Chapter Three – Aviation Demand Forecasts

3 | Section 1 – Introduction of Aviation Demand Forecasts

Approximating future growth and aviation demand at the Elbow Lake Airport (Y63) is a crucial element in the master planning process to ensure reasonable allocation of future resources. If an airport is poised to see exploding growth, steps need to be taken to be able to accommodate that demand. If an airport is more likely to see a regression of activity, however, other steps to help ensure the continued viability of the airport, and perhaps attract additional use, might be in order. Future levels of activity are just one of several parts of the equation for proper airport planning. The size and speed of the forecast aircraft can also have dramatic effects on developmental efforts. Collecting the appropriate information and using reasonable judgment and approved methodologies to help predict the level of activity and the types of aircraft at Elbow Lake Airport are at the core of the airport master planning forecast process.

To best answer how the future might impact an airport, the FAA has developed an airport master planning process. The FAA process is somewhat rigid, but allows for some flexibility as well. Chapter 7 of the FAA Advisory Circular (AC) 150/5070-6B, "Airport Master Planning," provides guidance for master plan forecasts. The forecast chapter of an airport master plan is one of only two elements of an airport master plan that must be approved by the FAA. The other element that requires FAA approval is the Airport Layout Plan (ALP). Approval is required because the forecasting chapter wields a heavy influence on the rest of the master plan and future planning for funding of the airport.

Some of the more stringent aspects of the FAA language concerning aviation forecasting in an airport master plan include specific items that must be forecast and how they are projected into the future. Some of the more flexible forecast elements the FAA allows is directly related to the FAA's understanding of the unique nature of smaller, GA airports. The FAA understands there is a limited amount of data associated with GA airports without an operational control tower or commercial services records. More acute local attributes of the airport, the general use of the facility, and the local sponsor's own

For the Elbow Lake Airport, specific national, regional, and local data was examined and then combined with previous and current forecasts.

understanding of the facility must be incorporated into the forecast. Heavy reliance upon formal and informal interviews with airport representatives and users provides a great deal of information related to the GA airport forecasting effort. Other national, regional, and local data can be used to assist with the forecast data the FAA already has on record for the airport. The data collected is then used within with one or more forecasting methodologies specifically approved by the FAA to forecast the data into future years.

For the Elbow Lake Airport, specific national, regional, and local data was examined and then combined with previous and current forecasts. The data was used to establish a baseline and a forecast for aircraft operations, based aircraft, instrument operations, and a critical aircraft design group, which will enable facility planners and the FAA to determine the appropriate airport development reference code for potential future projects. Aircraft operation numbers will be further subset into GA local and GA itinerant operations. Air taxi and local military operations are also sometimes included within the forecasting element, but will not be addressed in this report since the Elbow Lake Airport has only negligible numbers of operations for those types of activities and is not expected to have any substantial numbers over the forecast period. The Elbow Lake Airport Master Plan forecast is consistent with FAA Advisory Circular (AC) 150/5070-6B and the July 2001 FAA guidance paper entitled "Forecasting Aviation Activity by Airport." Historic air traffic data, prior forecasts, an examination of local, county, and applicable US Census data reflecting past future economic trends were used to augment the final forecast. Interviews with airport management and owner of the FBO, based aircraft owners, MnDOT, Great Lakes Region FAA ADO specialists and other informed parties were especially important in estimating current and future operational numbers for the facility in the absence of any unpublished data. The forecast relies on information obtained from the parties interviewed and incorporates their expertise and judgment, as well as that of the forecaster.

3 | Section 2 – Local Data

3.2.1 Y63 Aircraft Operations

The FAA has categorized the Elbow Lake Airport as a "Local General Aviation Airport" (as per the FAA "ASSET" report). The FAA breaks out all General Aviation Airports into four, recently developed, sub-categories. These are National, Regional, Local, and Basic, based on the individual airports specific role and activity levels. Figure 3-1 describes these General Aviation sub-categories.

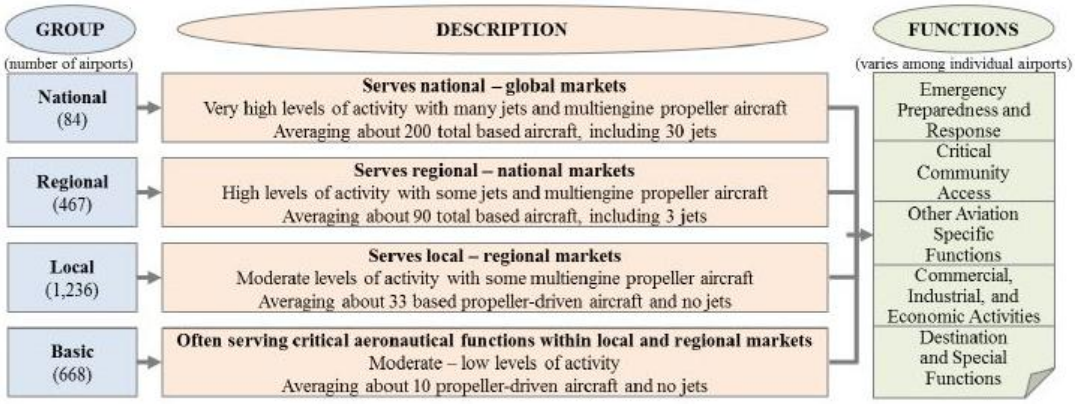

Figure 3-1: General Aviation Airport Categories

The Elbow Lake Airport has no air traffic control tower and no scheduled commercial passenger operations. Because of this, aircraft operations are not counted as they would if more direct and accurate operational data were available. Local sponsor and tenant knowledge of the operations at the airport, supplemented with other available data, such as historical 5010 operations and fuel sales, is utilized to better understand aircraft operations. The method that the FAA uses to determine and record numbers of aircraft operations at airports is through the FAA Form 5010-1, more simply known as the 5010 Master Record. The FAA usually contracts with individual states to perform 5010 Master Record inspections at all public use airports, usually once every three years, as a way of updating and maintaining critical information about airports. As part of these inspections at smaller GA airports, like Elbow Lake, trained inspectors will talk with airport representatives to establish reasonable guesses as to the number and types of aircraft operations at the facility, as well as the number of based aircraft. In Minnesota, the inspections are conducted by personnel from Minnesota Department of Transportation (MnDOT) Office of Aeronautics and Aviation. Interviews with these inspectors were conducted as part of this forecasting effort to better ascertain how historic 5010 operation numbers were determined. The types of aircraft operations recorded by the 5010 inspections are filtered into various subsets. This information is then used by the FAA to develop their official forecasts for individual airports, known as the Terminal Area Forecast (TAF). The FAA usually forecasts future aircraft operations numbers for smaller GA airports in the TAF by simply repeating the same existing operations numbers over the forecast period, or

"flat line forecasting". This repetition is due to the level of uncertainty with the estimated operations and based aircraft numbers gathered during the 5010 inspection process. It is also due to the overwhelming work that would be required by FAA staff to provide individual and independent forecasts for each and every small airport. This is also the reason why the FAA TAF for Elbow Lake appears to show no growth. (See Section 3.6.1 for additional information regarding the Y63 TAF). Figure 3-2 below shows the most current FAA 5010 information reported for Elbow Lake Airport for aircraft operations and based aircraft.

Based Aircraft	Number
90 Single Engine:	24
91 Multi Engine:	1
92 Jet:	0
Total	25
93 Helicopters:	1
94 Gliders:	0
95 Military:	0
96 Ultra-Light:	1
Total	2
Operations	
100 Air Carrier:	0
102 Air Taxi:	0
103 GA Local:	6,000
104 GA Itnrnt:	3,000
105 Military:	0
Total	9,000
Operations for 12 Months Ending	04/30/2016

Figure 3-2: Current FAA 5010 for Y63 – Based Aircraft and Aircraft Operations

Historic Elbow Lake aircraft operation numbers as recorded by the FAA TAF that reflect 5010 inspection estimates consistently put the total operations at 9000 since the inception of the facility. There is one exception to this trend. Historic FAA TAF operation estimates reflective of the 5010 inspections between 2011 and 2014 show a change from previous years' operation numbers. Due to the limited total span of the years of data anomaly, this data most likely reflects only one particular 5010 inspection period. During this period, or inspection, the 5010 inspector dropped his estimation of aircraft operations at the airport from previous estimates. (See Figure 3-3 below).

Year	Total Operations
All years prior to 2010*	9,000
2011 - 2014	4,200
2015 and beyond	9,000
*Note – 5010 Inspections were completed only once every 3 years	

Figure 3-3: Y63 Historical Aircraft Operations (as per FAA 5010 Master Record 10 Year History)

After conducting interviews with both the airport manager and the 5010 inspector, the reason for this change in the number of aircraft operations is likely due to the airport manager giving a more reasonable estimate of actual aircraft operation numbers to the 5010 inspector. The airport manager and the Minnesota 5010 inspectors are reasonably confident that historic operation numbers for Y63 had been overinflated for some time. The manager did stress however, that operations at the airport were increasing every year, and that the airport had seen significant growth of the facility in the short time it has gone from a small unpaved strip to the facility it is now. After extensive interviews with the manager, the FAA and Minnesota State Aeronautics 5010 inspectors, it is likely that the actual number of operations at this time falls in between the original high estimate, and the alternative estimated 5010 ops numbers recorded a few years ago. This shortfall of reliable operation numbers based on 5010 inspections via inspector estimates and tenant interviews during a once every three year inspection cycle is a problem that is inherent throughout the US, and is not the fault of any inspector or airport representative. The FAA has recently tried to encourage a special emphasis on establishing more realistic and meaningful numbers for GA aircraft operations. In addition, all of the interviews conducted in support of this forecast supported these adjusted levels of operations. As a result of all of these factors, amended estimated operational numbers for Elbow Lake will be considered for this forecast. The amended operational numbers for a baseline of 2016 will be:

- General Aviation Itinerant 2,000
- General Aviation Local 4,000
- Total Operations 6,000

Medivac flights are one of the most critical needs that an airport provides to the residents of a community. The residents of Elbow Lake are no exception. Although medivac flights account for only a small number of the total flights in and out of the Elbow Lake Airport, they are one of the most important types of operations that the airport hosts. In addition to the potential lifesaving benefits of these flights, these operations also utilize some of the more complex types of aircraft that visit the facility. Until recently, it was common to see Beechcraft King Air aircraft providing medivac flights. Lately, however, these medivac flights have been carried out by Pilatus type aircraft. Both of these aircraft types represent significant increases in the size and performance of aircraft that normally use the Elbow Lake Airport facilities. The hospital in Elbow Lake recently upgraded their helipad area, which has enabled the hospital to serve helicopter medivac flights much more efficiently. When the helicopters are unable to land at the hospital, or fixed wing transport is more appropriate, medivac aircraft based at nearby Alexandria are summoned to use the Elbow Lake facility. During these periods the when hospital helipad is unavailable, it is not uncommon for the Pilatus medivac aircraft to use the Elbow Lake Airport twice a week, or stay longer-term when the weather is bad in nearby Alexandria. Overall, there are estimated to be 10 or fewer medivac flights per year, on average, transporting patients out of Elbow Lake.

