircraft will continue to comprise the majority of the fleet mix at Merrill Municipal Airport, with slower growth in turbine aircraft. The table details the based aircraft fleet mix projections for the airport over the next 20 years. Single engine pistons are projected to increase from the 44 currently based at the airport, to 48 by 2043. The multi-engine piston is expected to phase out by the end of the planning period, in line with national trends, while three turboprops, two jets, and a helicopter are anticipated to be added to the fleet mix by 2043. The 'other' category, which includes experimental, ultralight, and unmanned aerial system (UAS) aircraft, is also expected to account for two based aircraft, as this category is also predicted to increase in numbers in the future.

OPERATIONS FORECASTS

Operations at Merrill Municipal Airport are classified as either general aviation, air taxi, or military. General aviation operations include a wide range of activity from recreational use and flight training to business and corporate uses. Air taxi operations are those conducted by aircraft operating under 14 Code of Federal Regulations (CFR) Part 135, otherwise known as "for-hire" or "on-demand" activity. Military operations include those operations conducted by various branches of the U.S. military.

Aircraft operations are further classified as local and itinerant. A local operation is a takeoff or landing performed by an aircraft that operates within sight of an airport, or which executes simulated approaches or touch-and-go operations at an airport. Generally, local operations are characterized by training activity. Itinerant operations are those performed by aircraft with a specific origin or destination away from an airport. Typically, itinerant operations increase with business and commercial use since business aircraft are used primarily to transport passengers from one location to another.

As previously stated, according to recent FAA guidelines outlined in the "Forecast Review and Approval Instructions" memo dated August 2024, a traditional, detailed forecast of operations is not necessary for non-towered airports experiencing less than 90,000 annual operations. However, one was prepared for Merrill Municipal Airport prior to the memo's release and thus is included in the master plan.

Because Merrill Municipal Airport is not equipped with an airport traffic control tower (ATCT), precise operational (takeoff and landing) counts are not available. Sources for estimated operational activity at the airport include the FAA Form 5010 Airport Master Record, the FAA TAF, and the 2030 Wisconsin State Airport System Plan. The 2023 FAA TAF indicates a total of 18,710 operations in 2023, as does Form 5010 for the 12-month period ending June 22, 2023. In both estimates, there is an even split of local and itinerant operations, with each comprising 48.1 percent of the total operations count. Air taxi and military operations are estimated at 3.7 percent and 0.05 percent of the total, respectively. On a more local level, the State System Plan provided an estimate of 21,800 total operations with a base year of 2010. The State System Plan did not categorize operations by local or itinerant.

Additional calculations to estimate annual operations were also conducted for comparison purposes. The first, Equation 15 in FAA's "Model for Estimating General Aviation Operations at Non-towered Airports Using Towered and Non-towered Airport Data," factors in regional population and based aircraft data to develop a baseline operational count. When this data was input, the result was 15,393 annual operations, as shown in **Table 2K**.

Table 2K | FAA Model for Operations Estimates

Inputs		
Population Within 25nm	161,334	
Population Within 100 nm	2,054,056	
Based aircraft	45	
Based AC at airports within 100 nm	1,348	
Equation 15		
755		775
241 (BA)	+	10845
0.14 (BA^2)	-	284
31,478 (% in 100 mi)	+	1051
5,557 (VITFSnum)	+	0
0.001 (Pop100)	+	2,054
3,736 (WACAORAK)	-	0
12,121 (Pop25/100)	+	952
Estimate of Total Ops		**15,393**

775 = Constant
BA = Based aircraft
VITFSnum = # of FAR 141 pilot schools on airport
WACAORAK = 1 if CA, OR, WA, AK; 0 otherwise

Source: Equation 15, Model for Estimating General Aviation Operations at Non-towered Airports Using Towered and Non-towered Airport Data, GRA, Inc. (2001)

The second calculation multiplies validated based aircraft by an estimated number of operations per based aircraft (OPBA), as outlined in Airport Cooperative Research Program (ACRP) Report 129, *Evaluating Methods for Counting Aircraft Operations at Non-Towered Airports*. In FAA Order 5090.5, the FAA recommends using a multiplier of 350 OPBA for local GA airports. This resulted in an estimated 15,750 total annual operations.

Records from FlightAware were also used in an attempt to quantify operations at RRL. FlightAware is an aviation technology company that provides flight tracking data using the ADS-B network, which is a surveillance technology that combines an aircraft's positioning source, avionics, and ground infrastructure to determine information about an aircraft. Aircraft equipped with ADS-B Out broadcast information including GPS location, altitude, ground speed, and other data. Data from FlightAware was analyzed for the years 2021, 2022, and 2023.[2] According to this data, there were 711 operations in 2021,

[2] 2023 FlightAware data is reflective of reported operations occurring between January 1, 2023 and November 7, 2023.

601 in 2022, and 774 in 2023. It should be noted that this does not represent the total number of operations occurring at RRL during this period. The data is likely limited due to a number of factors, including inadequate radar coverage around RRL and aircraft that are operating without ADS-B Out.

Lastly, The FAA's Traffic Flow Management System Count (TFMSC) database was examined to assist in determining total annual operations at RRL. The TFMSC database captures an operation when a pilot files a flight plan and/or when flights are detected by the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to certain factors, such as incomplete flight plans, limited radar coverage, and VFR operations, TFMSC data does not account for all aircraft activity at an airport by a given aircraft type. The TFMSC reports 166 operations occurring at RRL during 2023 and is considered to be a limited dataset.

In summary, the following estimates of annual operations as derived from various sources are:

- FAA Form 5010 – 18,710 annual operations
- 2023 FAA TAF – 18,710 annual operations
- 2030 Wisconsin State Airport System Plan – 21,800 (2010 base year estimate)
- FAA Equation 15 – 15,393 annual operations
- OPBA with 350 multiplier – 15,750 annual operations
- FlightAware – 774 operations (January 1, 2023 through November 7, 2023)
- TFMSC – 166 operations (2023)

Based on activity levels in the region and at similar airports, the OPBA estimation of 15,750 annual operations is considered to be most in line with actual operations. A 50/50 split between local and itinerant operations is assumed, based on what is reported in the FAA TAF and the Form 5010. As such, the following figures will be carried forward for use as the base year count:

- 7,875 annual itinerant GA operations (50 percent of total)
- 7,875 annual local GA operations (50 percent of total)

General Aviation Operations Forecast

Market Share Projections

Table 2L presents three market share forecasts for local and itinerant GA operations, based on the airport's current market share of total U.S. itinerant GA operations. In 2023, the airport held a 0.052 percent market share of national itinerant operations and 0.053 percent of the market share for local operations. The first forecast carries this figure forward as a constant through the planning period, resulting in 8,720 itinerant operations and 8,840 local operations by 2043, for CAGRs of 0.51 percent and 0.58 percent, respectively. As growth in both itinerant and local operations is expected to occur nationally, two increasing market share forecasts were also developed. The first considers a slower growth scenario, with an increase to 10,520 itinerant operations and 10,470 local operations by 2043. This produced CAGRs of 1.46 percent and 1.43 percent, respectively. A faster growth scenario evaluated market shares at 0.075

percent for both itinerant and local operations. This resulted in 12,530 itinerant operations by 2043 at a CAGR of 2.35 percent, and 12,470 local operations at a CAGR of 2.32 percent.

