Chapter 3 – Aviation Activity Forecasts

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The overall goal of aviation activity forecasting is to prepare forecasts that accurately reflect current conditions, relevant historic trends, and provide reasonable projections of future activity, which can be translated into specific airport facility needs anticipated during the next twenty years and beyond.

Introduction

This chapter provides updated forecasts of aviation activity for Kittitas County Airport – Bowers Field (ELN) for the twenty-year master plan horizon (2015-2035).

The most recent FAA-approved aviation activity forecasts for Bowers Field were prepared in 2011 for the Airfield Needs Assessment project. Those forecasts evaluated changes in local conditions and activity that occurred since the previous master plan forecasts were prepared in 2000, and re-established base line conditions. The Needs Assessment forecasts provide the "accepted" airport-specific projections that are most relevant for comparison with the new master plan forecasts prepared for this chapter.

The forecasts presented in this chapter are consistent with Bowers Field's current and historic role as a community/regional general aviation airport. Bowers Field is the only airport in Kittitas County capable of accommodating a full range of general aviation activity, including business class turboprops and business jets. This level of capability expands the airport's role to serve the entire county and the local Ellensburg community.

The intent is to provide an updated set of aviation demand projections for Bowers Field that will permit airport management to make the decisions necessary to maintain a viable, efficient, and cost-effective facility that meets the area's air transportation needs.

Unless specifically noted, the forecasts of activity are unconstrained and assume that Kittitas County will be able to make the facility improvements necessary to accommodate anticipated demand. Through the evaluation of airport development alternatives later in the master plan, Kittitas County will consider if any unconstrained demand will not or cannot be reasonably met.

The FAA-defined airport master plan forecasting process for general aviation airports is designed to address elements critical to airport planning by focusing on two key activity segments: based aircraft and aircraft operations (takeoffs & landings). Detailed breakdowns of these are also provided including aircraft fleet mix, activity peaking, distribution of local and itinerant operations, and the determination of the critical aircraft, also referred to as the design aircraft.

The critical aircraft represents the most demanding aircraft type or family of aircraft that uses an airport on a regular basis (a minimum of 500 annual takeoffs & landings). The existing and future critical aircraft are used to define a variety of FAA design standards for airfield facilities to be used in master planning. FAA airport design standards are organized into several different groupings, each reflecting the physical requirements of that aircraft type. The activity forecasts also provide consistency in evaluating future demand-based facility requirements such as runway and taxiway capacity, aircraft parking and hangar capacity.

Forecast Process

The Federal Aviation Administration (FAA) provides guidance on forecasting aviation activity in airport master planning projects. FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans, outlines seven standard steps involved in the forecast process:

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) **Previous Airport Forecasts**: May include the FAA Terminal Area Forecast (TAF), 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**: Follow guidance in FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than 10 percent variance, supporting documentation should be supplied to the FAA. The aviation demand forecasts are then submitted to the FAA for their approval.

Airport Service Area

The airport service area refers to the geographic area surrounding an airport that generates most "local" activity. A 30- or 60-minute surface travel time is used to approximate the boundaries of a service area for a typical general aviation airport. The population, economic characteristics, and capabilities of competing airports within an airport's service area are important factors in defining locally generated demand for aviation facilities and services, and influence the airport's ability to attract transient aircraft activity.

In contrast, the service area for commercial airports often extends beyond a two hour drive time due the relatively small number of airports with scheduled airline service. Ellensburg is located within the service areas defined for three commercial airports: Yakima Air Terminal, Pasco/Tri Cities, and SEATAC International Airport.

Figure 3-1 illustrates the approximate service area boundaries for Bowers Field. Competing airports located beyond the service areas typically have less impact on local airport activity due to the redundancy provided by closer facilities. With numerous airports nearby, service areas often overlap, creating competition between airports for items such as hangar space, fuel and aviation services. These items are sensitive to cost, convenience and quality of facilities or services for both locally based and transient users.

AIRPORT SERVICE AREA
FIGURE 3-1

KITTITAS COUNTY - BOWERS FIELD
AIRPORT MASTER PLAN

CENTURY WEST ENGINEERING

Table 3-1 lists the publicly owned, public use airports within a 50 nautical mile (air miles) radius of Bowers Field. It is noted that some of the public use airports listed provide competitive facilities and services with master plans that provide for future facility expansion.

Bowers Field and Cle Elum Municipal Airport are the only FAA funded airports (National Plan of Integrated Airport Systems – NPIAS) in Kittitas County, and within the 30-minute defined service area boundary. Bowers Field accommodates a full range of general aviation activity, including large turbine aircraft associated with business aviation. Bowers Field also accommodates a regional helicopter wildfire response facility managed by the Washington Department of Natural Resources (DNR). The unique and unduplicated facilities provided at Bowers Field create a large geographic service area that extends through the entire county and into adjacent counties.

Cle Elum Municipal Airport (S93) is the closest airport in the service area. Cle Elum has a paved and lighted 2,379-foot runway that accommodates small single-engine and multi-engine aircraft, and helicopters. The airport does not offer fuel, services or pilot facilities. Pangborn Memorial Airport (EAT) and the Yakima Air Terminal (YKM) are the largest airports located within the service area for Bowers Field, accommodating general aviation and commercial activity with a full range of facilities and services.

TABLE 3-1: PUBLIC USE AIRPORTS IN VICINITY OF BOWERS FIELD *(WITHIN 50 NAUTICAL. MILES)*

AIRPORT	LOCATION	RUNWAY LENGTH(S) (FEET)	SURFACE	LIGHTED RUNWAY?	FUEL AVAILABLE?
Cle Elum Municipal Airport	17.5 NM Northwest	2,379	Asphalt	Yes	No
Pangborn Memorial Airport	26 NM Northeast	5,700 4,460	Asphalt	Yes	Yes
Yakima Air Terminal	27 NM South	7,604 3,835	Asphalt	Yes	Yes
Easton State Airport	30 NM Northwest	2,640	Turf	Yes	No
Quincy Municipal Airport	30 NM Northeast	3,660	Asphalt	Yes	No
Cashmere-Dryden Airport	34 NM North	1,800	Asphalt	Yes	No
Ephrata Municipal Airport	45 NM Northeast	5,500 3,842	Asphalt	Yes	Yes

Socioeconomic Trends and Forecasts

AREA ECONOMY

Historically, downturns in general aviation activity often occur during periods of weak economic conditions and growth typically coincides with favorable economic conditions. It is evident that the recent economic recession and the slow recovery that followed, has constrained general aviation activity locally, statewide, and throughout the national airport system. However, as indicated in the FAA's national long-term aviation forecasts, the overall strength of both U.S. and regional economies is expected to sustain economic growth over the long-term, which has historically supported growth in aviation activity.

The local and regional economy for Kittitas County has historically been led by agriculture, recreation and tourism, while being anchored by Central Washington University. These core sectors will continue to be leading employers in the region and provide opportunities for local businesses to expand into a variety of value added products. The unique aspects of both the upper and lower county economy have the potential of impacting activity at Bowers Field based on its large geographic airport service area and unique facilities.

The 2012 Census of Agriculture[1] for Kittitas County lists 1,006 farms, totaling 183,124 acres (182 acres per farm average), which was approximately 3 to 4 percent lower than recorded in the 2007 census. The land in farm use is 50 percent pastureland; 37 percent cropland; 8 percent woodland; and 5 percent other uses. The market value of the products sold in 2012 was estimated at $68.9 million, up 13 percent from 2007. Top crop and livestock items (by acreage) include hay, cattle, wheat, horses, vegetables (all), and sweet corn.

In 2015, overall nonfarm employment in Kittitas County was estimated at 16,990 Washington Employment Security Department (ESD).[2] The data reveal several interesting facts about the nature of employment in the county.