Although medivac flights account for only a small number of the total flights in and out of the Elbow Lake Airport, they are one of the most important types of operations that the airport hosts.

Agricultural use of the Elbow Lake Airport is one of the most important roles the facility serves. Understandably, the type of use waxes or wanes during the year, dependent upon the season, weather, crop prices and need. No standalone area on the airport or ag pit is dedicated to agricultural aircraft operations at Elbow Lake. Operators wishing to use the airport for agricultural related operations must comply with some very basic and reasonable rules regarding chemical loading and operations. Agricultural use of the airport spans all aspects of the industry, including business related flights, crop spraying and FBO repairs of agricultural aircraft. Agricultural related aircraft typically seen at Elbow Lake include 602 and 802 Air Tractors and other similar type aircraft.

Military and government operations in and out of Elbow Lake are relatively sparse. The most common use of the airport by government aircraft are the occasional practice use of the instrument approach procedure by military OH-60s, Chinooks, and Blackhawks.

An established seaplane base located on Flekkefjord Lake for float or amphibious type aircraft is located immediately adjacent to the current Elbow Lake Airport facilities. Even though this seaplane base has been utilized for quite some time, it was never officially included as a separate facility or runway as per the FAA 5010 Master Record Process. Recent efforts were taken to rectify this recording anomaly with the FAA, and a separate water based runway will appear on official FAA 5010 records in the future. This exclusion, however, did not prevent the inclusion of operations from the seaplane base from any of the operational data gathered for the airport by the state or FAA. All operational numbers that were included as part of historic 5010 information and current master planning estimates include the utilization of this seaplane base. Operationally, the seaplane base accounts for a small but significant portion of the total operations at Elbow Lake. During periods when the lake is frozen, there will be occasional use by ski equipped aircraft operating on and off the surface, but this is relatively rare. Current estimates are in the range of approximately between 250 and 500 floatplane or skiplane operations on Flekkefjord Lake per year.

3.2.2 Based Aircraft Numbers

In 2016, there were 25 verified based aircraft reported at Elbow Lake.

The number of based aircraft at Elbow Lake has grown exponentially in a relatively short amount of time. This quick growth of based aircraft is primarily due to the recent expansions over the last ten years of the airport, from a short, unimproved turf strip with little infrastructure to a facility with a longer paved runway accommodating a very busy FBO and lots of hangars and demand for more. Up until very recently, the actual based aircraft numbers at Elbow Lake differed significantly from official FAA 5010 numbers. This is because the numbers reflected in the last 5010 reports were derived independently of the last, fully implemented FAA basedaircraft.com program. This program mandates that all airports register the tail numbers of aircraft with existing airports to get a much more accurate count of aircraft at airports. This new data reflected the inaccuracy of the previous 5010

based aircraft estimates. The Elbow Lake Airport Manager recently updated the FAA records as required on the FAA website, and reported 25 verified based aircraft.

Source: Joe LaRue, Prairie Air, Inc.

3.2.3 Aircraft Operations versus Based Aircraft

The ratio of aircraft operations in relation to the total number of based aircraft can assist with the reasonableness of determining current and future aircraft operations over time at an airport. FAA Order 5090.3C, *Field Formation of the National Plan of Integrated Airport Systems (NPIAS),* Chapter 3, Section 3-2(c) describes general guidelines that help to identify reasonable ratios of based aircraft versus operations for forecast purposes. General FAA guidelines suggest reasonable mediums of 250 operations per based aircraft for rural general aviation airports with little itinerant traffic and 350 operations per based aircraft for busier general aviation airports with more itinerant traffic. These "rule of thumb" ratios should be augmented with information from local representatives regarding the type and use of aircraft based at the facility, typical itinerant traffic and other local concerns.

As mentioned previously, the drop-in operations numbers from 5010 inspection records a few years ago at Elbow Lake were not linked directly to measureable declines in operations. They were in fact changed with the knowledge that the actual numbers of aircraft operations did not change in any significant way. When analyzing the ratio of based aircraft versus aircraft operations utilizing historic 5010 data as depicted in Figure 3-4 below, it dramatically emphasizes the aforementioned notion that 5010 aircraft operation estimates were vastly overstated for many years, and are much more likely to be closer to the estimated averages described in section 3.2.1. The data presented also lends credence to the validity of the FAA inspector dropping the estimated aircraft operations several years ago during that particular 5010 inspection cycle, after discussions with the airport representatives. This information assists with determining if the statistical

rate of actual operations versus based aircraft numbers ratio were reasonable or not.

Year	Operations	Aircraft	Ratio
1990	9,000	6	1,000
1995	9,000	9	1,000
2000	9,000	9	1,000
2001	9,000	9	1,000
2002	9,000	9	1,000
2003	9,000	9	1,000
2004	9,000	17	529.4
2005	9,000	18	500
2006	9,000	18	500
2007	9,000	18	500
2008	9,000	18	500
2009	9,000	18	562.5
2010	9,000	16	562.5
2011	4,200	16	262.5
2012	4,200	17	247.1
2013	4,200	18	233.3
2014	4,200	18	233.3
2015	9,000	16	562.5
2016	9,000	16	562.5
2017	9,000	16	562.5
2018	9,000	16	562.5
2019	9,000	16	562.5
2020	9,000	16	562.5
2025	9,000	16	562.5
2030	9,000	16	562.5
2035	9,000	16	562.5
2040	9,000	16	562.5

Figure 3-4: Historical and Forecast Ops vs. Based Aircraft as per FAA 5010 and FAA TAF Data for Y63 fiscal years 2016 to 2045, published January 2017

Looking at both historical and forecasted TAF data for Elbow Lake, and in particular the ratio of based aircraft versus operations since 1990, the ratio seems extremely disproportionate. Ratios for aircraft versus operations can vary significantly, but ratios in excess of 300 for airport similar to Elbow Lake should raise considerable attention as to their validity. This makes the data contained within the historic Elbow Lake 5010 based aircraft versus operations information somewhat arbitrary for forecasting purposes. It does, however, support the notion that the amended aircraft operation numbers are far more realistic from previous 5010 estimates. When using the amended operational estimated for Elbow Lake and the actual based aircraft at the facility, a ratio of 240 to 1 is produced. This number may still seem somewhat high on average for the elbow Lake facility, but is much more realistic.

- Current estimated actual ops versus based aircraft ratio utilizing adjusted operations numbers and basedaircraft.com records
  - 6,000 / 25 = 240

3.2.4 Hangar Availability at Y63

The lack of availability of hangar space at a particular airport or imminent plans for additional hangar development is a metric that can indicate the viability of the facility and its potential for short-term growth. It is not always a good marker for long-term growth, however. The data can quite effectively show near-term trends, and also be used to see where GA aircraft operations might be heading, and can influence heavily what near-term future infrastructure development might be necessary at the airport. The Elbow Lake Airport currently has a very robust and steady amount of local traffic, with 25 based aircraft, and a current waiting list for approximately 4 or 5 hangar spots. This signifies that activity at Elbow Lake is at least steady and most likely climbing. The facility has several private hangars and two T-hangar complexes. The two T-hangars are quite different in age and functionality, with one offering more space and more convenience than the other. Private and T-hangar rates at Elbow Lake are very reasonable in terms of costs for aircraft storage.

Elbow Lake Airport currently has a waiting list for approximately 4 or 5 hangar spots. This signifies that activity at is at least steady and most likely climbing.

One of the large hangars located on the airport is utilized as a common aircraft storage area. This is important to note, since a Beechjet aircraft normally stationed at Fergus Falls will occasionally visit the Elbow Lake Airport to utilize this hangar for overnight storage and protection from potentially threatening weather. This is just one more positive indicator of the viability of the airport and its current infrastructure and occasional use by much larger and faster aircraft than it routinely sees.

There are no permanent aircraft hangar or storage spots dedicated for use by float or amphibious aircraft at Elbow Lake and there is as of yet no immediate accessible way for an amphibious aircraft to direct taxi and access the main terminal and apron areas of the airport. Float aircraft must currently be trailered to the FBO for work to be done. This is a situation that airport representatives hope to rectify in the near future through development that will support seaplane operations. There is about 180' of dock space currently available for float aircraft at the seaplane base, as well as 6 land based moorings for float type aircraft. The FBO also operates a boat that enables towing of float aircraft, if needed. Fueling aircraft on floats is accomplished from a truck owned by the FBO. It is clear from the interviews conducted that the seaport segment of the airport is ready for some additional infrastructure and growth and is currently inhibited by a lack of facilities.

3.2.5 Fuel Sales

Fuel sales data calculates to a robust 6.32% average annual percent growth rate.

Fuel sales are another indirect metric that can help to determine historical trends in activity at an airport. Although actual sales can fluctuate from time to time, consumption of fuel can itself act as a litmus test for activity at an airport. Interpreting fuel sales information at Elbow Lake over was possible with interviews with airport representatives. The data gathered indicates that reasonable fluctuations in the price of the fuel at any given time seem to have little effect of the overall sales. The FBO is currently independent and unbranded. The Tesoro Fuel distributor is located just outside Elbow Lake, which simplifies fuel acquisition for the FBO. The FBO does provide some small sales of JET A from an 800 gal trailer specifically set up for it. The JET A sales are primarily for fueling turbine helicopters that are being worked on by the FBO, but they do not impact total fuel sales at Elbow Lake significantly. Fuel sales data as shown in Figure 3-5 below calculates to a robust 6.32% average annual percent growth rate.