TABLE 2L Operations Forecasts – Market Share

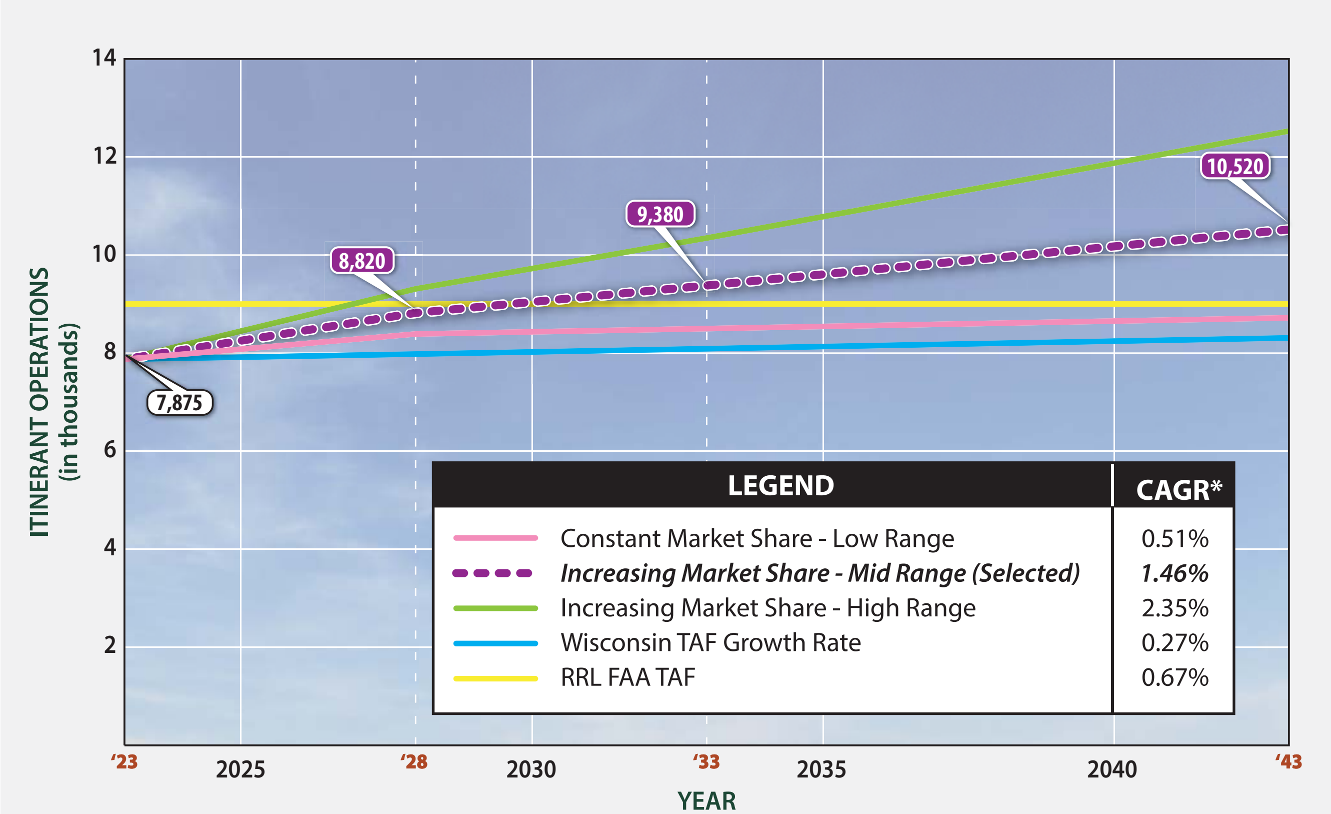
Year	RRL GA Itinerant	U.S. GA Itinerant	Market %	RRL GA Local	U.S. GA Local	Market %
2023	7,875	15,077,947	0.052%	7,875	14,801,816	0.053%
Constant Market Share - Low Range						
2028	8,390	16,067,702	0.052%	8,390	15,767,731	0.053%
2033	8,500	16,274,397	0.052%	8,540	16,043,229	0.053%
2043	8,720	16,704,132	0.052%	8,840	16,622,293	0.053%
CAGR	0.51%			0.58%		
Increasing Market Share - Mid Range – Selected Forecast						
2028	8,820	16,067,702	0.055%	8,780	15,767,731	0.056%
2033	9,380	16,274,397	0.058%	9,320	16,043,229	0.058%
2043	10,520	16,704,132	0.063%	10,470	16,622,293	0.063%
CAGR	1.46%			1.43%		
Increasing Market Share - High Range						
2028	9,310	16,067,702	0.058%	9,250	15,767,731	0.059%
2033	10,350	16,274,397	0.064%	10,280	16,043,229	0.064%
2043	12,530	16,704,132	0.075%	12,470	16,622,293	0.075%
CAGR	2.35%			2.32%		

Sources: FAA Aerospace Forecast - Fiscal Years 2023-2043; Coffman Associates analysis

Other Projections

Lastly, projections presented in the FAA TAF and the Wisconsin TAF growth rate were considered, with the TAF projections included primarily for comparison purposes. The TAF estimates both itinerant and local operations at Merrill Municipal Airport to remain flatlined at 9,000 over the course of the planning period. The statewide TAF growth rate for itinerant operations is estimated at 0.27 percent, which, when applied to the base year count, results in 8,310 itinerant operations at Merrill Municipal Airport by 2043. The Wisconsin TAF growth rate for local operations is estimated at 0.23 percent, which results in 8,250 local operations 2043 when applied to the base year count.