- Private versus Government:
    - Total Private Employment: 10,470 (62%)
    - Total Government Employment: 6,520 (%)
- Leading Employment Sectors (general):
    - Service Providing: 15,480 (91%)
    - Goods Producing: 1,510 (9%)
- Leading Employment Sectors (specific):
    1) State and Local Government (Education): 4,570 (26.9%)
    2) Leisure and Hospitality: 3,210 (18.9%)
    3) State and Local Government (Non-Education): 1,770 (10.4%)
    4) Retail Trade: 1,660 (9.8%)
    5) Education and Health Services: 1,450 (8.5%)

[1] USDA 2012 Census of Agriculture, County Profile, Kittitas County, Washington
[2] Washington State ESD, Labor Market and Performance Analysis, 2015.

6) Mining, Logging, and Construction: 930 (5.5%)
7) Information and Financial Activities: 730 (4.3%)
8) Professional and Business Services: 680 (4.0%)

Many of the traditional industry sectors are characterized by seasonal employment fluctuations and modest wages. The per capita income for Kittitas County in 2015 was $37,775, approximately 22 percent below Washington's per capita income level of $48,292. It is noted however, that the university student population is considered in this calculation, which skews the numbers downward due to reduced income levels while attending school. A summary of the Woods & Poole 2014 forecast of personal per capita income and employment data for Kittitas County is provided in **Table 3-2**. It is noted that the 2014 forecasts are expressed in 2009 dollars; however, the key long-term assumption is that the gap between Kittitas County and Washington per capita income is expected to remain about the same during the next twenty years. Overall employment growth is modest, but will result in expanded economic activity.

TABLE 3-2: PERSONAL PER CAPITA INCOME & EMPLOYMENT DATA

	HISTORIC	FORECAST				
	2010	2015	2020	2025	2030	2035
Per Capita Income (in 2009 dollars)						
U.S.	$39,144	$41,554	$44,387	$47,848	$51,833	$56,346
Washington	$41,341	$43,699	$46,455	$49,838	$53,719	$58,086
Kittitas County	$31,489	$33,157	$35,304	$37,986	$41,084	$44,588
Kittitas County % of Washington	76%	76%	76%	76%	76%	77%
Employment (Kittitas County)						
# Jobs	20,182	21,409	22,873	24,417	26,056	27,787
Source: Woods & Poole (2014)						

As the economy of Kittitas County evolves, the potential exists for the "suburbanization" of Metropolitan Seattle/Puget Sound to expand in Kittitas County based on proximity to the region, increasingly reliable freeway access via U.S. Interstate 90, regional economics and shifting demographics (including in-migration of retirees), etc. While this trend involves some positive aspects, there are concerns over the potential impact on housing prices, supply of affordable housing, the local workforce, and the ratio of local "live/work" and "commuter" populations. However, as an indicator of economic activity, growth in population provides a basic stimulant to a local economy and contributes to transportation demand.

The Kittitas County unemployment rate was at 6.3% in July 2016, which was less than one percentage point higher than the Washington statewide unemployment rate of 5.7%.

POPULATION

In broad terms, the population within an airport's service area affects the type and scale of aviation facilities and services that can be supported. Although a large number of airport-specific factors can affect activities at an airport, changes in population often reflect other broader economic conditions that may also affect airport activity. The airport service area for Bowers Field includes Ellensburg, Kittitas, Cle Elum, Roslyn, Easton, and unincorporated Kittitas County. Although Bowers Field is located in Ellensburg, changes in population in its entire service area will be examined.

HISTORIC POPULATION

Certified estimates of population for Washington counties and incorporated cities are developed annually by the Office of Financial Management (OFM). The annual OFM estimates, coupled with the decennial U.S. Census, conducted every ten years, provide an indication of local area population trends over an extended period. Washington state growth. Historic population data and average growth rates for Kittitas County, Ellensburg, and Washington are summarized in **Table 3-3**.

TABLE 3-3: HISTORIC POPULATION

YEAR	KITTITAS COUNTY	CITY OF ELLENSBURG (INCORPORATED AREA ONLY)	ELLENSBURG SHARE (%) OF KITTITAS COUNTY POPULATION	WASHINGTON
1990[1]	26,725	12,360	46%	4,866,699
2000[1]	33,369	15,431	46%	5,894,281
2010[1]	40,915	18,174	44%	6,724,540
2015[2]	42,670	18,810	44%	7,061,410
Average Annual Rates (AAR) of Growth (%)				
	KITTITAS COUNTY	CITY OF ELLENSBURG		WASHINGTON
1990-2000	2.2%	2.2%		1.9%
2000-2010	2.1%	1.6%		1.3%
2000-2015	1.7%	1.3%		1.2%
2010-2015	.84%	.69%		.98%
Sources: 1. U.S. Census data 2. Office of Financial Management (OFM) annual estimates.				

The 2015 OFM population estimate for Kittitas County was 42,670; the City of Ellensburg (incorporated area only) was 18,810, which accounted for 44 percent of county population. Since 2000, population growth in Kittitas County has slightly outpaced Ellensburg (1.7 percent compared to 1.3 percent average annual growth).

POPULATION FORECASTS

Office of Financial Management (OFM)

Long-term population forecasts prepared by the Office of Financial Management (OFM) are periodically generated to support local and statewide planning. The most recent OFM projections (May 2012) were developed in three scenarios (Low, Medium, High) for Kittitas County through 2040, with projected annual growth rates ranging from 0 to 2.13 percent. The three scenarios project that Kittitas County population in 2040 will be between 43,000 and 70,000

Kittitas County Coordinated Population Forecast

In 2015, Kittitas County began an update of its twenty-year Comprehensive Plan. A major component of the update was an evaluation of population and employment, which led to developing projections and allocations within the county.[3] The analysis of forecast population was based on OFM's most recent projections that extend to 2040. Based on its analysis, the High OFM forecast has been preliminarily selected as the preferred population forecast for use in determining overall growth and local distributions within the county. **Table 3-4** summarizes the forecast and presents Ellensburg's share of county population, assuming current levels are maintained.

TABLE 3-4: POPULATION FORECASTS

	2010 US CENSUS	2015	2020	2025	2030	2035
KITTITAS COUNTY						
OFM High Forecast[2] *(1.94% AAR 2010-2035)*	40,915	47,759	52,395	57,065	61,652	66,075
CITY OF ELLENSBURG						
45% of County OFM Forecast[1] *(1.99% AAR 2010-2035)*	18,174	21,492	23,578	25,679	27,743	29,734
WASHINGTON						
OFM Medium Forecast[3] *(.93% AAR, 2010-2035)*	6,724,540	7,022,200	7,411,977	7,793,173	8,154,193	8,483,628

1. City of Ellensburg population projection assumes that 2010 allocation (45%) of county population is maintained and applied to OFM High Forecast (final allocation to be determined by Kittitas County in 2016)
2. Kittitas County Medium Forecast prepared by Office of Financial Management (OFM) May 2012
3. Washington State Medium Forecast prepared by Office of Financial Management (OFM) May 2012

[3] Draft Population Projection Review and Analysis; Draft Employment Projections and Allocation Scenarios (BERK Consulting, December, 2015)

National General Aviation Activity Trends

The first fifteen years of the 21st Century has presented numerous challenges for general aviation (GA). On a national level, most measures of GA activity declined sharply during "The Great Recession" and have only recently started to show modest signs of improvement.

In addition to the broad economic effects of the recession, general aviation has also experienced several other market pressures that have depressed activity. Chief among these have been the rising price and impending regulatory restriction of leaded aviation gasoline (AVGAS). After several years of evaluation and industry testing, the FAA is now moving into the final phase of testing that is expected to result in the selected replacement fuel grade by 2018. The primary goal of developing a new blend of unleaded AVGAS is to comply with the Clean Air Act. The anticipated phase out of leaded aviation fuels is similar to the transition to unleaded automobile gasoline that occurred in the 1970s.

In 2015, the FAA estimated that 208 million gallons of AVGAS were consumed in the U.S., compared to 1.47 billion gallons of jet fuel (general aviation only). Based on FAA long-term forecasts, the piston general aviation fleet is expected to shrink by approximately 12 percent over the next twenty years, although AVGAS consumption is forecast to remain within 1 percent (+/-) of current levels during the period. By comparison, general aviation jet fuel consumption and the turbine fleet are forecast to increase by 54 percent during the period.