Year	Avg. Price	Quantity
2007	3.99	7,143
2008	4.76	9,264
2009	4.13	8,692
2010	4.71	7,573
2011	5.04	8,883
2012	5.29	9,123
2013	5.45	11,250
2014	5.21	11,805
2015	4.47	11,319
2016	4.44	11,660
2017 est.		14,000

Figure 3-5: Y63 Fuel Sales Last 10 Years

3.2.6 IFR Flight Information In and Out of Y63 (Traffic Flow Management System Counts)

Instrument Flight Rules (IFR) activity is an important component of operations at the Elbow Lake Airport. The airport is fortunate to have two instrument approach procedures (IAPs) to allow instrument flight in and out of the airport, as well as the ability for students and pilots to shoot practice instrument approaches. Having an instrument procedure at a GA airport can greatly expand its utility, and allow for the provision of services that would normally not be found at airports without an

approach. This is especially true in terms of life-saving medical flights. Although forecasting for instrument flight operations is not a mandatory component of an airport master plan, it can help show its importance. IFR data can be a great tool in better understanding the airport's importance to a community and provide clear examples of aircraft operations that would not have been possible without an approach.

To allow for a better understanding of the types and numbers of IFR operations at the Elbow Lake Airport, and the aircraft that utilize the facility, all instrument flight plans filed with the FAA that originated from or terminated at the airport were gathered for a period of one year. This information was obtained through a private source that utilizes the FAA Traffic Flow Management System Counts (TFMSC). Traffic Flow Management System Counts are designed to provide information on traffic counts by airport and includes various data about the types of aircraft, point of departure or arrival, end numbers, owners and other various data. It captures data for flights that fly under Instrument Flight Rules (IFR) and are captured by the FAA's enroute computers. VFR and some non-enroute IFR traffic is excluded. TFMSC source data are created when pilots file flight plans and/or when flights are detected by the National Airspace System (NAS), usually via RADAR.

Elbow Lake Airport IFR Flight activity summary for 2016:

- 152 IFR flight plans were filed to or from Elbow Lake between January 2016 and January 2017
- The majority of IFR flights originated or terminated in Minnesota. Other states included:
  - Colorado
  - Illinois
  - Iowa
  - Michigan
  - Oklahoma
  - South Dakota
  - Texas
  - Wisconsin
  - Wyoming
- The vast majority of aircraft were single engine, piston powered aircraft
- Aircraft ownership information reflects the majority of IFR aircraft were based at Elbow Lake.

The breadth and depth of recorded IFR activity in and out of Elbow Lake in 2016 substantiates the importance of instrument approach capabilities for the Elbow Lake Airport. An edited list of all IFR records for 2016 can be found in the Appendix.

3.2.7 Y63 Aircraft Fleet Mix

To determine the types of aircraft operating in and out of Elbow Lake Airport, interviews were conducted with airport representatives, the FAA and MnDOT engineers, planners and 5010 inspectors. Augmenting this information was the

collection of all IFR data from the last year for all IFR flights originating or ending at Elbow Lake Airport.

The vast majority of aircraft currently operating in and out of Elbow Lake are of the single engine, piston powered type. This is true for both the hard-surfaced runway and the seaplane base as well. Although the paved surface of the runway at Elbow Lake is likely to handle some heavier, higher performance aircraft, it was constructed and intended to be used by aircraft weighing 12,500lbs or less. Paved runways designated and intended for this weight bearing capacity are considered "Utility" runways by FAA definition. IFR records indicate aircraft such as Beech A36, Cessna 182 & 172, Piper Cherokee, Rockwell Commander, Cessna Turbo Skylane, Cirrus 22, Maule, and a Cessna 340 frequent the airport. With the exception of the Cessna 340, these aircraft are all single engine, piston powered aircraft. The Cessna 340 is a light twin, piston aircraft.

The vast majority of aircraft use at the Elbow Lake Airport is by aircraft that fall within or below the FAA Airport Design Group (ADG) B-II category.

Other single engine piston aircraft that have been observed or known to frequent or are based at the Elbow Lake Airport include agricultural aircraft, such as 602 and 802 Airtractors, Cessna 150 & 177, Piper Navahos, Senecas, and Super Cubs, North American T-6, Vans RV-8, Zenith 701, Bellanca Viking, Aeronca Champ, Piper Tri-Pacer and an Ercoupe. DeHavilland Beavers on floats are also occasionally seen on the sealane. Several varieties of helicopters are also frequent visitors to the Elbow Lake Airport, including R-22s and a based R-44, as well as Bells, Enstrongs, and Schwitzers. A twin-engine Cessna 337 is currently based at the airport. Other larger high performance or twin engine aircraft that are known to have landed at Elbow Lake include a Pilatus, Cessna 310, King Airs, and a Beechjet.

The vast majority of aircraft use at the Elbow Lake Airport is by aircraft that fall within or below the FAA Airport Design Group (ADG) B-II category. This information is important in determining the critical aircraft data for Elbow Lake Airport. More detailed explanations of what a "critical aircraft" is and the results of the determination can be found in Section 9 of this chapter. In order to determine the appropriate critical aircraft and what the airport might expect from future operations, it is important to analyze the different FAA categories for aircraft and their design group. For example, some of the aircraft that visit the Elbow Lake Airport, such as the Beechjet, with a 42' wingspan, falls within the B-I category, as does the twin engine Cessnas that also frequent the airport. The Pilatus falls within the A-II category, however, the King Air falls within the B-II design group.

3 | Section 3 – Regional Data

3.3.1 Great Lakes Region FAA TAF Stats

As a requirement of the FAA's NPIAS program, TAF statistics for all NPIAS airports in the United States are projected forward, not only from a local level, but regional and national level as well. The current FAA TAF numbers for past and forecast based aircraft within the Great Lakes Region can be seen in Figure 3-6 below. The

FAA forecasts a very modest 0.746% average annual overall growth rate for based aircraft throughout the Great Lakes Region for the next 25 years. This statistic can vary from airport to airport given local factors, such as flight schools or charter operations, however, as gross estimate of based aircraft growth rate on a local level without obvious influential anomalies, it is useful.

Fiscal Year	Great Lakes (AGL)
Historical	Total Based Aircraft
2011	26,676
2012	26,593
2013	27,262
2014	27,572
Forecast	Total Based Aircraft
2015	27,786
2016	27,982
2017	28,159
2018	28,360
2019	28,548
2020	28,747
2025	29,733
2030	30,702
2035	31,704
2040	32,760

Figure 3-6: Great Lakes Region Total Based Aircraft TAF Forecast

The FAA's TAF also predicts total airport operations by region as well. This statistic has the same fundamental limitations when overlaying it onto a local forecast as does the based aircraft TAF forecasts, but as a general rule, it is less susceptible to non-specific influences than the based aircraft forecast since based aircraft numbers are more dependent upon local airport influences than total operation numbers are. The exception is the case of an additional on field flight school or similar being developed. The FAA TAF anticipates a 0.606% average annual overall growth rate in the total airport operations within the Great Lakes Region for the next 25 years (see Figure 3-7).

Fiscal Year	Great Lakes (AGL)
Historical	Total Aircraft Operations
2011	15,821,010
2012	15,649,076
2013	15,305,889
2014	14,939,552
Forecast	Total Aircraft Operations
2015	14,881,298
2016	14,922,302
2017	15,001,641
2018	15,073,522
2019	15,144,556

Fiscal Year	Great Lakes (AGL)
2020	15,222,893
2025	15,606,661
2030	16,053,966
2035	16,528,989
2040	17,045,343

Figure 3-7: Great Lakes Region TAF Total Operations Summary

3.3.2 Minnesota FAA TAF Stats

Similarly to the regional Great Lakes FAA TAF statistics, the FAA TAF also breaks out the same type of data for each of the states. See Figure 3-8 below. Extrapolating the FAA TAF forecasts for GA local and itinerant operations throughout the forecast period, a modest average annual increase of 0.63% is forecast for total statewide aircraft operations. Utilizing the statewide based aircraft data in the same format, an average annual growth rate of 0.36% is forecast.

Minnesota Statewide FAA Operations and Based Aircraft FAA TAF Summary and Forecast Report - January 2017				
Fiscal Year	Total Itinerant Operations	Total Local Operations	Total Operations	Total based Aircraft
1990	1,236,523	958,481	2,195,004	3,317
1991	1,304,040	1,046,706	2,350,746	3,428
1992	1,314,382	1,038,500	2,352,882	3,446
1993	1,305,178	1,008,602	2,313,780	3,445
1994	1,344,619	973,674	2,318,293	3,468
1995	1,380,726	954,521	2,335,247	3,601
1996	1,412,555	962,499	2,375,054	3,656
1997	1,378,456	890,596	2,269,052	3,830
1998	1,421,022	1,026,673	2,447,695	4,293
1999	1,456,004	1,092,000	2,548,004	4,480
2000	1,501,456	1,123,153	2,624,609	4,520
2001	1,438,094	1,077,463	2,515,557	4,759
2002	1,439,506	1,075,355	2,514,861	4,821
2003	1,396,136	1,022,007	2,418,143	4,932
2004	1,428,067	1,005,216	2,433,283	4,861
2005	1,430,914	1,011,486	2,442,400	4,875
2006	1,359,044	971,192	2,330,236	4,615
2007	1,317,665	958,782	2,276,447	4,639
2008	1,312,414	925,440	2,237,854	4,383
2009	1,270,803	901,483	2,172,286	4,376
2010	1,231,929	901,403	2,133,332	4,105
2011	1,199,143	871,683	2,070,826	4,134
2012	1,192,536	856,484	2,049,020	4,182
2013	1,166,942	839,835	2,006,777	4,105
2014	1,148,093	820,805	1,968,898	4,199
2015	1,173,125	833,748	2,006,873	4,306
2016*	1,170,705	840,189	2,010,894	4,317

Minnesota Statewide FAA Operations and Based Aircraft FAA TAF Summary and Forecast Report - January 2017				
Fiscal Year	Total Itinerant Operations	Total Local Operations	Total Operations	Total based Aircraft
2017*	1,178,707	838,049	2,016,756	4,330
2018*	1,183,399	841,044	2,024,443	4,346
2019*	1,186,666	844,678	2,031,344	4,362
2020*	1,189,928	848,283	2,038,211	4,376
2025*	1,225,412	865,982	2,091,394	4,453
2030*	1,274,686	883,844	2,158,530	4,538
2035*	1,326,956	903,114	2,230,070	4,619
2040*	1,383,192	924,141	2,307,333	4,706
2045*	1,442,165	946,714	2,388,879	4,786

Figure 3-8: FAA Minnesota Aircraft Operations and Based Aircraft Forecasts

3.3.3 Minnesota State Aviation System Plan Studies

The State of Minnesota produced an exhaustive statewide aviation system plan that was last updated in 2013. Although much of the data gathered and used within the original study is nearly 4 years old, it is still very relevant as there have been no major economic or industry shifts in the recent years that would have tremendously skewed existing data. The Forecast element of the study covered within Chapter 3 and the accompanying Appendix "C" highlighted several industry-related topics and forecasts which are relevant to the Elbow Lake Master Plan. The methodologies that were used to generate the forecasts within the Minnesota State Aviation System Plan are similar to those employed within this Elbow Lake forecasting chapter. The methods utilize several bottom-up, top-down, and individual airport circumstances to augment trending data. A summary of the State of Minnesota estimates for both based aircraft and operations can be found in Figure 3-9 below. Comparative estimates of the difference between the forecast average annual growth rate of the FAA TAF forecasts and the State of Minnesota System Plan forecasts are relatively minimal, and the two sets of data complement one another, lending to their overall validity. The State of Minnesota average based aircraft growth rate over the majority of the forecast period is 1.0%, while the operations growth rate is estimated at 1.6%. In addition to this data, the Minnesota System Plan further broke out airport operations estimates by class of aircraft. In particular, single engine piston aircraft were estimated to grow at a slower overall rate than other class of aircraft over the forecast period, at 0.8%. This estimate is much more in tune with the type of operations exhibited at the Elbow Lake Airport.