Exhibit 2E presents graphs of the itinerant and local GA operation projections, while **Table 2M** summarizes each forecast. In terms of itinerant operations, the forecasts present a planning envelope ranging from 8,310 (Wisconsin TAF growth rate forecast) to 12,530 itinerant operations (high-range market share forecast). Local operations show a very similar scenario, ranging from 8,250 (Wisconsin TAF growth rate) to 12,470 (high-range market share forecast) local operations. With growth in itinerant and local operations anticipated both nationally and regionally, it is reasonable to assume a moderate increase in this type of traffic over the next 20 years. As such, the mid-range increasing market share forecast is the selected projection for each operational category. For itinerant operations, this is reflective of a 1.46 percent CAGR, or 10,520 operations by the end of the planning period; and for local operations, the result is 10,470 operations at a CAGR of 1.43 percent. Overall, this represents a somewhat conservative yet realistic growth scenario. Combined, these forecasts illustrate growth from an estimated 15,750 total GA operations in 2023 to 21,090 total operations by 2043 – an increase of 5,340 operations.



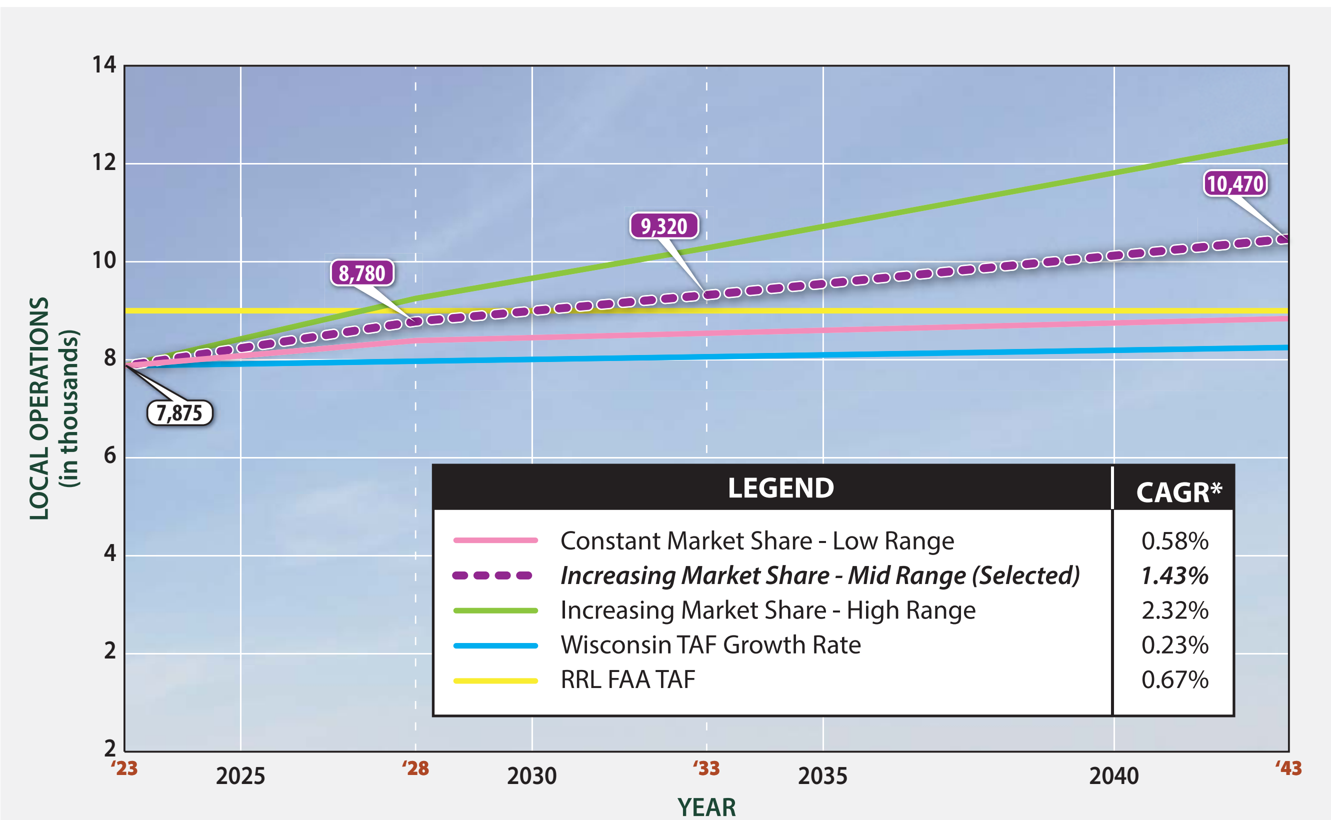


Exhibit 2E
ITINERANT AND LOCAL GA FORECASTS

Table 2M | RRL Operations Forecast Summary

Projections	2028	2033	2043	CAGR
Itinerant GA				
Constant Market - Low Range	8,390	8,500	8,720	0.51%
Increasing Market - Mid Range	**8,820**	**9,380**	**10,520**	**1.46%**
Increasing Market - High Range	9,310	10,350	12,530	2.35%
Wisconsin TAF Growth Rate	7,980	8,090	8,310	0.27%
RRL FAA TAF	9,000	9,000	9,000	0.67%
Local GA				
Constant Market - Low Range	8,390	8,540	8,840	0.58%
Increasing Market - Mid Range	**8,780**	**9,320**	**10,470**	**1.43%**
Increasing Market - High Range	9,250	10,280	12,470	2.32%
Wisconsin TAF Growth Rate	7,970	8,060	8,250	0.23%
RRL FAA TAF	9,000	9,000	9,000	0.67%

Air Taxi Operations Forecast

The air taxi category, which is a subset of the itinerant operations category, is comprised of operations that are conducted by aircraft operating under 14 CFR Part 135. Part 135 operations are “for-hire” or “on-demand” and include charter and commuter flights, air ambulance, or fractional ownership aircraft operations. The FAA projects a 0.8 percent CAGR increase in air taxi operations between 2023 and 2043. The primary reasons for this increase are the technological advancements of the electric vertical takeoff and landing aircraft (eVTOL) and the continued national growth in the business jet segment of the air taxi category.

TABLE 2N | Historic and Projected Air Taxi Operations

Year	Air Taxi Operations
2014	90
2015	86
2016	112
2017	4
2018	4
2019	8
2020	148
2021	136
2022	18
2023*	4
Air Taxi Operations Forecast	
2028	100
2033	100
2043	100

Note: 2023 counts are from 1/1/23-12/4/23

Source: AirportIQ

Historic air taxi records at Merrill Municipal Airport were not available. The FAA TAF and Form 5010 both report 700 air taxi operations. AirportIQ, a company which records Part 135 operations, was consulted to determine a more accurate air taxi count. Over the last 10 years, air taxi operations as reported by AirportIQ at RRL have fluctuated significantly, as can be seen in **Table 2N**. For this reason, and due to the generally low number of this type of operation, a flat count of 100 air taxi operations will be considered for each of the plan years.