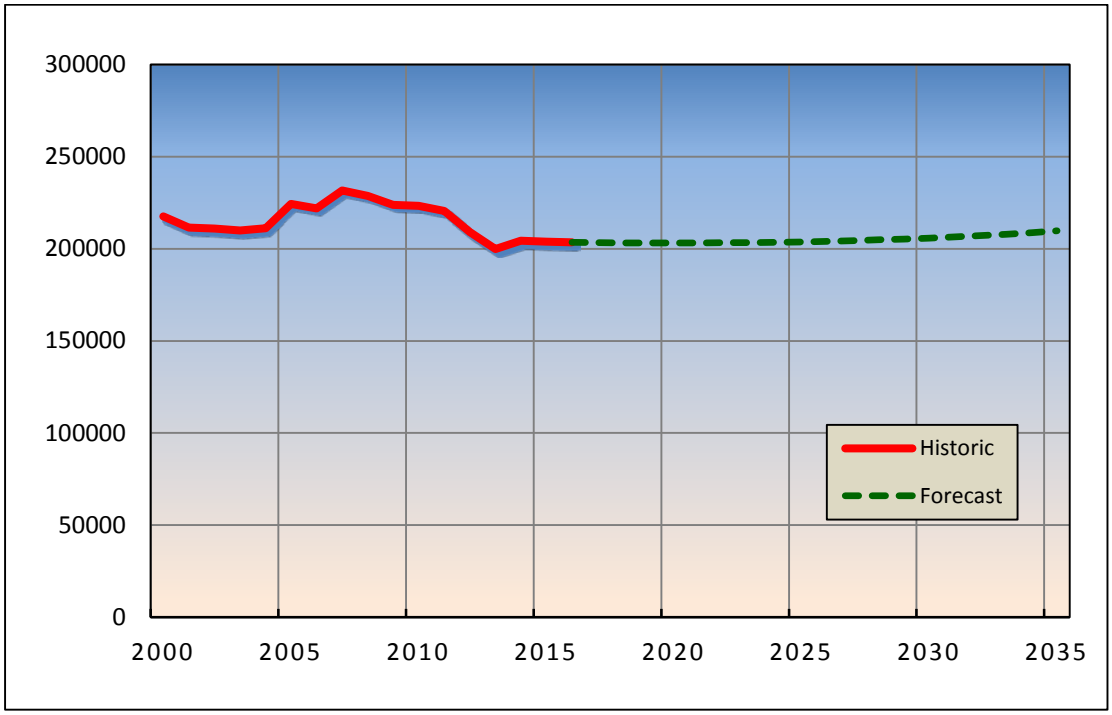
With AVGAS consumption expected to remain at current levels for the foreseeable future, it is reasonable to conclude that the segments of piston-related aviation activity expected to grow, such as flight training, will consume an increasingly larger share of AVGAS within the current twenty-year planning period. Less active segments of piston activity will consume an increasingly smaller share of AVGAS. This trend would be expected to impact utilization levels (annual flight hours) differently for flight training and non-flight training piston aircraft. The anticipated system wide growth in several turbine-related activity segments provides a reasonable basis to assume that the conditions exist for turboprop, business jet, helicopter, and aerial applicator traffic to increase at airports that have historically accommodated these aircraft types.

Data maintained by the FAA show significant system-wide declines of several key general aviation activity indicators occurred between 2001 and 2015. During this period, piston aircraft flight hours declined by 38 percent and AVGAS consumption levels dropped by approximately 25 percent. In contrast, activity measures attributed to turbine aircraft have all increased well above 2001 levels.

As depicted in **Figure 3-2**, the active GA fleet has fluctuated within an overall decline over the last 15 years. The FAA's long-term forecasts predict that the U.S. active GA aircraft fleet will grow by approximately 3 percent between 2015 and 2036, but will remain below recent peak levels.[4]

[4] FAA Aerospace Forecast Fiscal Years 2016-2036

FIGURE 3-2: US ACTIVE GENERAL AVIATION FLEET



It is noted that within the overall forecast growth from 2015 to 2036, several segments are projected to decline in actual numbers including single engine piston aircraft (-14%) and multi-engine piston aircraft (-11%). These declines reflect attrition of an aging fleet, which is not being offset by new aircraft production. Encouraging areas within the GA fleet are found in turboprops (particularly single engine) (+32%), experimental aircraft (+20%), sport aircraft (+153%), and business jets (+66%) growth through 2034.

Aircraft manufacturing has shown positive gains in recent years after an extended period of weak sales. Worldwide GA aircraft deliveries in 2015 totaled 3,320 aircraft, a decrease of 4.8 percent over the previous year, but still well below (-38 percent) the recent peak in 2008.[5] The adaption of both turbine and diesel engines for small general aviation aircraft by several established manufacturers; the development of a replacement for 100LL AVGAS; and the resurgence of unleaded automobile gasoline for a growing Light Sport Aircraft (LSA) and experimental aircraft fleet are positive developments that may be significant in the long-term future of general aviation.

Although the FAA maintains a modestly favorable long-term outlook, many of the activity segments associated with piston engine aircraft and AVGAS consumption are not projected to return to "pre-recession" levels by 2036. Although some segments of general aviation are expected to grow at moderately high rates, most measures of the general aviation industry suggest modest, sustained growth in the range of 0 to 2 percent annually is expected over the next twenty years.

[5] General Aviation Manufacturers Association (GAMA), 2014 Delivery Report

Rather than the broad and robust growth experienced during its formative years, the long-term expectations for general aviation now reflect focused opportunities for growth (flight training, sport aircraft use, business aviation, etc.) that are consistent with changing macroeconomic conditions and the more specific economic challenges associated with private aircraft ownership. Many of the traditional activity sectors associated with general aviation (single-engine and piston engine aircraft ownership, active private pilots, aircraft utilization, etc.) are expected to decline by about 10 to 15 percent over the next twenty years—largely as the active aircraft fleet shrinks and the pilot population ages.

The FAA's annual growth assumptions for individual general aviation activity segments are summarized in **Table 3-5.**

TABLE 3-5: FAA LONG RANGE FORECAST ASSUMPTIONS (U.S. GENERAL AVIATION)

ACTIVITY COMPONENT	FORECAST ANNUAL AVERAGE GROWTH RATE (2015-2036)
Aircraft in U.S. Fleet	
Single Engine Piston Aircraft in U.S. Fleet	-0.7%
Multi-Engine Piston Aircraft in U.S. Fleet	-0.5%
Turboprop Aircraft in U.S. Fleet	1.3%
Turbojet Aircraft in U.S. Fleet	2.5%
Experimental Aircraft in U.S. Fleet	0.9%
Sport Aircraft in U.S. Fleet	4.5%
Piston Helicopters in U.S. Fleet	2.1%
Turbine Helicopters in U.S. Fleet	2.0%
Active GA Fleet (# of Aircraft)	0.2%
Active Pilots in U.S.	
Private Pilots	-0.6%
Commercial Pilots	-0.6%
Airline Transport Pilots	0.4%
Instrument Rated Pilots	0.1%
Sport Pilots	4.8%
Student Pilots (Indicator of flight training activity)	0.3%
Active GA Pilots (All Ratings)	0.1%
Hours Flown in U.S.	
Piston AC	-0.5%
Turbine AC	2.5%
Experimental AC	1.9%
Sport AC	5.0%
Total GA Fleet Hours	1.2%
Fuel Consumption in U.S.	
AVGAS (Gallons consumed - GA only)	0.0%
Jet Fuel (Gallons consumed – GA only)	2.1%
Source: FAA Long Range Aerospace Forecasts (FY 2016-2036)	