GA Based Aircraft and Operations		
Year	Based Aircraft	Operations
2010	5,100	1,743,000
2015	5,500	1,870,000
2020	5,700	1,978,000
2030	6,100	2,388,000
Average Annual Growth Rate		
2010-2015	1.4%	1.4%
2010-2020	1.1%	1.3%
2010-2030	1.0%	1.6%

Figure 3-9: State of Minnesota Based Aircraft and Operations Forecasts
Source: Minnesota State Aviation System Plan

The Minnesota System Plan also provided some forecast data for individual GA airports as well. The results for the based aircraft forecasts that were published in the system plan can be found in Figure 3-10 below. The results of the aircraft operations forecast can be found in Figure 3-11. Starting estimates for the based aircraft and aircraft operations Figures for the Minnesota System Plan utilized existing 5010 data at the time of the report. As explained earlier in this forecast, the 5010 data for both operations and based aircraft was re-evaluated as part of this forecasting effort. In particular, the Minnesota System Plan utilized the lower operations numbers that were found for the short period in the 5010 Master Records for Elbow Lake from 2011 to 2014. This is actually fortunate, because those numbers reflected much more accurately the actual estimated number of operations at that time. In reference to the based aircraft however, the data used within the Minnesota System Plan was quite different from what the actual number of based aircraft was, and currently is. The primary reason for this disparity is that the based aircraft information recorded as part of the 5010 Master Record for Elbow Lake (which was the primary source of inventory data used in reference to Elbow Lake in the system plan) was different from the much more accurate FAA basedaircraft.com data. This is not a reflection of erroneous data collection from the system plan, but primarily due to the fact that the FAA basedaircraft.com data was most likely not even available at that time. This fact does not negate the value of the information in the system plan report however, since the overall trending percentage of based aircraft estimates would likely be very similar, independent of the initial based aircraft data utilized by the report.

Airport Name	2015 As Reported	2020 Estimated	2030 Estimated
Elbow Lake	20	20	21

Note: Numbers based on a generic growth rate of between .001% and .015%
Figure 3-10: Minnesota State Aviation System Plan Based Aircraft Forecasts for Y63

Airport Name	2015 As Reported	2020 Estimated	2030 Estimated
Elbow Lake	4,230	4,357	5,351

Note: Numbers based on a generic growth rate of between .006% and .015%
Figure 3-11: Minnesota State Aviation System Plan Aircraft Operations Forecasts for Y63

3.3.4 Regional Demographic and Socioeconomic Influences

The US census estimates the 2016 population of Minnesota at just over 5,500,000 people, and Grant County in particular at nearly 6,000 with a median household income of just over $50,000. There are approximately 3,300 homes in Grant County and just over 450 registered companies. As a northern mid-western state, Minnesota's population and economic workforce has similarities with both the more agriculturally based surrounding states, such as North Dakota, and also with some of the more historically manufacturing based states, such as Michigan. Grant County and Elbow Lake, however, are much more influenced by the agricultural market trends, similar to its immediately adjacent geographic neighbors within and outside Minnesota.

Figure 3-12 below shows the recent changes in real gross domestic product by state and region throughout the US since 2014. As can be seen from the graphic, Minnesota shows a recent GDP increase of 1.4%. This present increase is relatively stable and healthy. Volatile markets can be exemplified by looking at the stats for nearby North Dakota, which showed a recent increase of 6.3%, due to the Bakken oil boom, which has most assuredly cooled off by now, and is most likely in GDP recession.

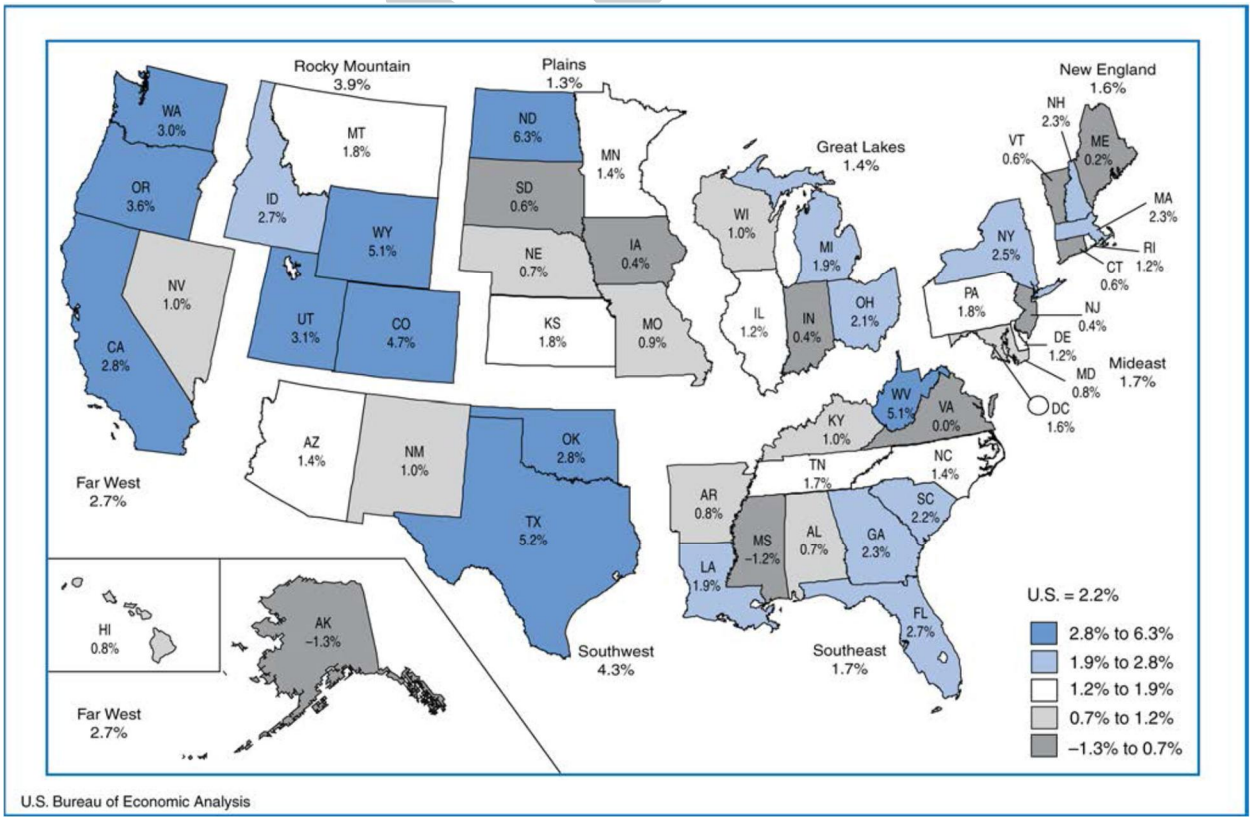

Figure 3-12: Percent Change in Real Gross Domestic Product by State, 2014

State, regional, and county historical and forecast average annual employment trends can also be useful when melding realistic expectations for overall impacts to based aircraft and operations at a facility like Elbow Lake Airport. Comparative historical data over a recent 10-year span between Grant County, similar regions and the State of Minnesota can been seen in Figure 3-13 below. This data loosely suggests that as the economic influences of the region goes, so goes Grant County. Specific anomalies in data are not unusual for a county with a small population, such as Grant County and it can be difficult to make reliable correlations between local economic trends and aviation activity.

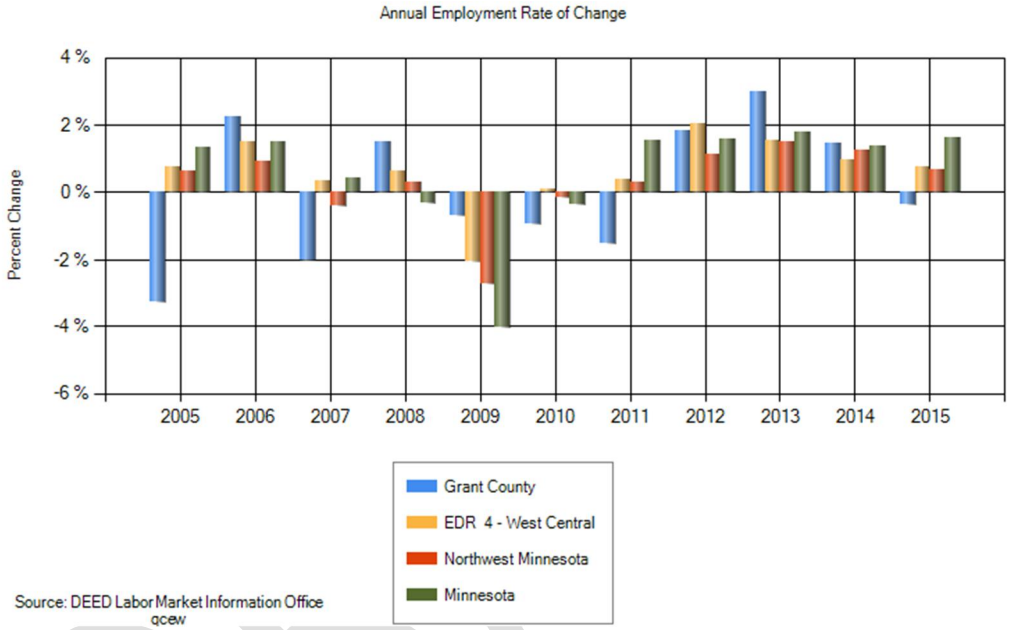

Figure 3-13: Annual Employment Rate of Change 2005 Through 2015

Similarly, taking a look at forecast future trends for this same data, as seen in Figure 3-14, we can see a broad spectrum of estimated ranges for forecast changes by industry. (Grant County is included as part of the Northwest Minnesota Economic Impact Area for statistical purposes). Trade, transportation, and utilities employment is forecast for a robust growth of 6.5% over 10 years, or a 0.65% average annual growth rate.