Military Operations Forecast

Military aircraft can and do utilize civilian airports across the country, including Merrill Municipal Airport. However, it is inherently difficult to project future military operations due to their national security nature and the fact that missions can change without notice. Thus, it is typical for the FAA to use a flat-line number for military operations. For this planning study, military operations at Merrill Municipal Airport are projected to stay constant through the plan years at 10 itinerant operations and will likely constitute helicopter activity.

Peak Period Forecasts

Peaking characteristics play an important role in determining airport capacity and facility requirements. Because Merrill Municipal Airport does not have a control tower, the generalized peaking characteristics of other non-towered general aviation airports have been used for the purposes of this study. The peaking periods used to develop the capacity analysis and facility requirements are described below.

- Peak month – the calendar month in which traffic activity is the highest
- Design day – the average day in the peak month, derived by dividing the peak month by the number of days in the month
- Design hour – the average hour within the design day
- Busy day – the busiest day of a typical week in the peak month

For the purposes of this study, the peak month for total operations was estimated at 10 percent of the annual operations. By 2043, the estimated peak month is projected to reach 2,109 operations. The design day is estimated by dividing the peak month by the number of days in the month (31), and the busy day is calculated at 1.25 times the design day. The design hour is then calculated at 15 percent of the design day. These projections are included in **Table 2P**.

Table 2P | Peak Period Forecasts – Merrill Municipal Airport

	2023	2028	2033	2043
Annual	15,754	17,700	18,800	21,090
Peak Month	1,575	1,770	1,880	2,109
Design Day	51	57	61	68
Design Hour	8	9	9	10
Busy Day	64	71	75	82

Source: Coffman Associates analysis

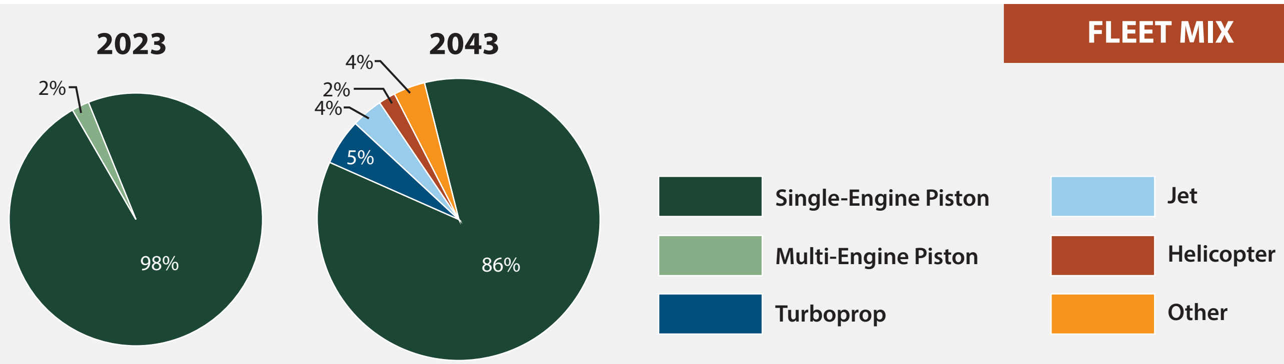
FORECAST SUMMARY

This chapter has outlined the various activity levels that might be reasonably anticipated over the planning period. **Exhibit 2F** presents a summary of the aviation forecasts prepared in this chapter. The base year for these forecasts is 2023, with a 20-year planning horizon to 2043, which allowed for the development of a conceptual forecast scenario to serve as a basis for planning purposes. The primary aviation demand indicators are based aircraft and operations. Based aircraft are forecast to increase from 45 in 2023 to 56 by 2043 (1.09 percent CAGR). Total operations at Merrill Municipal Airport are forecast to increase from 15,754 in 2023 to 21,100 by 2043 (1.47 percent CAGR).

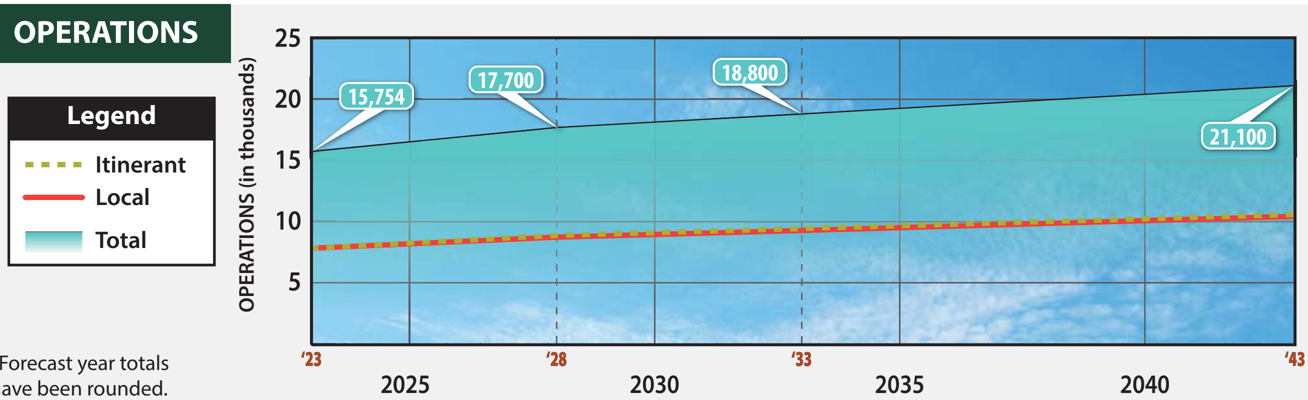
Projections of aviation demand will be influenced by unforeseen factors and events in the future; therefore, it is not reasonable to assume that future demand will follow the exact projection line, but over time, forecasts of aviation demand tend to fall within the planning envelope. The forecasts developed for this master planning effort are considered reasonable for planning purposes. The need for additional facilities will be based upon these forecasts; however, if demand does not materialize as projected, then

	Base Year	Forecast		
	2023	2028	2033	2043
OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	4	100	100	100
General Aviation	7,875	8,820	9,380	10,520
Subtotal*	***7,879***	***8,920***	***9,480***	***10,620***
Local				
General Aviation	7,875	8,780	9,320	10,470
Subtotal	***7,875***	***8,780***	***9,320***	***10,470***
TOTAL OPERATIONS*	15,754	17,700	18,800	21,100
PEAKING				
Peak Month	1,575	1,770	1,880	2,109
Design Day	51	57	61	68
Design Hour	8	9	9	10
Busy Day	64	71	75	82
BASED AIRCRAFT				
Single-Engine Piston	44	46	47	48
Multi-Engine Piston	1	1	1	0
Turboprop	0	1	2	3
Jet	0	0	0	2
Helicopter	0	0	0	1
Other	0	0	0	2
TOTAL BASED AIRCRAFT	45	48	50	56

FLEET MIX



OPERATIONS



*Forecast year totals have been rounded.

implementation of facility construction can be slower. Likewise, if demand exceeds these forecasts, the airport may accelerate construction of new facilities.