Overview of Recent Local Events

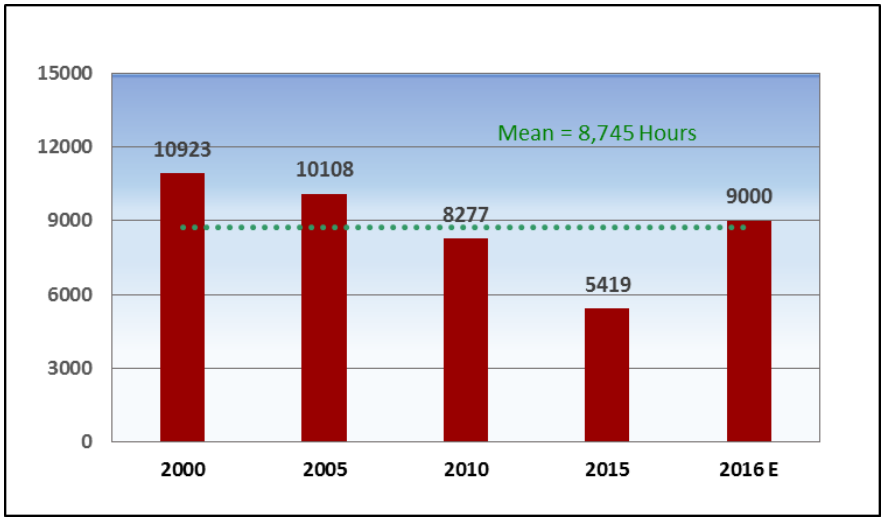
An element of the forecast update considers changes in local events that have occurred since the most recent aviation activity forecasts were prepared in 2011. The events will be evaluated to determine their potential significance in testing previous forecast assumptions and defining updated assumptions.

FLIGHT TRAINING

Flight training has accounted for the majority of airport activity at Bowers Field dating back to 1990s or earlier. Central Washington University (CWU) provides a flight training program certified under FAR Part 141 – Pilot Schools. CWU relies on contract services for aircraft flight instruction and to provide its flight training fleet; simulator training is provided with CWU instructors and equipment in their facility at Bowers Field. The flight program had approximately 136 active students in the 2015-16 academic year and projects an enrollment of 160 to 180 active flight students in 2016-2017.

In 2014, CWU awarded its flight training contract to IASCO Flight Training (IFT), based in Redding, California. The contract was previously awarded to Midstate Aviation, a local flight school and aeronautical service provider that has been operating on Bowers Field since 1961. The change of contractors involved an uneven transition period which included a temporary interruption and significant decline of flight training operations at the airport in 2014. Activity steadily increased in 2015 and has continued to increase through mid-2016. **Figure 3-3** depicts the flight hours generated through CWU's flight program at various points between 2000 and 2016.

FIGURE 3-3: CWU FLIGHT TRAINING - FLIGHT HOURS LOGGED – BOWERS FIELD



Complete data for 2014 were not available, however the 2014 sales of aviation gasoline (AVGAS)—which is heavily influenced by flight training activity—was 31 percent lower than 2013 and 21 percent lower than 2015. The sharp decline and partial recovery of fuel sales experienced during this period is consistent with the documented changes within the CWU flight training program.

Based on year-to-date activity reported through June, CWU flight training activity in 2016 is projected to be comparable to 2010 levels. Future expectations for flight training activity will be discussed later in the chapter, however, it is apparent the CWU flight training program continues to work through a process of re-defining its overall program objectives and structure. This process appears to be an essential strategic element for preserving the existing program and expanding beyond current and past capabilities.

Although the volume of CWU flight training has fluctuated over time, the activity consistently represents the majority of air traffic at the airport. The 2011 Airfield Needs Assessment study estimated that flight training accounted for 73 percent of total airport operations (takeoffs and landings) in 2010, down slightly from the 80 percent estimated in the 2000 Airport Master Plan. The current air traffic distribution is expected to remain relatively unchanged during the twenty-year planning period.

It is also noted that the change in flight training contractors resulted in a significant change in the composition of the airport's based aircraft fleet, although the overall fleet size has not changed significantly. During this transition, Midstate Aviation sold the majority of their flight training aircraft (17 estimated in 2011), while IFT brought in new flight training aircraft (10 to 16 during 2016). A hangar fire in summer 2016 destroyed two of IFT's aircraft; IFT reports that these aircraft will be replaced and the company is currently planning its fleet requirements based on 2016 enrollments. The overall net effect is that the current (August 2016) based aircraft fleet is estimated at 60 aircraft, down from an estimated 65 in 2011. However, IFT, indicates that up to an additional six aircraft will be located at Bowers Field to accommodate fall 2016 enrollments.

2017 Note: (information updated as part of FAA forecast review; original data has not been modified) Ongoing contract and operational issues led to a CWU decision in early 2017 to bring flight operations in house and eliminate use of subcontractors to provide their aircraft fleet and flight instruction. IFT's current contract expires in 2018 and CWU indicates that it will not be renewed. Despite a difficult "contractor" period that has plagued the flight training program in recent years, the underlying strength of the flight training program (as measured by student enrollment levels) has been preserved. With a new organizational structure in place by 2018, the future of the flight program appears to be bright and will continue as the largest segment of flight activity at Bowers Field for the foreseeable future.

AVIATION FUEL SALES

Under its current agreement, Midstate Aviation, the airport's fixed base operator (FBO) provides quarterly fuel records to airport management. **Table 3-6** summarizes the fuel delivery data for Bowers Field between 2010 and 2016.

TABLE 3-6: BOWERS FIELD FUEL VOLUME (GALLONS)

	2010	2011	2012	2013	2014	2015	2016 (PROJ)
Aviation Gasoline (100LL)	65,996	58,469	56,102	56,762	39,385	47,559	88,070
% Change From Prev. Year	--	-11.4%	-4.0%	+1.2%	-30.6%	+20.8%	+85.2%
Jet Fuel (Jet A)	53,549	52,376	99,174	50,739	72,125	54,103	50,188
% Change From Prev. Year	--	-2.2%	+89.6%	-48.8%	+42.1%	-25.0%	-7.2%
Total	119,545	110,845	155,276	107,501	111,510	101,662	138,258
% Change From Prev. Year	--	-7.3%	+40.0%	-30.8%	+3.7%	-8.8%	+36.0%
* Projected based on Jan-Jun YTD volumes (38,495 gal. AVGAS; 20,007 gal. Jet-A), planned flight training student enrollments in fall 2016 quarter, and review of recent historic levels							

Figure 3-4 illustrates historic AVGAS and Jet Fuel sales volumes at Bowers Field between 2000 and 2016. The overall trends and periodic fluctuations are consistent with specific events at the airport.

Figure 3-5 compares general aviation fuel consumption in the U.S. and at Bowers Field in the 2010-2016 period.

A review of recent historic records indicates fluctuations in aviation gasoline AVGAS (100LL) sales/delivery volumes are consistent with the events in flight training noted above. The 2011 Airfield Needs Assessment documented the decline in AVGAS consumption that occurred between 2000 and 2010, which coincided with a documented decline in flight training activity during the period. A combination of events, including economic recession, the rising cost of flight training, and limited employment opportunities were believed to be contributing to declining activity. Improving conditions over the last several years appear to have arrested the downward trend and the long-term expectations for flight training demand suggest growth. Although the overall trend line for Bowers Field points downward, the current level of flight training and the associated AVGAS consumption appear to be returning to levels experienced in the early-to-mid 2000s. If current levels are sustained over the next few years, the linear trend will begin to level and eventually rise.