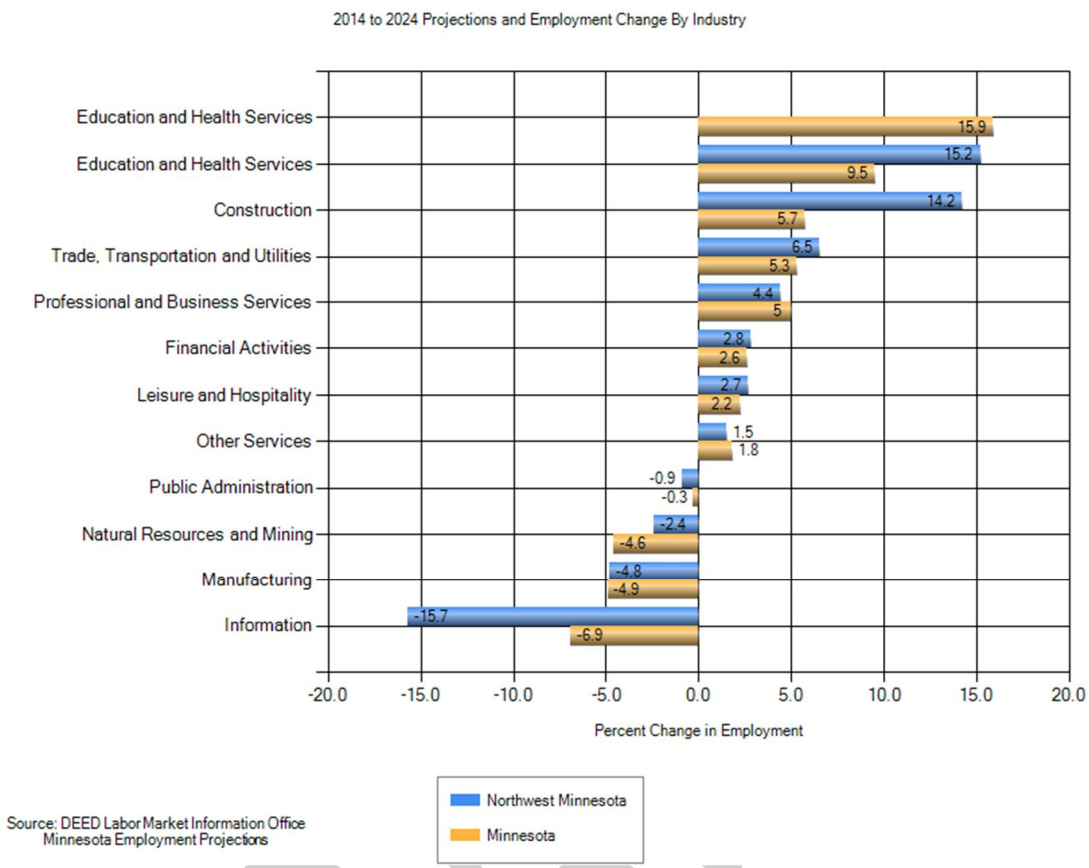

Figure 3-14: Projected Change in Employment by Industry 2014 Through 2024

3 | Section 4 – National Data and Trends

3.4.1 Factors Influencing the Industry

An important part of developing trends for statistical purposes is analyzing relevant issues from a national perspective, and then applying them, if warranted, to the regional and local perspective. One of the most reliable and important tools for this purpose is the information collected and analyzed by the FAA as part of its FAA Aerospace Forecast (2016-2036), and the NPIAS-driven TAF reports.

The Aerospace Forecast report clearly states that the U.S. is still recovering well from the most serious economic downturn since WWII, and the slowest expansion in recent history. There is no indication that the U.S. economy will backslide, and all indications are that aviation will continue to grow. The recent sharp decline in oil prices is acting as a catalyst for moderate aviation industry growth.

The report forecasts oil prices to continue to fall to about $43/barrel, but then rise to around $100 per barrel by 2023, and rise even further to $150/barrel. The forecasted growth for general aviation is modest, with the GA fleet forecast to increase 0.2%/year till 2016 (see Figure 3-15) and GA hours flown projected to increase an average of 1.2%/year (see Figure 3-16).

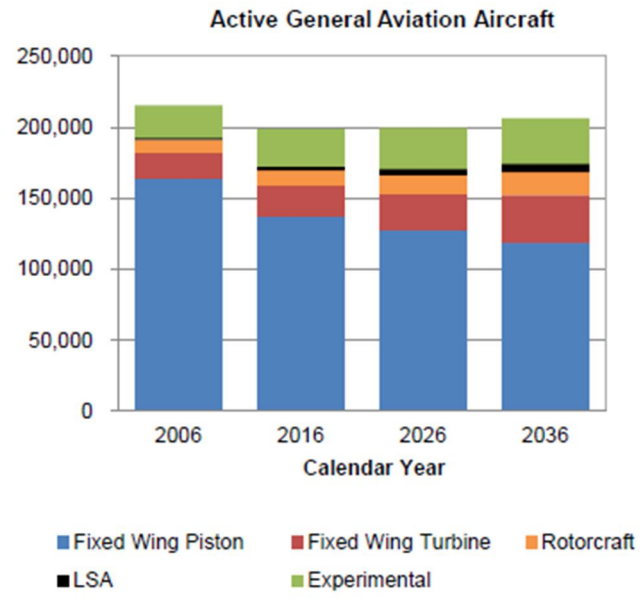

Figure 3-15: FAA Aerospace Forecast Active GA Fleet Estimates

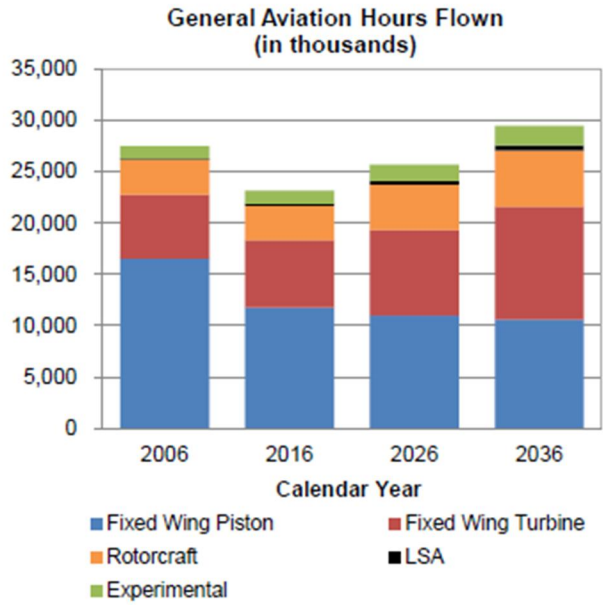

Figure 3-16: FAA Aerospace Forecast GA

Another metric which can have a lesser impact upon GA activity levels at airports such as Elbow Lake is the trend of numbers of active pilots (see Figure 3-17). The industry is forecasting a slight decrease in active GA pilots over the period forecast, but a robust increase in the numbers of airline transport pilots. This is due to the

airline pilot shortage that the US is in the midst of currently. Even more dramatic is the rise in the number of active sport pilots that is expected over the forecast period, with an annual increase of nearly 4.8%. When combining all the statistics as a whole, the relevancy to the Elbow Lake Airport forecasts is that the industry trends in pilot numbers will likely have no detrimental effect on positive growth at Elbow Lake. Estimating the impact of these metrics into the overall calculated rate for either based aircraft or operations would be approximately 2.00%

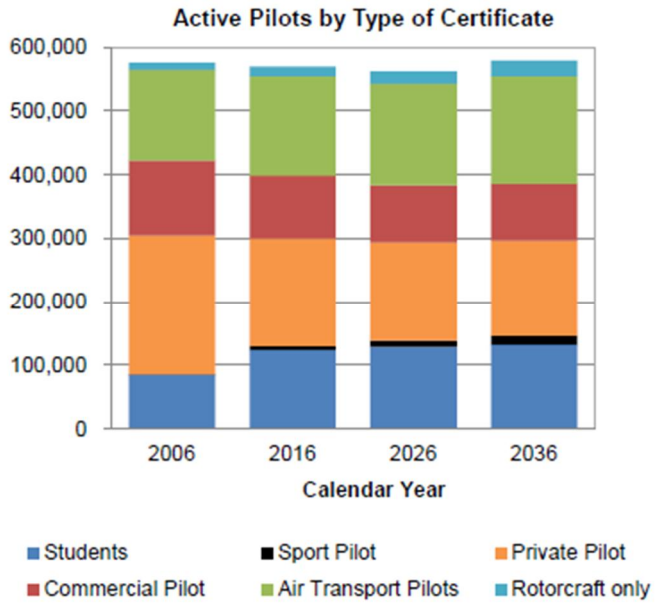

Figure 3-17: FAA Aerospace Forecasts for Active Pilots

3.4.2 National FAA TAF Stats

The latest FAA TAF forecasts some interesting data for the US as a whole. Total GA itinerant operations are forecast to increase by 0.086% nationwide, with local operations expected to increase by 0.039%. Total operations at all airports are expected to rise 0.068%. Based aircraft are forecast to increase by 0.91% nationwide. See Figure 3-18 below.