FORECAST COMPARISON TO THE FAA TAF

Historically, forecasts have been submitted to the FAA for evaluation and to be compared to the TAF. The FAA preferred that forecasts differ by less than 10 percent in the 5-year period and 15 percent in the 10-year period. Where the forecasts do differ, supporting documentation was necessary to justify the difference.

Table 2Q presents a summary of the selected forecasts and a comparison to the FAA TAF. The direct comparison between the master plan forecasts and the TAF is presented at the bottom of the table. The operations forecast is within the TAF tolerance for the both the 5-year and 10-year periods.

Table 2Q | Comparison of Master Plan Forecasts to FAA TAF

	2023	2028	2033	2043	CAGR
Total Operations					
Master Plan Forecast	15,754	17,700	18,800	21,100	1.5%
TAF	18,710	18,710	18,710	18,710	0.0%
% Difference	17.15%	5.55%	0.48%	12.01%	
Based Aircraft					
Master Plan Forecast	45	48	50	56	1.4%
TAF	23	23	23	23	0.0%
% Difference	64.71%	70.42%	73.97%	83.54%	

In terms of based aircraft, the master plan forecast is outside the TAF tolerance for both the 5- and 10-year periods. This is due in part to the TAF count being well below the FAA-validated count for the base year based aircraft, as well as the flatlined growth projection for based aircraft over the next 20 years.

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

The FAA has established several aircraft classification systems that group aircraft types based on their performance (approach speed in landing configuration) and design characteristics (wingspan and landing gear configuration). These classification systems are used to determine the appropriate airport design standards for specific airport elements, such as runways, taxiways, taxilanes, and aprons.

AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical aircraft is used to define the design parameters for an airport. The critical aircraft may be a single aircraft type or a composite aircraft representing a collection of aircraft with similar characteristics. The critical aircraft is classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13B, *Airport*

Design, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2G**.

Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards. The AAC, depicted by a letter A through E, is the aircraft approach category and relates to aircraft approach speed (operational characteristics). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

Airplane Design Group (ADG): The ADG, depicted by a Roman numeral I through VI, is a classification of aircraft which relates to aircraft wingspan or tail height (physical characteristics). When the aircraft wingspan and tail height fall in different groups, the higher group is used. The ADG influences design standards for taxiway safety area (TSA), taxiway object free area (TOFA), taxilane object free area, apron wingtip clearance, and various separation distances.

Taxiway Design Group (TDG): A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. The TDG relates to the undercarriage dimensions of the critical aircraft. The TDG is classified by an alphanumeric system: 1A, 1B, 2A, 2B, 3, 4, 5, 6, and 7. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances, are determined solely based on the wingspan (ADG) of the critical aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

The back side of **Exhibit 2G** summarizes the classification of the most common aircraft in operation today. Generally, recreational and business piston and turboprop aircraft will fall in AAC A and B, and ADG I and II. Business jets typically fall in AAC B and C, while the larger commercial aircraft will fall in AAC C and D.

AIRPORT AND RUNWAY CLASSIFICATIONS

Airport and runway classifications, along with the aircraft classifications defined previously, are used to determine the appropriate FAA design standards to which the airfield facilities are to be designed and built.

Runway Design Code (RDC): A code signifying the design standards to which the runway is to be built. The RDC is based upon planned development and has no operational component.

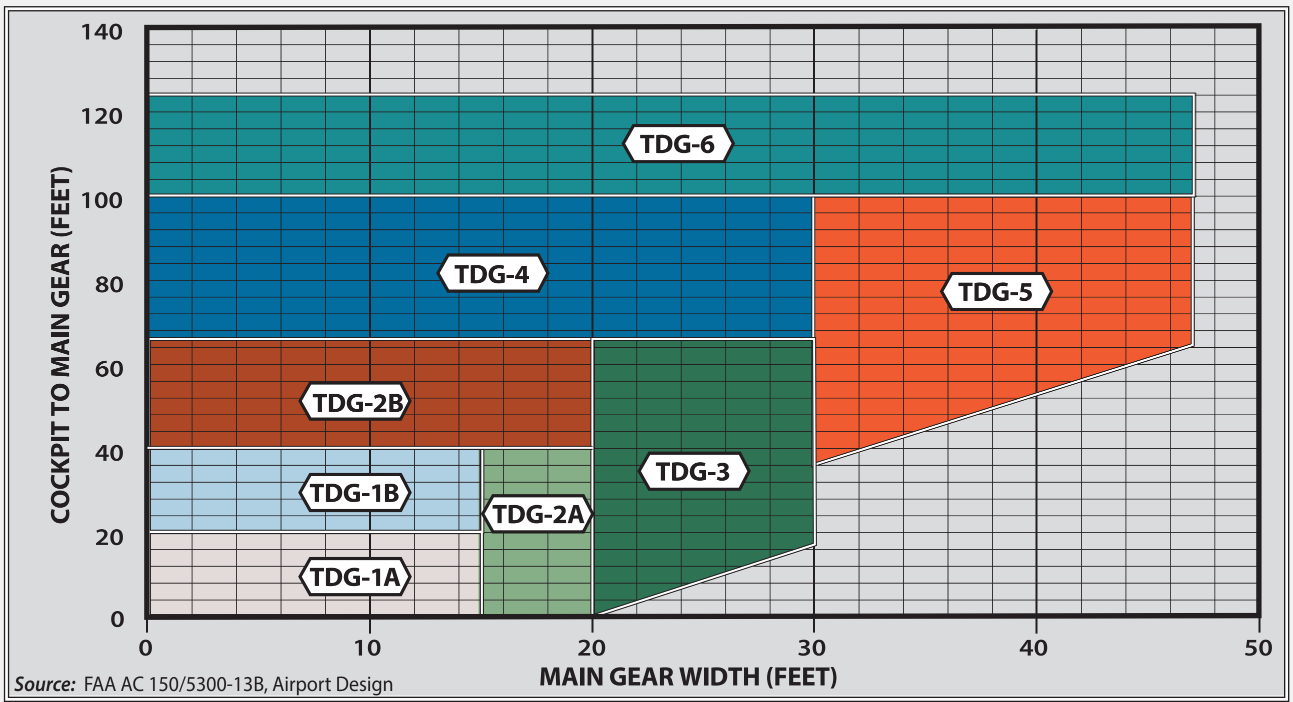
AIRCRAFT APPROACH CATEGORY (AAC)	
Category	**Approach Speed**
A	Less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