FIGURE 3-4: AVIATION FUEL ACTIVITY (ANNUAL GALLONS SOLD - 2000-2016) – BOWERS FIELD

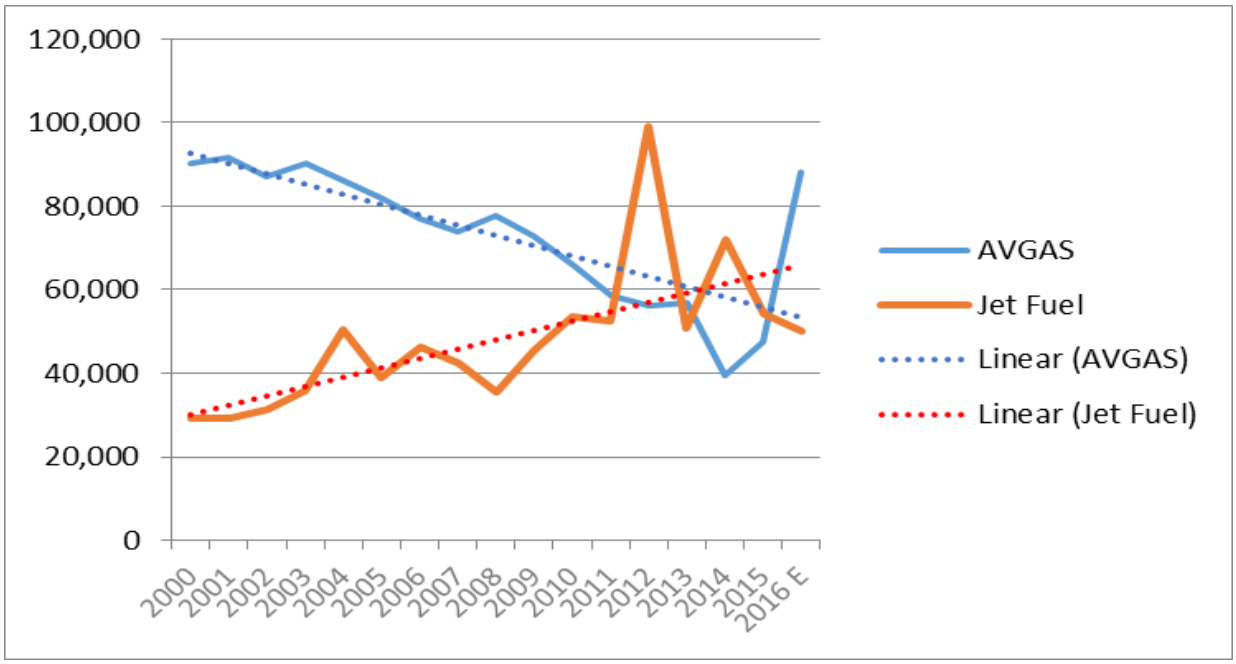
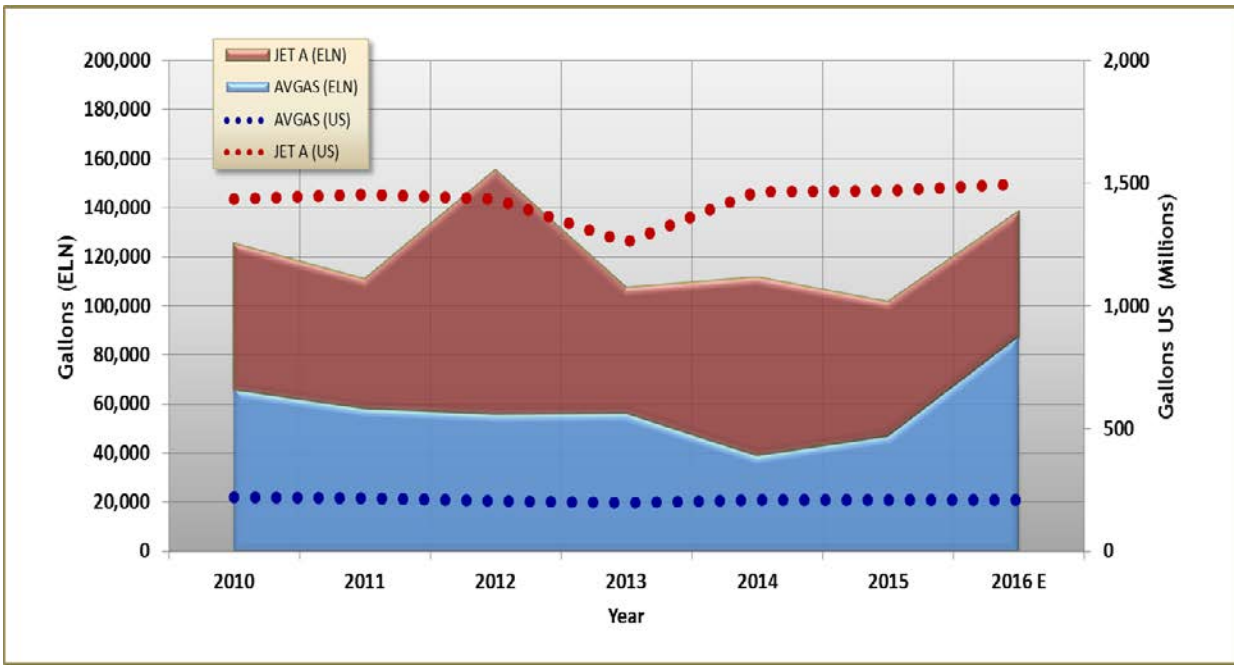


FIGURE 3-5: HISTORIC FUEL SALES – BOWERS FIELD & US GENERAL AVIATION



Jet fuel volumes at Bowers Field have also fluctuated in recent years, although the overall trend has shown consistent upward growth. It appears that factors unrelated to flight training activity are responsible for these shifts. Two specific upward spikes (+89%, + 42%) in annual jet fuel volume occurred in 2012 and 2014, which coincided with major wildfire helicopter response efforts based at Bowers Field. A decline in jet fuel volume is identified early in 2016. Based on reporting for the first and second quarter (through June), jet fuel volume is running approximately 18 percent below the average volume for same period in 2010-2015 and 34 percent below 2015. This downward shift appears to be related to a reduction in FBO services provided at the airport. The future of FBO services at Bowers Field is uncertain at this time. However, the ability to support locally based aircraft and attract transient general aviation activity is heavily dependent on the selection, quality, and reliability of FBO services available. For larger business aircraft, the ability to provide mobile full service fueling is particularly important. The FBO indicates that they are seeing an increase in larger turbine business aircraft activity related to the Suncadia Resort, located near Cle Elum/Roslyn, although they do not consistently purchase fuel due to the limitations associated with the current 4,301-foot length of Runway 11/29.

It is noted that the Department of Natural Resources (DNR) does not purchase aviation fuel from Midstate Aviation for their normal flight operations. DNR maintains their own mobile fuel trucks and does not report fuel volumes to the county. However, during major emergency response operations, when additional fuel is required, local fuel purchases are made for DNR and contract aircraft. This segment of jet fuel consumption varies by year and depends on the severity of the fire season.

HANGAR CONSTRUCTION

One multi-unit hangar (Carrera 21-unit) and one small/medium conventional hangar (Lease Lot H-32) have been constructed at Bowers Field since 2004. No new hangars have been constructed on the airport since 2011, when the Carrera T-hangar was completed.

A fire in July 2016 destroyed four units and damaged two other units in the Carrera T-hangar. Several units in the T-hangar have been used by the CWU flight training contractor for aircraft storage and maintenance. Prior to the recent fire, the building owner indicated that they had five vacant units available for rent. The use of a T-hangar to house flight training operations is not ideal. Demand currently exists for larger conventional hangar space for flight training aircraft storage and maintenance operations. The existing large hangar on the airport is currently leased by the airport FBO. Changes in FBO operations are anticipated in the near future, which may allow the existing hangar to accommodate CWU flight training operations. Alternatively, the university may seek funding to construct a facility on the airport that would include hangar space.

Suncadia Resort

Suncadia Resort is a planned development located in upper Kittitas County, near Cle Elum. The $1 billion, 6,300-acre development provides a year-round destination resort experience that includes three nationally-rated golf courses, guest lodging though a variety of on-site properties, and private homes. The resort is ranked #4 on U.S. News & World Report's Best Resorts in Washington.[6]

Suncadia is currently experiencing substantial growth in new home construction and residential lot sales. A total of 3,900 home sites are planned through the current and future plats. According to resort staff, 1,400 home sites have been sold to date, with 400 to 450 sites currently developed. Since 2015, about 60 new home sites are sold each year. Overall, growth in Upper Kittitas County is following a similar trend with expanded recreation, second home, and retirement residential investment. It is noted that the average value of new home construction in Upper County is significantly higher than for the overall county. The economic forces associated with the ongoing Upper County real estate investment and growth in resort business are complementary to stimulating demand for air traffic.