Unites States FAA Operations and Based Aircraft FAA TAF Summary and Forecast Report - January 2017				
Fiscal Year	Total Itinerant Operations	Total Local Operations	Total Operations	Total based Aircraft
1990	64,484,674	40,846,243	105,330,917	162,155
1991	69,049,736	43,963,157	113,012,893	159,455
1992	69,400,352	43,133,290	112,533,642	158,740
1993	68,735,866	42,132,359	110,868,225	154,345
1994	69,545,925	40,964,156	110,510,081	155,336
1995	69,193,450	39,840,997	109,034,447	157,757

Unites States FAA Operations and Based Aircraft FAA TAF Summary and Forecast Report - January 2017				
Fiscal Year	Total Itinerant Operations	Total Local Operations	Total Operations	Total based Aircraft
1996	71,144,149	40,129,822	111,273,971	159,559
1997	72,160,346	40,239,122	112,399,468	167,592
1998	74,299,005	43,032,882	117,331,887	173,866
1999	75,696,052	43,696,821	119,392,873	176,008
2000	77,071,788	44,801,413	121,873,201	179,719
2001	75,768,724	44,619,929	120,388,653	186,731
2002	74,303,025	44,461,329	118,764,354	188,757
2003	73,436,680	43,245,669	116,682,349	190,101
2004	74,150,077	42,683,881	116,833,958	193,041
2005	73,011,514	42,381,497	115,393,011	197,214
2006	71,379,075	42,020,851	113,399,926	197,301
2007	71,251,558	42,259,941	113,511,499	199,608
2008	69,108,218	41,558,436	110,666,654	175,579
2009	64,566,672	39,452,976	104,019,648	177,432
2010	63,100,633	38,195,819	101,296,452	165,472
2011	62,555,625	37,515,779	100,071,404	160,374
2012	61,992,081	37,277,486	99,269,567	163,333
2013	61,093,227	37,041,805	98,135,032	166,953
2014	60,457,044	36,919,666	97,376,710	170,375
2015	60,538,335	37,190,738	97,729,073	163,994
2016*	60,945,397	37,124,626	98,070,023	165,480
2017*	61,464,535	37,240,993	98,705,528	166,822
2018*	61,838,254	37,366,024	99,204,278	168,247
2019*	62,162,956	37,493,350	99,656,306	169,600
2020*	62,484,360	37,622,882	100,107,242	170,947
2025*	64,632,098	38,294,916	102,927,014	178,273
2030*	67,267,620	39,017,760	106,285,380	185,377
2035*	70,061,800	39,798,973	109,860,773	192,766
2040*	73,038,543	40,646,728	113,685,271	200,655
2045*	76,157,045	41,568,652	117,725,697	208,977

Figure 3-18: US FAA TAF Historical and Forecast Statistics – January 2017

3 | Section 5 – Other Local and Regional Factors

When forecasting future operations and based aircraft at GA airports, it is important to examine other potential influences and desires that could affect overall development. Some of the items to consider may have unquantifiable metrics, while others may factor directly into the forecasting formula. It is incumbent upon the forecaster to not only use professional judgment when considering these variables, but to place a great degree of emphasis upon stakeholder opinions about future aviation trends. Forecasting operations at larger, commercial airports can certainly be challenging due to their complexity and the sheer amount of data available, however, smaller GA Airport forecasts can be equally challenging since some variables can potentially have an enormous impact regionally. This makes forecasting operations and based aircraft for GA airports much more dependent upon local input and forecaster discretion. At Elbow Lake in particular, there were two specific issues that need to be taken into consideration when developing forecasts and a determination for a critical aircraft.

3.5.1 Recent Rapid Growth of Y63 and Desires of Airport Reps, State and FAA

In just over a decade, Elbow Lake Airport has been transformed from a turf runway with one T-hangar, no FBO and virtually no other infrastructure into a thriving GA airport, looking to expand. It is not uncommon to see considerable increased use following major infrastructure improvements at any GA airport, but that growth many times is short lived, or worse, becomes noticeably neglected due to lack of use. This is certainly not the case at Elbow Lake. After numerous discussions with representatives from the airport, MnDOT and the FAA Great Lakes Region, it is clear that all parties involved do not want to see potentially shortsighted restrictions placed on the critical aircraft and classification of the Elbow Lake Airport. Good planning that takes into consideration all current and anticipated uses at the Elbow Lake Airport, as well as the desires of the community, the airport users, state aeronautics and the FAA is very important. It is certainly not proper for a forecaster to exaggerate development needs when there is no clear indication of development demand. Airports that are languishing are done a disservice with forecasts that place developmental and financial burden on them with less than deserved indicators. This is not the case at Elbow Lake. It is imperative to understand the reasons for the recent growth at the Elbow Lake Airport and the current vitality of the airport.

Good planning that takes into consideration all current and anticipated uses at the Airport, as well as the desires of the community, the airport users, state aeronautics and the FAA is very important.

3.5.2 FBO Activity, Seaplane Base Use and Other Catalysts

The current economic outlook for the region surrounding Elbow Lake is relatively stable, with modest growth predicted both regionally and nationally. Even with the recent downturn in corn prices, the impacts upon the Elbow Lake Airport have been stable. The FBO is a thriving enterprise, and has grown to over nine employees in a very short amount of time, including a flight instructor on staff. The importance of the FBO in creating and driving activity to the Elbow Lake Airport cannot be understated. Elbow Lake Airport and the FBO are fortunate to have a symbiotic relationship.

Although seaplane base use at Elbow Lake ebbs and flows over time, recent plans to ensure the viability of the sealane and to enhance its visibility have been considered. Airport representatives have recently made sure to officially list Sealane 11/29 as an approved seaplane base with the State of Minnesota, and to also include it as a separate runway facility through the FAA 5010 Master Record process. Once recorded, this will greatly enhance the advertisement of the seaplane base automatically through various government and private publications that utilize the centralized FAA and State airport data. Further planned development to enhance seaplane base operations and enable amphibious aircraft to access the main airport's active paved areas will also increase traffic. Other on-airport catalysts driving operations are important to note. In addition to a local flying club on field, there are two on field businesses as well as a non-profit venture that utilize 2 182RGs, an A-36 Bonanza and a Robinson R-44. These enterprises are thriving and contribute heavily to total operations.

3.5.3 Corn and Crop Futures

With so many people located around Elbow Lake tied directly to agriculture, and with two large John Deere and Case implement dealers located within the community, corn prices in particular can have a dramatic effect on the local economy of Elbow Lake. Interviews with airport representatives suggest that the vitality of the agriculture market, and corn prices in particular, can heavily impact the airport. Corn prices can fluctuate rather volatilely, and recent years have seen them near $8.00/bushel, but more recent prices have seen them as low as $2.60/bushel. Many farmers consider $2.80/bushel a common "break even" harvest price. Although predicting the commodities' future markets can be onerous at best, and is well beyond the scope of this particular forecast, it should be pointed out that all national trends and data suggest that agricultural prices, especially for corn, will at the very least remain stable, and are not expected to slow much further. Augmenting that information is the fact that if corn prices rebound only modestly, they will only impact the Elbow Lake Airport and its activity in positive and dramatic ways. Taking a look at corn prices per bushel over several decades in Figure 3-19, these fluctuations over time are evident.

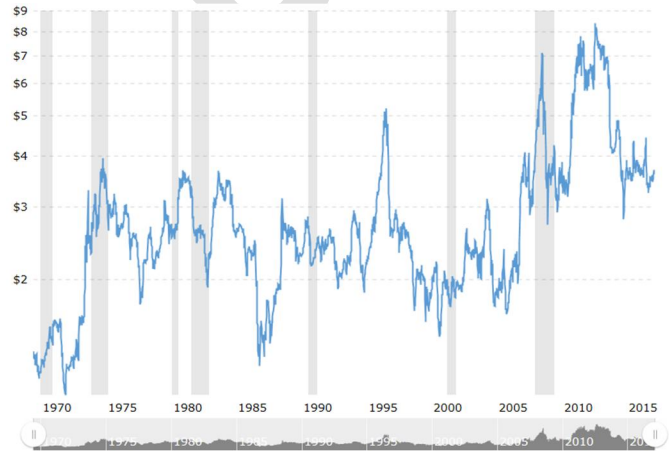

Figure 3-19: Corn Price Fluctuations Since 1970

3 | Section 6 – Existing Y63 Forecasts

3.6.1 FAA TAF for Y63

The FAA's official forecast for Elbow Lake, and for all other airports as well, is provided by the annual FAA TAF (Terminal Area Forecast). FAA TAF information has been utilized in several previous sections of this forecast chapter. The FAA TAF is used in conjunction with the FAA's National Plan of Integrated Airport Systems (NPIAS) as the means to determine an airport's forecasted number of aircraft operations and based aircraft, especially if no other data is available. The FAA TAF and the associated annual summary report provide forecasts for multiple levels, from nationwide to region and down to the individual airport level. The types of operations that the TAF forecasts for individual airports depends upon the complexity of the airport, with large commercial service airports having more complex data, and smaller GA airports having less. For the Elbow Lake Airport, the TAF forecasts the number of total aircraft operations and based aircraft. A graphic of the historical levels and current TAF forecasts for both airport operations and based aircraft for Elbow Lake can be seen in the following Figures 3-20 and 3-21.