AIRPLANE DESIGN GROUP (ADG)		
Group #	**Tail Height (ft)**	**Wingspan (ft)**
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

VISIBILITY MINIMUMS	
RVR* (ft)	**Flight Visibility Category (statute miles)**
VIS	3-mile or greater visibility minimums
5,000	Not lower than 1-mile
4,000	Lower than 1-mile but not lower than ¾-mile
2,400	Lower than ¾-mile but not lower than ½-mile
1,600	Lower than ½-mile but not lower than ¼-mile
1,200	Lower than ¼-mile

***RVR**: Runway Visual Range

TAXIWAY DESIGN GROUP (TDG)



Source: FAA AC 150/5300-13B, Airport Design

A-I

Aircraft	TDG
• Beech Baron 55	1A
• **Beech Bonanza**	**1A**
• Cessna 150, 172	1A
• Eclipse 500	1A
• Piper Archer, Seneca	1A

B-I

Aircraft	TDG
• **Beech Baron 58**	**1A**
• Beech King Air 90	1A
• Cessna 421	1A
• Cessna Citation CJ1 (525)	1A
• Cessna Citation 1(500)	2
• Embraer Phenom 100	1B

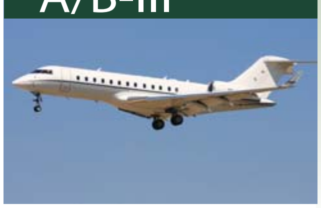
A/B-II *12,500 lbs. or less*

Aircraft	TDG
• **Beech Super King Air 200**	**2**
• Cessna 441 Conquest	1A
• Cessna Citation CJ2 (525A)	2
• Pilatus PC-12	1A

B-II *over 12,500 lbs.*

Aircraft	TDG
• Beech Super King Air 350	2
• Cessna Citation CJ3(525B), Bravo (550), V (560)	2
• **Cessna Citation CJ4 (525C)**	**1B**
• Cessna Citation Latitude/Longitude	1B
• Embraer Phenom 300	1B
• Falcon 10, 20, 50	1B
• Falcon 900, 2000	2
• Hawker 800, 800XP, 850XP, 4000	1B
• Pilatus PC-24	1B

A/B-III



Aircraft	TDG
• Bombardier Dash 8	3
• **Bombardier Global 5000**, 6000, 7000, 8000	**2**
• Falcon 6X, 7X, 8X	2

Note: Aircraft pictured is identified in bold type.

C/D-I

Aircraft	TDG
• **Lear** 25, 31, 45, 55, **60**	**1B**
• Learjet 35, 36 (D-I)	1B

C/D-II

Aircraft	TDG
• Challenger 600/604/800/850	1B
• Cessna Citation VII, X+	1B
• Embraer Legacy 450/500	1B
• **Gulfstream IV**, 350, 450 (D-II)	**2**
• Gulfstream G200/G280	1B
• Lear 70, 75	1B

C/D-III *less than 150,000 lbs.*

Aircraft	TDG
• Gulfstream V	2
• **Gulfstream** G500, 550, 600, **650 (D-III)**	**2**

C/D-III *over 150,000 lbs.*

Aircraft	TDG
• Airbus A319-100, 200	3
• **Boeing 737 -800**, 900, BBJ2 (D-III)	**3**
• MD-83, 88 (D-III)	4

C/D-IV

Aircraft	TDG
• Airbus A300-100, 200, 600	5
• Boeing 757-200	4
• **Boeing 767**-300, **400**	**5**
• MD-11	6

D-V

Aircraft	TDG
• Airbus A330-200, 300	5
• Airbus A340-500, 600	6
• Boeing 747-100 - 400	5
• Boeing 777-300	6
• **Boeing 787-8**, 9	**5**

Exhibit 2G
AIRCRAFT REFERENCE CODES

The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the available instrument approach visibility minimums expressed by RVR values in feet of 1,200 (⅛-mile), 1,600 (¼-mile), 2,400 (½-mile), 4,000 (¾-mile), and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component reads “VIS” for runways designed for visual approach use only.

Approach Reference Code (APRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. Like the RDC, the APRC is composed of the same three components: the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under particular meteorological conditions where no special operating procedures are necessary, as opposed to the RDC, which is based upon planned development with no operational component. The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to takeoff operations. The DPRC represents those aircraft that can take off from a runway while any aircraft are present on adjacent taxiways, under particular meteorological conditions with no special operating conditions. The DPRC is similar to the APRC but is composed of two components: AAC and ADG. A runway may have more than one DPRC depending on the parallel taxiway separation distance.

Airport Reference Code (ARC)**:** An airport designation that signifies the airport’s highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely at an airport. The current ALP for Merrill Municipal Airport identifies the existing ARC as B-II.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical aircraft is used to define the design parameters for an airport. The critical aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by the three parameters: AAC, ADG, and TDG.

The first consideration is the safe operation of aircraft likely to use an airport. Any operation of an aircraft that exceeds design criteria of an airport may result in a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The critical aircraft is defined as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, excluding touch-and-go operations. Planning for future aircraft use is of importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short-term development does not preclude the reasonable long-range potential needs of the airport.

According to FAA AC 150/5300-13B, *Airport Design*, "airport designs based only aircraft currently using the airport can severely limit the airport's ability to accommodate future operations of more demanding aircraft. Conversely, it is not practical or economical to base airport design on aircraft that will not realistically use the airport." Selection of the current and future critical aircraft must be realistic in nature and supported by current data and realistic projections.

AIRPORT CRITICAL AIRCRAFT

There are three elements for classifying the airport critical aircraft. The three elements are the AAC, ADG, and the TDG. The AAC and ADG are examined first, followed by the TDG.

As discussed, the FAA's TFMSC database captures certain operations (i.e., those where a flight plan is filed and those detected by radar). While the TFMSC data does not account for all aircraft activity at an airport by a given aircraft type, it does provide an accurate reflection of IFR activity. Operators of high-performance aircraft, such as turboprops and jets, tend to file flight plans at a high rate.