Bowers Field is the only airport in Kittitas County capable of accommodating the full range of business class aircraft (business jets and turboprops) that are routinely used to access premier golf resorts, particularly in locations with limited scheduled commercial air service. This activity includes private and company-owned aircraft, aircraft charter flights, and fractional aircraft operators such as NetJets, Flexjet, and Flight Options. As the region continues to grow, it is reasonable to expect air traffic at Bowers Field will reflect this growth, particularly for business class aircraft unable to operate at Cle Elum Municipal Airport.

General aviation airports located near remote premier golf resorts with limited commercial air service often experience increased flight activity. Two regional examples include Bandon State Airport and SW Oregon Regional Airport (Bandon Dunes Golf Resort), and Sunriver Airport (Sunriver Resort).

Historic & Current Aviation Activity

For Bowers Field, aircraft operational data (takeoffs and landings, touch and go landings, etc.) are limited to estimates. As a non-towered airport, no records of operational activity are maintained. However, a review of estimates contained in state aviation system plans, previous master plans, FAA Terminal Area Forecast (TAF) data, and onsite activity counts provide a general indication of activity at the airport over time. Based aircraft counts are updated periodically either as part of a master plan update or by airport management for other purposes.

[6] http://travel.usnews.com (8/1/17)

HISTORIC DATA - FAA TERMINAL AREA FORECAST (TAF)

The Federal Aviation Administration (FAA) maintains the Terminal Area Forecast (TAF) for airports that are included in the federal airport system—the National Plan of Integrated Airport System (NPIAS). When reviewing FAA TAF data, it is important to note that when there is no change from year to year it often indicates a lack of data, rather than no change in activity. Similarly, a large change in data in a single year may follow updated reporting that captures changes that occurred over several years. Small changes in year-to-year activity that extend through the forecast typically reflect assumed growth rates that are not frequently updated. For these reasons, the TAF should be used as general guide for comparison with other forecasts and periodic activity estimates.

A review of historic TAF data for Bowers Field (1990 through 2014) reflects several significant fluctuations in estimated annual aircraft operations totals and based aircraft totals. Acknowledging that these internal fluctuations reflect a low level of accuracy in any given year, the 25-year data sample suggests overall growth in both activity segments during the period. The TAF estimates an increase in based aircraft from about 35 to 50 aircraft, with a 2011 peak of 65. Aircraft operations estimates range from around 14,000 to 60,000 during the same period. The FAA TAF estimate for 2014 was 48 based aircraft and 51,865 operations. **Table 3-7** summarizes recent historic TAF based aircraft and aircraft operations estimates for Bowers Field as currently published by FAA.

TABLE 3-7: FAA TAF DATA – BOWERS FIELD

YEAR	AIRCRAFT OPERATIONS[1]	BASED AIRCRAFT[1]	RATIO: GA OPERATIONS PER BASED AIRCRAFT
1990	14,000	35	400
2000	55,000	51	1,078
2005	57,375	52	1,103
2010	60,445	49	1,234
2011	48,660	65	749
2012	49,728	48	1,036
2013	50,797	48	1,058
2014	51,865	48	1,081

1. FAA Terminal Area Historical Activity Estimates (January 2016)

CURRENT ESTIMATE OF ACTIVITY

Based Aircraft

A review of the airport's current based aircraft fleet was performed in order to provide the most accurate data for estimating current activity and developing updated activity forecasts. A review of airport tenant records, the FAA data bases for airport-identified based aircraft and FAA-registered aircraft within Kittitas County, and data collected from airport users was conducted to determine the current based aircraft total for Bowers Field. In January 2011, there were 55 total verified based aircraft at Bowers Field.[7] In July 2016, the based aircraft count was 60, a decrease of 5 aircraft from 2011.

As noted earlier, since the 2011 aircraft count was made, the airport has experienced two significant events affecting its based aircraft count. First, a change in contractors for the CWU flight training program led to the sale and departure of the majority of the previous contractor's (Midstate Aviation) fleet of aircraft (estimated to be 17 in 2011). Midstate reported in June 2016 that they currently have four single-engine piston aircraft based at Bowers Field, and that one previously owned twin-engine piston aircraft is based at the airport (sold to a local pilot). The current CWU flight training contractor (IASCO Flight Training – IFT) has positioned as many as 16 aircraft at the airport in response to its student enrollments starting in late 2014. However, IFT operates bases in Ellensburg and Redding, California and periodically adjusts and positions its aircraft fleet of based on ongoing training requirements.

The July 2016 hangar fire at Bowers Field destroyed two flight training aircraft and two other private aircraft. IFT indicates that their lost aircraft are in the process of being replaced, and that an additional two aircraft will be located at Bowers Field in fall 2016 based on student enrollments. With these changes, the flight training fleet in the fall of 2016 will total 14 aircraft. The two private aircraft destroyed in the recent fire are not expected to be immediately replaced.

The based aircraft fleet mix is primarily single-engine and multi-engine piston airplanes with a small number of turbine aircraft (2 business jets, 1 multi-engine turboprop), and one piston helicopter. The current based aircraft count is summarized in **Table 3-8**.

[7] Kittitas County – Bowers Field ALP Update – Airfield Needs Assessment (2011), Century West Engineering

TABLE 3-8: BOWERS FIELD (ELN) BASED AIRCRAFT

AIRCRAFT TYPE	TOTAL
Based Aircraft (July 2016)	
Single-Engine Piston	52
Multi-Engine Piston	6
Turboprop	1
Turbojet	2
Total Based Aircraft	**60**

The Washington Department of Natural Resources (DNR) operates a wild fire response base at Bowers Field and bases several turbine helicopters (agency and contractor operated) at the airport during the typical five-month fire season. These aircraft are not included in the airport's based aircraft count, since they are not permanently located at the airport.

Aircraft Operations

FAA Guidance for Estimating Air Traffic at Non-Towered Airports

The FAA provides planning guidance for estimating activity at general aviation airports without control towers, including the use of activity ratios to project aircraft operations from the number of based aircraft at the airport. In the absence of actual aircraft operation counts, an operation per based aircraft (OPBA) ratio is generally adequate for airport planning purposes. The OPBA is intended to reflect operations from both locally-based and transient aircraft.

These ratios are intended to provide the basis to approximate air traffic, however, it is recognized that the presence of unique activities can skew ratios considerably. For example, an airport with a large portion of its activity associated with flight training will typically have higher activity levels (ratios) due to significantly higher aircraft utilization levels (annual flight hours per aircraft, etc.). Conversely, an airport with limited or no fixed base operator (FBO) services, or aviation fuel, will typically have lower activity levels.

Prior to the recent economic recession, the FAA developed "typical" OPBA ratios for general aviation airports based on observations at airports throughout the United States.[8] The recommended ratios ranged from 250 to 450 operations per based aircraft depending on the size of the community, airport type, and the nature of the air traffic. These ratios were also consistent with a range of activity models derived from a detailed analysis of independent variables.[9] As noted earlier, most measures of general aviation activity

[8] Field Formulation of National Plan of Integrated Airport Systems (FAA)
[9] Model for Estimating General Aviation Operations at Non-Towered Airports Using Towered and Non-Towered Airport Data (GRA, 2001)

tracked by FAA declined sharply during the recent economic recession and have not yet returned to pre-recession levels. The system wide impact has been a reduction in aircraft utilization, which translates into lower activity ratios. One notable exception is the number of active "Student Pilot" certificates, which has run opposite to most other pilot categories, growing at just less than 2 percent annually since 2001. Roughly translated, airports with established flight training activity have been more successful in maintaining or growing their flight activity during the last decade and have generally outperformed system wide averages.