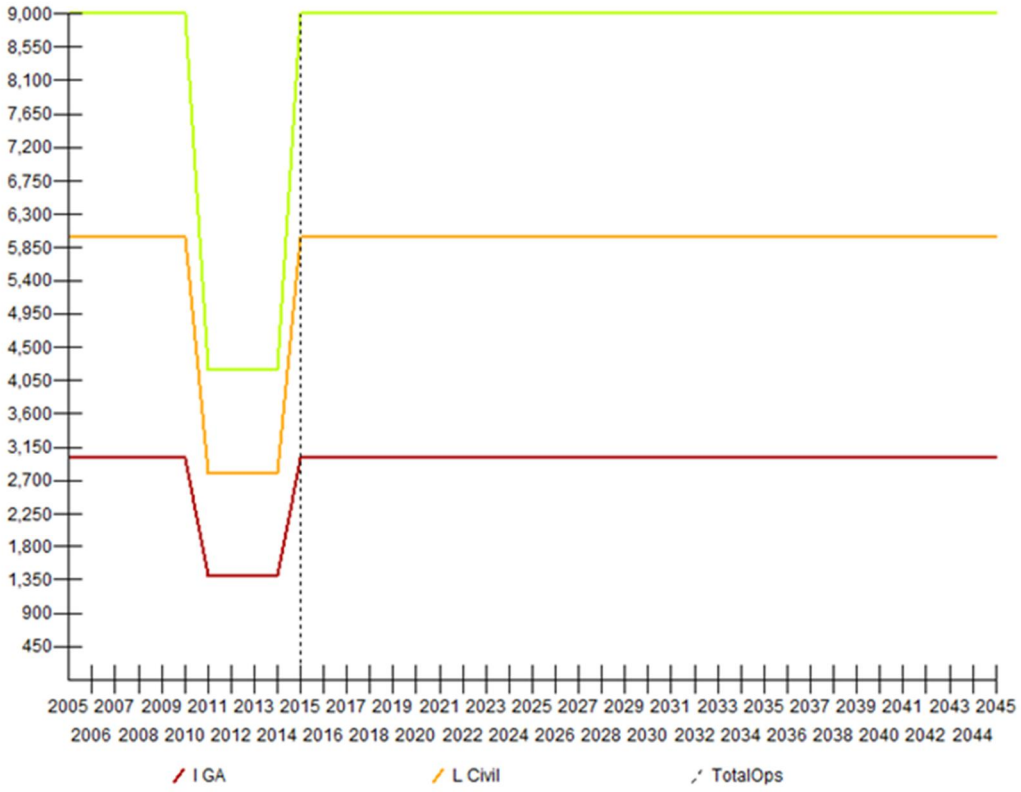

Figure 3-20: Current FAA TAF Historical and Forecast Activity Data for Y63

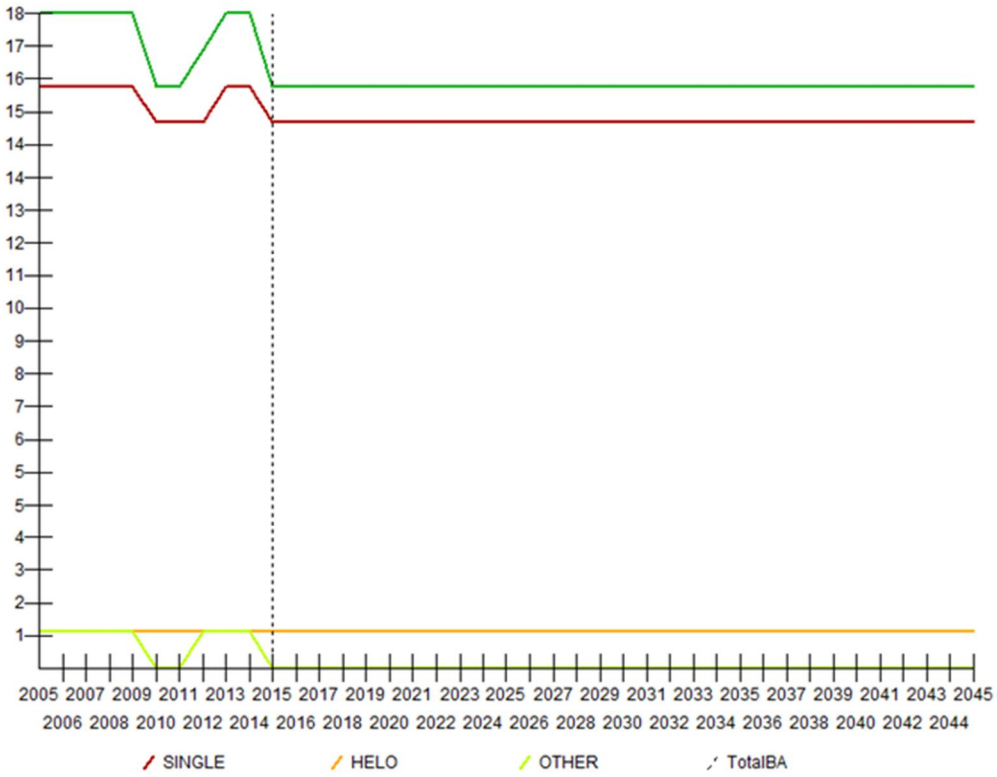

Figure 3-21: Current FAA TAF Historical and Forecast Based Aircraft Data for Y63

As can be seen, the forecast for total aircraft operations at Elbow Lake stays consistent throughout the forecast period. As described earlier in this chapter, these current and forecast numbers are directly attributed to FAA 5010 records. The anomaly that appears between the 2011 and 2014 period timeframe is reflective of the 5010 inspector's readjustment in the estimation of the number of operations during that inspection cycle as described in section 3.2.1. The flat line forecasting method is the common method for FAA TAF forecasts for smaller GA airports. This is because it would be impractical for the FAA to conduct highly detailed analysis of the operational numbers at every GA airport across the country. To augment these flat line forecast estimates, the FAA relies upon the airport master planning process. To ensure reasonableness in the master planning forecasts however, FAA AC 150/5070-6B states that all airport master plan forecasts must be compared against the FAA's TAF. After comparisons are made, the forecasts are considered compatible and consistent with the FAA TAF for all classes of airports if the forecasts for total enplanements, based aircraft, and total operations meet the following criterion:

- Forecasts differ by less than 10 percent in the five-year forecast period
- Forecasts differ by less than 15 percent in the ten-year forecast period

If comparisons are not consistent with the FAA TAF, the reasons for the differences must be explained.

3.6.2 2004 Master Plan Forecast

The most recent Master Plan conducted for the Elbow Lake Facility in 2004 was examined as part of this forecasting effort to assist in determining a baseline for the current forecast data and as required by the FAA. In terms of normal intervals between master plans for airports, a span of 13 years is just a little longer than usual, and normally the spread of data between the two plans and the overall infrastructure of the facility being measured are not all that different. In the case of Elbow Lake, however, there was an abnormal amount of infrastructure development and business activity between the two master planning efforts. This fact needs to be weighed when considering the impacts of the last master plan forecasts upon the overall data.

Foreseeing potential and planned growth, the last master plan included two separate forecasts for based aircraft and aviation activity at Elbow Lake, one assuming no facility improvements, and the other assuming a future paved runway and hangar expansion, which ultimately took place. Figure 3-22 below reflects those forecast levels for the one that assumed growth.

National Trends Based Aircraft Forecast with Paved Runway and Hangar Expansion				
Year	Based Aircraft	Based Aircraft Operations	Transient Aircraft Operations	Total Aircraft Operations
2002	8	1,968	1,904	3,872
2003	8	1,986	1,921	3,907
2004	8	2,004	1,938	3,942
2005	8	2,022	1,956	3,977
2006	8	2,040	1,973	4,013
2007	16	3,936	1,991	5,927
2008	16	3,971	2009	5,981
2009	16	4,007	2,027	6,034
2010	16	4,043	2,045	6,089
2011	17	4,080	2,064	6,144
2012	17	4,116	2,082	6,199
2013	17	4,153	2,101	6,255
2014	17	4,191	2,120	6,311
2015	17	4,228	2,139	6,368
2016	17	4,267	2,158	6,425
2017	17	4,305	2,178	6,483
2018	18	4,344	2,197	6,541
2019	18	4,383	2,217	6,600
2020	18	4,422	2,237	6,659
2021	18	4,462	2,257	6,719
2022	18	4,502	2,278	6,780
2023	18	4,543	2,298	6,841

Figure 3-22: 2004 Elbow Lake Master Plan Forecast Table

Assuming that the current amended number of aircraft operations developed in Section 3.2.1 is relatively accurate, the forecast provided in the last Master Plan was reasonable in terms of the forecasted number of number of operations for 2017. The previous forecast rendered an average annual aircraft activity growth rate of approximately 3.83%, which would usually be considered higher than average but not unreasonable for Elbow Lake, especially with the infrastructure and business growth it has experienced. On the other hand, the based aircraft forecast, with a rate of nearly 6.25% appears to have fallen somewhat short, despite the extremely high average annual growth rate. This anomaly is most likely due to a combination of the number of aircraft on the field being underreported as a result of the information being based on existing 5010 data, prior to the FAA basedaircraft.com data being available. Also contributing was a higher than anticipated demand for hangar space prior to infrastructure development. There are currently 25 aircraft based at the Elbow Lake Airport, with demand for approximately 5 more spaces.

3 | Section 7 – Forecasting Methodology

FAA AC 150/5070-6B gives wide latitude in both the types and application of the methods that can be used when forecasting data within an Airport Master Plan. The reason for this flexibility is to account for the large variances in the types and complexities of airports and the large number of variables that can influence the forecasts. Professional judgment must be employed in determining the best methodology for the application of forecasts. There are several types of methodologies that the FAA recognizes, including:

1) Regression analysis – This is a statistical technique that ties aviation demand (dependent variables), such as enplanements, to economic measures (independent variables), such as population and income. This type of analysis should be restricted to relatively simple models with independent variables for which reliable forecasts are available.
2) Trend analysis and extrapolation – This method relies on projecting historic trends into the future. In trend analysis, a simple equation can be used with time as the independent variable. It is one of the fundamental techniques used to analyze and forecast aviation activity. While it is frequently used as a back-up or expedient technique, it is highly valuable because it is relatively simple to apply. Sometimes trend analysis can be used as a reasonable method of projecting variables that would be very complicated (and costly) to project by other means. This is especially true for smaller, GA airports.
3) Market share analysis or ratio analysis – This technique assumes a top-down relationship between national, regional, and local forecasts. Local forecasts are a market share (percentage) of regional forecasts, which are a market share (percentage) of national forecasts. Historical market shares are calculated and used as a basis for projecting future market shares. This type of forecast is useful when the activity to be forecast has a constant share of a larger aggregate forecast.

4) Smoothing – A statistical technique applied to historical data, giving greater weight to the latest trend and conditions at the airport; it can be effective in generating short-term forecasts.

For the Elbow Lake Airport Master Plan Forecasts, a combination of Trend Analysis with applied Smoothing to account for Market Share Ratio will be utilized. Historic and current airport data, with existing forecasts will be used to create a trending percentage that will be influenced (smoothing) to create a forecasting average. This methodology takes advantage of the known historical trends of the airport, the current operational and based aircraft data and other data influencing the region including national trends and data. Statistical rounding of percentages to a reasonable percent will also be employed in the forecast analysis since the relatively low integers that are being equated into the formulas obviate rounding.

In determining the function of a linear graph over time, several average and trend amended annual growth rates that were previously discussed in this chapter were considered as well as other national and specific information. The specific annualized rates and the other relevant information used are summarized in Figure 3-23 below:

Level of Indicator	Specific Indicator	Source	Average Annual Growth
Aircraft Operations Information			
Regional	GLR aircraft operations forecast	FAA TAF	0.61%
State	Minnesota GA and civilian aircraft operations forecast	FAA TAF	0.63%
State	Minnesota aircraft operations forecast average (All Aircraft)	MN State Aviation System Plan	1.60%
State	Minnesota aircraft operations forecast average (Single Engine Piston)	MN State Aviation System Plan	0.80%
Local	Elbow Lake Airport aircraft operations forecast average	MN State Aviation System Plan	0.006% - 0.015%
Local	Elbow Lake Airport operations trend	2004 Y63 Master Plan	3.83%
Composite Average			1.25%
Based Aircraft Information			
Regional	GLR based aircraft forecast	FAA TAF	0.75%
State	Minnesota based aircraft forecast	FAA TAF	0.36%
State	Minnesota based aircraft forecast average	MN State Aviation System Plan	1.00%
Local	Elbow Lake Airport based aircraft forecast average	MN State Aviation System Plan	0.001% - 0.015%
Local	Elbow Lake based aircraft trend	2004 Y63 Master Plan	6.25%
Composite Average			1.67%

Figure 3-23: Specific Indicators Used in Consideration for Y63 Forecasts, adjusted as described in literature for categories, trending, and anomalies.