Exhibit 2H presents the TFMSC operational mix at the airport for turbine aircraft operations for the last 10 years.[3] As can be seen, there has been limited reporting of activity by turboprops and business jets, with no single aircraft or family of aircraft having conducted 500 or more operations at the airport over the last 10 years. In 2023, the greatest number of operations in any single design family was 42 in B-I, which accounted for approximately 82 percent of logged turbine aircraft activity was conducted by the Beechcraft King Air 90/100. The remaining operations recorded in the TFMSC were conducted by aircraft in A-I/II (seven operations) and B-II (two operations).

FlightAware data was also analyzed for the years 2021, 2022, and 2023[4]. Like the TFMSC, the FlightAware data presents limited operations but likely does not reflect the entirety of operations occurring at Merrill Municipal Airport due to radar coverage limitations and other factors mentioned earlier. According to the data received for 2023, the most frequent operator at the airport is a Cessna 172, with 174 operations, followed by a Piper Cherokee with 98 operations. Both of these aircraft are classified within the A-I family of aircraft. The third most frequent operator according to the FlightAware data was a King Air 100, which is a B-I aircraft, and for which 55 operations were recorded.

[3] 2023 TFMSC data is reflective of operations occurring between November 1, 2022 through October 31, 2023.
[4] 2023 FlightAware data is reflective of reported operations occurring between January 1, 2023 and November 7, 2023.

When planning for new facilities at Merrill Municipal Airport, it is necessary to consider the types of aircraft operating most frequently at the airport to identify the existing, future, and ultimate critical aircraft. Future refers to a period between now and 10 years, while ultimate refers to the long-range, 20-year outlook. When extrapolating data from the TFMSC, it is reasonable to assume that aircraft in category A/B-I are conducting more than 500 annual operations at RRL. Operations by aircraft in this family have historically dominated; however, operations by B-II aircraft also make up a significant percentage of the total in recent years. Therefore, the existing/future critical aircraft for Merrill Municipal Airport has been determined to fall within ARC A-I, with the Cessna 172 serving as the representative aircraft, and the ultimate critical aircraft has been determined as B-II, with the King Air 200/300/350 or small to midsized corporate jets in the Cessna Citation family as representative aircraft. It should be noted that single engine pistons will likely continue to lead in terms of operations at the airport over the planning period, with some turboprop and jet operations. The ultimate B-II critical aircraft determination serves as a conceptual forecast intended to preserve future planning options for aeronautical development.

Airport Critical Aircraft Summary

While previous planning determined the existing critical aircraft to be B-II and the ultimate critical aircraft to be C-II, more specific information has become available regarding the types of aircraft most frequently operating at Merrill Municipal Airport (i.e., the TFMSC and FlightAware). Based on this recent data, the existing/future aircraft approach category is identified as "A," and the existing/future airplane design group is "I." Over the last 10 years, the most active A-I airplane at Merrill Municipal Airport has been the Cessna 172, which is TDG 1A aircraft. B-II aircraft, such as the King Air 200/300/350, also operate at the airport currently, and as the national fleet mix evolves to include more turboprop and jet aircraft, are likely to operate more frequently in the coming years. Therefore, the existing/future critical aircraft for Merrill Municipal Airport is classified as A-I-1A, represented by the Cessna 172, and the ultimate critical aircraft is classified as B-II-2A, represented by the King Air 200/300/350.

RUNWAY DESIGN CODE

The RDC relates to specific FAA design standards that should be met in relation to a runway. The RDC takes into consideration the AAC, ADG, and the RVR. In most cases, the critical design aircraft will also be the RDC for the primary runway.

Runway 7-25

Runway 7-25, as the primary runway, should be designed to accommodate the overall airport design aircraft. The primary runway is 5,100 feet long, 75 feet wide, and has non-precision instrument approaches with visibility minimums as low as one mile on each runway end. It has been established that the existing/future critical aircraft falls within ARC A-I; therefore, when factoring in the RVR, the existing/future RDC for Runway 7-25 is A-I-5000, while the ultimate RDC is classified as B-II-4000, which plans for the potential for lower visibility minimums in the future.

ARC	Aircraft	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
A-I	Cirrus Vision Jet	0	0	0	0	0	0	0	0	0	2	0
	Eclipse 400/500	0	0	0	0	0	0	2	0	0	0	0
	Epic Dynasty	0	0	0	0	0	0	0	0	2	0	0
	Piper Malibu/Meridian	2	0	0	0	0	0	2	2	0	0	0
	Socata TBM 7/850/900	144	114	132	148	0	4	4	4	2	0	2
	Total	146	114	132	148	0	4	8	6	4	2	2
A-II	Cessna Caravan	0	0	2	4	0	2	0	0	2	2	2
	Pilatus PC-12	4	56	6	18	6	4	0	4	6	6	3
	Total	4	56	8	22	6	6	0	4	8	8	5
B-I	Cessna 425 Corsair	0	0	0	0	0	0	0	0	2	0	0
	Citation CJ1	2	0	2	0	2	0	0	0	0	0	0
	Citation M2	0	0	0	0	0	0	2	2	0	0	0
	Citation Mustang	0	0	0	0	0	4	14	6	8	0	0
	Falcon 10	0	0	0	0	0	2	2	0	0	0	0
	Hawker 1000	0	0	0	0	0	0	0	0	2	0	0
	King Air 90/100	0	2	2	4	2	20	0	4	0	0	42
	Mitsubishi MU-2	0	0	0	0	0	0	0	0	12	0	0
	Piaggio Avanti	0	0	0	0	0	2	0	0	0	0	0
	Piper Cheyenne	0	0	0	4	2	0	4	0	0	2	0
	Premier 1	2	0	0	0	0	0	0	0	0	0	0
	Total	4	2	4	8	6	28	22	12	24	2	42
B-II	Cessna Conquest	6	0	0	0	0	4	0	8	0	0	0
	Citation CJ2/CJ3/CJ4	2	2	2	2	2	2	2	0	0	0	0
	Citation II/SP/Latitude	0	0	0	0	4	2	2	4	18	0	0
	Citation V/Sovereign	0	4	4	0	0	0	0	4	0	0	0
	Citation XLS	2	8	4	6	0	0	0	0	2	0	0
	Embraer EMB-110/120	0	0	0	2	0	0	0	0	0	0	0
	Falcon 20/50	0	0	0	4	4	0	2	0	0	0	0
	King Air 200/300/350	4	2	4	4	4	10	2	4	10	2	0
	Phenom 300	0	0	0	0	0	0	0	0	2	0	0
	Hawker 4000	0	0	0	0	0	0	0	0	0	0	2
	Swearingen Merlin	0	0	2	0	0	0	0	0	0	0	0
	Total	14	16	16	18	14	18	8	20	32	2	2
C-I	Learjet 31	0	0	2	6	2	0	0	0	0	0	0
	Learjet 40 Series	2	2	0	2	0	0	0	0	0	0	0
	Total	2	2	2	8	2	0	0	0	0	0	0
C-II	Challenger 300	2	0	0	0	0	0	0	0	0	2	0
	Challenger 600/604	0	0	0	0	2	0	0	0	0	0	0
	Hawker 800 (Formerly BAe-125-800)	2	2	0	0	0	0	0	0	0	0	0
	Total	4	2	0	0	2	0	0	0	0	2	0
D-I	Learjet 35/36	0	0	0	0	2	0	2	2	2	0	0
	Total	0	0	0	0	2	0	2	2	2	0	0