The connection between reduced AVGAS consumption and reduced piston aircraft hours flown within the U.S. fleet has also been well documented by the FAA during the last decade. In most cases, fueling activity trends and aircraft utilization trends are congruent. The significant fluctuations in AVGAS fueling volumes experienced at Bowers Field since 2014 are consistent with major structural changes in the university flight training program noted earlier. However, aside from the recent fluctuations which can be traced to specific and temporary localized events, Bowers Field has consistently outperformed the national growth in AVGAS consumption. This is a direct reflection of the impact of established flight training at the airport. Based on the FAA's relatively positive long-term forecast demand for general aviation flight training, it is reasonable to assume that this trend will continue as long as institutional flight training remains at Bowers Field.

On a national level, sustained growth in general aviation jet fuel consumption can be attributed to many factors. Included among these is a growing turbine aircraft fleet, increased demand for business class aircraft and on-demand travel, and aircraft ownership structures (e.g., corporate, government, high net-worth individuals, etc.) less dependent on discretionary spending to determine aircraft ownership and use. These factors are well aligned with the operational capabilities of Bowers Field and the composition of competing airports within its service area. In light of long-term FAA and business & general aviation aircraft industry market expectations, there is no indication that future levels of business aircraft activity at Bowers Field will not grow in response to an expanding business, recreational, and tourism economy in Kittitas County.

Current Air Traffic Estimate

Flight training activity at the airport reflects significantly higher aircraft utilization compared to private aircraft. Based on reported logged flight hours for 2015 and year to date 2016, and an average of 4 operations per flight hour logged, the projected level of fixed wing flight training at Bowers Field for 2016 is 36,000 aircraft operations. The current level of flight training activity is comparable to the recent typical levels (produced by the former flight training contractor) and is 66 percent higher than 2015. The significant year-to-year change reflects the dynamic nature of the activity and the effect of increasing the size of the flight training fleet and hours of instruction in response to student demand. The current level of non-flight training activity is estimated using an OPBA ratio of 225 per (non-flight training aircraft). This ratio is consistent with recent fueling activity and the services provided by the local fixed base operator (FBO).

By combining flight training and non-flight training general aviation activity, an aggregate operations-per-based aircraft ratio is produced. Government or military activity is not typically included in calculating activity ratios at general aviation airports, although the air traffic is included in the overall operations estimate for the airport. Based on current conditions, activity components/levels at Bowers Field include the following:

A. Non Flight Training Based Aircraft (50) x 225 operations per based aircraft ratio (captures local and transient aircraft activity);

B. Fixed Wing Flight Training Aircraft: 9000 flight hours x average of 4 operations per flight hour - 9,000 x 4 (operations ratio); and

C. DNR & Military Related Helicopter Activity (static estimate of 700 annual aircraft operations).

A. 50 x 225 = 11,250 Operations
B. 9,000 x 4 = 36,000 Operations
C. = 700 Operations

2016 Total (A+B+C): 47,950 Operations

47,250/60 (Based Aircraft) = 788 GA Operations per Based Aircraft

Synopsis of Current Air Traffic

The 2016 estimate of operations is approximately 1.5 percent lower than 2011 (48,660) and about 12 percent below the 2015 forecast (54,250) contained in the Airfield Needs Assessment study. The primary factors affecting actual versus forecast air traffic at Bowers Field since 2011 include an unanticipated change in CWU flight training contractors, an associated reduction in FBO services, fewer than expected aircraft relocating from other airports to occupy a new (2011) 21-unit hangar, a July 2016 fire that destroyed 4 aircraft, and reduced DNR helicopter activity at Bowers Field as part of the agency's continuous management/assignment of available assets in its regional wildfire response program. Based on the documented volume of airport-based flight training activity, it appears reasonable to use the OPBA ratio from the 2016 estimate (788 operations per based aircraft), to provide a basis for developing forecasts of future activity.

Instrument Flight Activity

Flight activity data for aircraft operating under instrument flight rules in the national airspace system is tracked by FlightAware, a company that developed live flight tracking services for commercial and general aviation. Instrument flight plan data for Bowers Field were obtained for calendar year 2015 and data previously acquired for other studies were also analyzed. The data are summarized in **Table 3-9** by aircraft type.

The data captures all civil aircraft filing instrument flight plans listing Bowers Field either as the originating airport or the destination airport. Military aircraft are not included in the FAA instrument flight plan data. It is noted that aircraft may cancel IFR flight plans enroute, so not every flight plan actually results in instrument operations. However, for the purposes of developing master plan activity forecasts, the data provides documentation of business class aircraft operating (commonly operating under IFR flight plans) at Bowers Field. Business class turboprops and business jets have been identified as the critical aircraft in the previous two FAA-funded master planning projects at Bowers Field.

The 2015 data is consistent with the recent airport activity trends noted earlier. For example, single engine piston IFR activity was down by more than 50 percent compared to 2010. Airport-based flight training typically accounts for the majority of that activity segment at Bowers Field, and the temporary reduction in overall flight training in 2015 is reflected in reduced instrument flight training. Turbine aircraft IFR activity has remained relatively stable between 400 and 500 annual operations, with modest year-to-year fluctuations. The air traffic includes a mixture of turboprops, small/medium business jets, and large business jets. As noted earlier, Bowers Field is the only airport in Kittitas County capable of accommodate business class aircraft.

Previous master plan estimates of instrument meteorological conditions (IMC)[10] at Bowers Field were 6.5 percent, with 93.5 percent visual conditions. Based on current traffic estimates, instrument operations currently appear to account for about 3 percent of overall operations, with instrument approaches (in actual instrument weather conditions) accounting for approximately 1 percent of total itinerant landings.

Note: 2016 Data Update:

Instrument flight plan data for calendar year 2016 were available for inclusion in this section (coinciding with FAA review), and has been added to **Table 3-9.** The 2016 data is relatively consistent with recent airport activity trends, which has fluctuated slightly year-to-year. IFR Jet activity in 2016 increased by 10.8 percent from the previous year (2015). The average IFR jet activity at Bowers Field for the last three years of data reviewed (2010, 2015, and 2016) was 276 operations (flight plan segments). This total does not include visual flight activity such as maintenance and training flights, and short flights that may be conducted to nearby airports with visual flight rules (VFR) flight plans. The IFR data total also does not include unmatched IFR flight plans (when an aircraft files IFR on either the arrival or the departure, but

[10] Visibility less than 3 statute miles and ceilings less than 1,000 feet above ground level (AGL).

not both). With rare exceptions, all aircraft generate at least one takeoff and one landing segment for each flight. It is estimated that these flights account for an additional 15 percent over the filed IFR flight plan segments for jets (estimated 317 total jet operations in 2016).

TABLE 3-9: INSTRUMENT ACTIVITY (FLIGHT PLAN FILINGS/OPERATIONS) – BOWERS FIELD

ARC	TYPE	REPRESENTATIVE AIRCRAFT	2016[1]	2015	2010	2009	2008
		Piston Aircraft (Fixed Wing)					
A-I	SEP/ MEP	Cessna 182/Beechcraft Baron 55	569	625	1,296	1,195	1,302
B-I	MEP	Beechcraft Baron 58/PA-31 Navajo/Cessna 421	51	44	23	51	58
		Subtotal - Piston	*620*	*669*	*1,319*	*1,246*	*1,360*
		Turbine Aircraft (Fixed Wing)					
A-I	SETP	TBM 700/EPIC	38	18	0	0	0
A-II	SETP	Cessna Caravan/Pilatus PC12	21	16	28	20	41
B-I	METP	Beechcraft King Air 100/Piper Cheyenne/Rockwell Aero Commander 690	86	65	51	40	59
B-I	Jet	Raytheon/Beech Premier 400A	12	6	38	8	7
B-II	METP	Beechcraft King Air 90/100/200/350	32	164	59	104	137
B-II	Jet	Cessna Citation Bravo, Excel, Encore/Falcon 20, 200	201	211	237	191	164
C-I	Jet	Hawker HS125, Learjet 31/45/55/60	19	6	10	8	14
C-II	Jet	Bombardier Challenger/Gulfstream III	5	6	1	0	2
D-I	Jet	Learjet 35/36/40	0	2	0	3	0
D-II	Jet	Gulfstream IV, V	2	0	2	4	0
B-III	Jet	Bae 146	2	0	0	0	0
--	Jet	Blocked (assumed to be B-II Jet)	16	1	50	26	32
		Subtotal - Turbine	*434*	*495*	*476*	*404*	*456*
		Other					
--	HELI	Helicopter	74	2	3	14	9
		Total Instrument Operations	**1,128**	**1,166**	**1,798**	**1,664**	**1,825**

Source: FlightAware. 1. FAA TFMSC Report (2016)

Aviation Activity Forecasts

EXISTING FORECASTS

Three current aviation forecasts for Bowers Field are available to compare with current activity, recent historic trends, and the updated forecasts prepared for the master plan:

- 2011 Bowers Field Airfield Needs Assessment[11] (current FAA approved forecast)
- FAA Terminal Area Forecasts (TAF) (2015 update)
- 2007 WSDOT Aviation – Long-term Air Transportation Study (LATS) LATS provides a forecast of based aircraft and annual aircraft operations at Washington's public use airports in the 2005-2030 time period.