Level of Indicator	Specific Indicator	Source	Average Annual Growth
Other Relevant Data			
National	Total based aircraft forecast	FAA Terminal Area Forecast Summary	0.91%
National	Local GA operations at airports forecast	FAA Terminal Area Forecast Summary	0.04%
National	Total GA aircraft available in fleet forecast	FAA Aerospace Forecast	0.20%
National	Total operations all airports forecast	FAA Aerospace Forecast	0.07%
National	GA hours flown forecast	FAA Aerospace Forecast	1.20%
National	Number of GA and Commercial pilot license forecasts	FAA Aerospace Forecast	2.00%
National	GA itinerant airport operations forecast	FAA Terminal Area Forecast Summary	0.09%
Regional	MN Trade, transportation and Utilities Forecast	MN Dept of Employment and Economic Devlpmnt	0.65%
Regional	Average GDP Increase State of Minnesota	US Dept of Commerce	1.40%
Local	Average annual fuel sales Elbow Lake	Y63 FBO	6.32%
Composite Average			1.29%

Figure 3-24: Other Relevant Indicators Used in Consideration for Y63 Forecasts

Utilizing the airport activity indicator levels in Figure 3-24 yields a statistical mean of 1.25% for aircraft operations and a statistical mean of 1.67% for based aircraft. Augmenting these growth rates with a composite statistical mean of 1.29% (as identified in Figure 3-24) of other relevant local, regional and national indicators as described in Figure 3-24 would yield an average annual increase of 1.27% for aircraft operations and 1.48% for an average annual increase of based aircraft.

These individual composite percentage yields seem very reasonable at first perspective, and would suffice for forecasting future trends at the Elbow Lake Airport. The total percentages of the types of aircraft operations, as categorized by the 5010 Master Record form, at the Elbow Lake Airport are likely to remain relatively constant in the future and it would not be reasonable to forecast small differences in these categories. For the purposes of these forecasts, the current fleet mix of approximately 70% GA local operations and 30% for GA itinerant, with a negligible set aside for transient military operations, was used to calculate the totals.

After further examination of all the factors and statistics influencing the Elbow Lake Airport, it is reasonable to allow the aforementioned average annual aircraft activity determination of approximately 1.27% to stand. Conversely, the impact of the other socio-economic factors considered within Figure 3-24 reduces the average yield statistically for based aircraft forecasts. It would seem prudent to allow the higher

specific indicator for based aircraft of approximately 1.67% to be utilized for the annual based aircraft forecast. This higher percentage determination seems even more reasonable considering the much higher than average growth of aircraft based at Elbow Lake, over pacing of all earlier predicted growth models for based aircraft at Elbow Lake, and the sheer activity of the airport, the FBO and other future influences likely to drive even more aircraft to be based at the airport.

3 | Section 8 – Y63 Forecasts

Figure 3-25 shows the forecasts developed within this master plan over the short, intermediate, and long term periods. A comparison of the FAA's current TAF forecasts with this Master Plan forecast is also shown. Substantial deviation from the FAA's TAF is noticeable; however, the explanation for this anomaly is quite straightforward.

Considering how the based aircraft forecast is derived for the FAA TAF forecasts, the FAA, as described earlier, relies upon the 5010 for much of its data, and then uses that data to project a flat line forecast through the TAF. Actual based aircraft numbers are already substantially higher over what the TAF uses as a baseline. This baseline is then flat line projected over the course of the TAF period. This is the reason for the statistical difference between the FAA TAF information and the Master Plan forecast.

When considering airport operation numbers, once again, the FAA uses a version of the 5010 numbers that has been explained in section 3.2.1 to have been estimated to be in significant error in terms of actual operations at the airport. It can be assumed that once this master plan is adopted, 5010 inspectors will be able to use the information within this master plan along with manager interviews at that time to help determine a more reasonable number of aircraft operations at Elbow. After that next 5010 master record cycle is complete, the next FAA TAF after that cycle will reflect the most current Elbow Lake 5010, and the operational baseline will dramatically decrease and the TAF forecast will align more with these particular forecasts. This will have the effect of the next FAA TAF appearing on par with this master plan forecast and the actual deviation over time from the new FAA TAF in regards to this forecast will be much slighter.

Elbow Lake Airport Master Plan Based Aircraft Forecasts				
	Base Year (2016)	Short Term Forecast (2021)	Intermediate Term Forecast (2026)	Long Term Forecast (2036)
Single	23	25	27	31
Twin	1	1	2	2
Jet	0	0	0	0
Helicopter	1	1	1	1
Total Based Aircraft Forecast	25	27	30	34
FAA TAF Based Aircraft forecast	16	16	16	16
% Difference Between Forecast and TAF	36%	41%	47%	53%

Elbow Lake Airport Master Plan Aircraft Operations Forecasts				
	Base Year (2016)	Short Term Forecast (2021)	Intermediate Term Forecast (2026)	Long Term Forecast (2036)
GA Local	4,000	4,250	4,500	5,000
GA Itinerant	2,000	2,125	2,250	2,750
Total Aircraft Operations Forecast **	6,000	6,375	6,750	7,500
Current TAF Aircraft Operations	9,000	9,000	9,000	9,000
% Difference Between Forecast and TAF	33%	29%	25%	17%
***It should be noted that these total numbers represent operations conducted from BOTH the paved runway and the sealane. Although the current 5010 does not separate out the sealane at this time, all historic and forecast activity numbers collected from 5010 inspectors and from information gathered from local representatives have included operations from both individual facilities as one specific metric.*				

Elbow Lake Airport Instrument Approach Procedures Forecasts				
	Base Year (2016)	Short Term Forecast (2021)	Intermediate Term Forecast (2026)	Long Term Forecast (2036)
Total Aircraft Operations Forecast	152	161	171	190

Figure 3-25: Y63 Aviation Forecasts Through 2036

3 | Section 9 – Critical Aircraft

The "ultimate" future Critical Aircraft for the Elbow Lake Airport Master Plan can be described as a generic B-II (Small) category aircraft… represented by the Beechcraft King Air.

The "Critical Aircraft" determination is an important aspect of an Airport Master Plan as it potentially sets ultimate design standards for an airport, such as the distance between runways and taxiways and the size of certain other areas protecting the safety of aircraft operations and passengers. Since there are thousands of different types of aircraft with different dimensions and performance characteristics, the FAA has grouped them into certain categories, based on wingspan and approach speeds. These different Aircraft Design Groups (ADG) assist with determining the Airport Reference Code (ARC) for individual airports. The critical aircraft for a particular airport is usually based upon the operations conducted by the largest and fastest aircraft using the facility with at least 500 forecast operations annually, unless other extenuating circumstances necessitate the need for an alternative designation. The designation of a critical aircraft does not necessarily have to be an actual specific aircraft, it can be an amalgamation of various types of aircraft, and represented by a specific ADG.

The Elbow Lake facility is somewhat unusual since most airports that are of similar size and use are normally built to B-II (Small) dimensions. This is partly because over the last several decades, the FAA began to notice that since most general aviation airports serve an aircraft fleet mix that generally encompasses B-II (Small) group sized aircraft, it was usually much more cost effective to build airports meeting AIP requirements initially to B-II (Small) standards, unless other extenuating circumstances applied. Elbow Lake is currently built to A/B-I (Small) dimensions. The Elbow Lake Airport does not have an

active control tower, or a method for recording all types and numbers of flights at the facility. Due to this, other reliable sources of information or methods of collecting relevant data were necessary to help in ascertaining critical aircraft information. In addition to gathering IFR flight records for the facility and examining types of fuel sales, in depth interviews with Federal, state, and local representatives were conducted. Most importantly, the manager of the airport and FBO was able to provide very detailed information about the nature of flights in and out of the airport. Since the FBO is usually quite busy, and a substantial amount of activity attributed to operations at the Elbow Lake Airport is generated in part due to the presence of the FBO, the information gleaned from this interview was extremely helpful in determining fleet mix utilizing the Elbow Lake facilities.

It was clear from the interviews conducted that although it is highly unlikely aircraft falling specifically within the B-II category will likely conduct more than 500 operations per year within the forecast period, many similarly-sized aircraft are already using the facility, and more importantly, are providing many important services. One of these services in particular is Medivac operations. Different types of aircraft providing Medivac services have utilized the Elbow Lake Airport, but most of them fall within or close to the B-II category, and certainly above the normal A-I operations routinely conducted at the airport. The B-II category is by far the most common category that the vast majority of General Aviation airports within the US fall into. This is because the B-II category commonly allows for the larger end of most commonly seen twin engine GA aircraft that commonly use GA facilities. One of the prime examples of a very common B-II-sized aircraft seen at many GA airports is the Beechcraft King Air, which has also been seen at the Elbow Lake Airport. In interviews and discussions with MnDOT representatives and Great Lakes Region FAA personnel, the topic of possible B-II designation at the Elbow Lake Airport was discussed without a 500 operations forecast limit. Limiting the Elbow Lake Airport to something less than B-II ultimately could significantly impact future development plans, and ultimately the viability of the facility for many years to come for aircraft of these types. If proper need and use of B-II sized aircraft for a facility can be identified within the master plan or forecasts, such as for medivac purposes or other critical needs, then it is prudent to illustrate that need ultimately through the identification of a B-II type Critical Aircraft.

Due to the factors identified within this forecast, and the identified future needs of the airport and its continued growth and identification as an important regional GA airport, the "ultimate" future Critical Aircraft for the Elbow Lake Airport Master Plan can be described as a generic B-II category aircraft, with an wingspan of less than 79 feet, an approach speed of less than 121 knots, and a weight of less than 12,500 pounds. Filling this representation for a Critical Aircraft for the Elbow Lake Airport would be the Beechcraft King Air.

Beechcraft King Air E90; Source: Wikimedia Commons