AIRPORT REFERENCE CODE (ARC) SUMMARY

ARC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
A-I	146	114	132	148	0	4	8	6	4	2	2
A-II	4	56	8	22	6	6	0	4	8	8	5
B-I	4	2	4	8	6	28	22	12	24	2	42
B-II	14	16	16	18	14	18	8	20	32	2	2
C-I	2	2	2	8	2	0	0	0	0	0	0
C-II	4	2	0	0	2	0	0	0	0	2	0
D-I	0	0	0	0	2	0	2	2	2	0	0
Total	174	192	162	204	32	56	40	44	70	16	51

APPROACH CATEGORY

AAC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
A	150	170	140	170	6	10	8	10	12	10	7
B	18	18	20	26	20	46	30	32	56	4	44
C	6	4	2	8	4	0	0	0	0	2	0
D	0	0	0	0	2	0	2	2	2	0	0
Total	174	192	162	204	32	56	40	44	70	16	51

DESIGN GROUP

ADG	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
I	152	118	138	164	10	32	32	20	30	4	44
II	22	74	24	40	22	24	8	24	40	12	7
Total	174	192	162	204	32	56	40	44	70	16	51

Source: TFMSC 2013-2022. Data normalized annually
**2023 Data From 11/1/22 Through 10/31/23*

Exhibit 2H
HISTORIC TURBOPROP AND JET OPERATIONS

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Runway 16-34

Runway 16-34 is the airport's crosswind runway. It measures 2,997 feet long by 75 wide and does not currently offer instrument approach capability. Presently, the RDC for Runway 16-34 is classified as A-I-VIS (visual approach capability only). This runway is designed to meet the minimum requirements for AAC A and B aircraft that utilize the airport; however, as part of this master plan, the continued eligibility of this runway will be examined based on the FAA's wind coverage requirements for crosswind components up to 10.5 knots (to be discussed in the next chapter). If Runway 16-34 is maintained over the 20-year planning period, it should be planned to meet RDC A-I-5000 standards, with consideration for the possible implementation of an instrument approach procedure with visibility minimums not lower than one-mile. The visibility requirements for each runway will be considered in the next chapter.

Note: Since the preparation of this chapter, the FAA issued "Reauthorization Program Guidance Letter (R-PGL) 25-01: Runway Projects," which clarified provisions in the FAA Reauthorization Act of 2024, including those related to crosswind runways. The PGL includes a definition for "legacy crosswind runways," which is a new runway type that is eligible for Airport Improvement Program (AIP) funding. These runways are "existing runways previously funded to function as a crosswind runway that is not parallel to the primary runway, when the primary runway alone achieves greater than 95 percent wind coverage." Following issuance of R-PGL, Runway 16-34 at Merrill Municipal Airport was determined by the FAA to meet the criteria for a legacy crosswind runway, therefore remaining eligible for AIP-funded projects.

APPROACH AND DEPARTURE REFERENCE CODES

The approach and departure reference codes (APRC and DPRC) describe the current operational capabilities of each runway and the adjacent parallel taxiways, where no special operating procedures are necessary. Essentially, the APRC and DPRC describe the current conditions at an airport in runway classification terms when considering the parallel taxiway.

The partial parallel taxiway for Runway 7-25 is located 300 feet from the runway (centerline to centerline). Each runway end has non-precision instrument approaches with one-mile visibility minimums. The APRC for Runway 7-25 is B/III/4000 and D/II/4000 and its DPRC is B/III and D/II.

Runway 16-34 is also separated from its partial parallel taxiway by 300 feet and has no published instrument approaches. Therefore, its APRC is B/III/4000 and D/II/4000 and its DPRC is B/III and D/II.

AIRPORT AND RUNWAY CLASSIFICATION SUMMARY

Table 2R summarizes the airport and runway classification currently and in the future. The existing critical aircraft is now defined by those aircraft in ARC B-I, with a transition to ARC B-II by the end of the planning period.

Table 2R | Airport and Runway Classifications

	Runway 7-25		Runway 16-34
	Existing/Future	Ultimate	Existing & Ultimate
Airport Reference Code (ARC)	A-I	B-II	A-I
Airport Critical Aircraft	A-I-1A	B-II-2A	A-I-1A
Critical Aircraft (Typ.)	Cessna 172	King Air 200/300/350	Cessna 172
Runway Design Code (RDC)	A-I-5000	B-II-4000	A-I-VIS*
Approach Reference Code (APRC)	B/III/4000 & D/II/4000	Same	B/III/4000 & D/II/4000
Departure Reference Code (DPRC)	B/III & D/II	Same	B/III & D/II
Taxiway Design Group (TDG)	1A	2A	1A

* If Runway 16-34 is maintained over the 20-year period, an instrument approach procedure with visibility minimums not lower than one-mile should be considered. This would result in an RDC of A-I-5000.

Source: FAA AC 150/5300-13B, Airport Design

SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the planning period, as well as the critical aircraft for the airport. Total based aircraft are forecast to grow from 45 currently to 56 by 2043. Operations are forecast to grow from an estimated 15,754 in 2023 to 21,100 by 2043. The projected growth is driven by FAA's positive outlook for general activity nationwide, as well as generally positive outlooks for the region.

The critical aircraft for the airport was determined by examining the FAA TFMSC database of flight plans and FlightAware data. The current critical aircraft is described as A-I-1A and is best represented by a Cessna 172, a small piston aircraft typically utilized for recreational flying. The ultimate critical aircraft is a King Air 200/300/350, which is classified as a B-II-2A aircraft.

The next step in the planning process is to assess the capabilities of the existing facilities to determine what upgrades may be necessary to meet future demands. The range of forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve as milestones or activity benchmarks in evaluating facility requirements.