The existing forecasts have been reviewed but are not modified to reflect recent events. Minor adjustments (interpolation, extrapolation) have been made to present each projection with common forecast year intervals. Although some projections may be obsolete relative to current activity (in actual numbers), the existing forecasts provide a useful gauge of future growth rates that are generally consistent with national and statewide expectations for defining general aviation activity.

It is noted that none of the existing aviation activity forecasts for Bowers Field reflect the recent fire-related loss of four aircraft, which accounted for 6 percent of the June 2016 based aircraft fleet (64), two weeks prior to the fire.

Existing based aircraft and operations forecasts are summarized below and in **Tables 3-10** and **3-11.** Updated forecasts have been developed and are presented later in the chapter.

2011 AIRFIELD NEEDS ASSESSMENT

Based Aircraft

The 2011 Airfield Needs Assessment forecasts project an increase from 65 to 88 (+23) based aircraft between 2011 and 2030, which reflects an average annual growth rate of **1.6 percent**. The current count of 60 aircraft is tracking approximately 13 percent below the nearest forecast year (2015), although the planned addition of 4 to 6 additional flight training aircraft within the next twelve months will close the forecast gap considerably. As noted earlier, the former CWU flight training contractor has sold the majority of its training fleet, and a July 2016 hangar fire destroyed 4 aircraft, both of which are reflected in the current count. *Correlation to current activity: Fair*

[11] 2011 Bowers Field Airport Layout Plan Update and Airfield Needs Assessment (Century West Engineering)

Aircraft Operations

The 2011 Airfield Needs Assessment projects annual aircraft operations at Bowers Field to increase from to 48,660 to 72,330, between 2011 and 2030, which reflects an average annual growth rate of **2.1 percent**. The current (2016) estimate of 49,200 annual operations is approximately 9.3 percent below the forecast for 2015. However, based on the potential expansion of flight training activity, the forecasts appear to provide reasonable a projection for comparison to the new forecast models developed for the master plan. *Correlation to current activity: Fair*

FAA TERMINAL AREA FORECAST (TAF)

Based Aircraft

The FAA TAF projects based aircraft at Bowers Field to increase from 48 to 73 (+25) between 2014 and 2035, which represents average annual growth of **2.02 percent**.

The TAF shows a single year adjustment for 2011 based aircraft (+16 aircraft) that mirrors the (2011) base year data contained in the Airfield Needs Assessment forecasts. However, without explanation, the TAF based aircraft total for the following year reverted back to pre-adjustment levels and then increased in subsequent years at the established TAF growth rate.

The verification of based aircraft conducted for the master plan update confirms that the 2016 TAF forecast of 51 based aircraft is 9 aircraft below current levels. It is recommended that the FAA "reset" the base year data during the next TAF update to reflect the current based aircraft count generated in the master plan.

With the changes in flight training aircraft numbers planned for fall 2016, the gap between the TAF and actual based aircraft count could increase to 14 to 16 by the end of the year, but that should be independently verified before making any additional adjustments. In its current form or revised, as the FAA's primary long-term system-level forecast, the TAF provides a reasonable baseline projection to which other forecasts can be compared. *Correlation to current activity: Low*

On a regional level, the 2013-2040 Terminal Area Forecast projects that based aircraft in the seven-state Northwest-Mountain Region will increase at an annual average rate of 0.96 percent through 2040, compared to 0.84 percent for the nine U.S. regions combined. The FAA forecast reflects expectations that the region has slightly stronger growth potential than the national system as a whole.

Aircraft Operations

The FAA TAF projects aircraft operations at Bowers Field to increase from 51,865 to 74,298 between 2014 and 2035, which represents average annual growth of **1.73 percent**.

The current (2016) estimate of 49,200 annual operations is approximately 8.9 percent below the forecast for 2015. However, as noted in the previous forecast, the planned expansion of flight training in late 2016 above current levels are expected to generate activity that is similar to the TAF projection. *Correlation to current activity: Fair*

The 2013-2040 Terminal Area Forecast projects that total airport operations in the seven-state Northwest-Mountain Region will increase at an annual average rate of 1.07 percent through 2040, compared to 0.64 percent for the nine U.S. regions combined. As with based aircraft, the FAA forecast reflects expectations that the region has slightly stronger growth potential than the national system as a whole.

2007 WSDOT LATS FORECAST

Based Aircraft

The LATS forecast projects an increase in Bowers Field based aircraft from 56 to 74 (+18 aircraft, +32%) between 2005 and 2030, which reflects an average annual growth rate of **1.1 percent**. The verification of based aircraft conducted for the master plan update confirms that the 2016 LATS forecast of 67 based aircraft is 7 aircraft above current levels. However, as noted earlier, the planned addition of several flight training aircraft at the airport in the fall 2016 will bring the actual and forecast levels closer. *Correlation to current activity: Fair*

Aircraft Operations

The LATS forecast projects an increase in Bowers Field annual aircraft operations from 21,545 to 27,845 (+29%) between 2005 and 2030, which reflects an average annual growth rate of **1.03 percent**. The 2016 estimate of aircraft operations conducted for the master plan update, and the estimate of activity prepared in the 2011 Airfield Needs Assessment are both considerably higher than the range of activity forecast in LATS. Although the growth rates used in LATS are comparable to other existing forecasts, the disparity in overall activity volume compared to recent activity estimates and the FAA TAF renders the projection obsolete. *Correlation to current activity: Poor*

TABLE 3-10: SUMMARY OF EXISTING BASED AIRCRAFT FORECASTS FOR BOWERS FIELD

EXISTING FORECASTS	2010	2015	2020	2025	2030	2035
2011 Airfield Needs Assessment (1.61% AAR 2011-2030)	65	69	75	81	88	-
2007 Washington Department of Transportation Long-term Air Transportation Study (LATS) (1.1% AAR 2005-2030)	60	67	69	71	74	-
FAA Terminal Area Forecast (Jan 2016) (2.02% AAR 2014-2035)	49	50	56	63	68	73

TABLE 3-11: EXISTING AIRCRAFT OPERATIONS FORECASTS (BOWERS FIELD)

EXISTING FORECASTS	2011	2015	2020	2025	2030	2035
2011 Airfield Needs Assessment (2.11% AAR 2011-2030)	48,660	54,250	61,670	67,210	72,330	-
2007 Washington Department of Transportation Long-term Air Transportation Study (LATS) (1.03% AAR 2005-2030)	21,945	25,395	26,095	26,795	27,845	-
FAA Terminal Area Forecast (Issued Jan 2016) (1.73% AAR 2014-2035)	48,660	52,933	58,275	63,615	68,957	74,298

UPDATED FORECASTS

Based Aircraft

Updated projections of based aircraft at Bowers Field have been prepared based on a review of recent socioeconomic data, existing aviation activity forecasts and current conditions. An evaluation of various forecasting methods was conducted to determine the most appropriate models for use at Bowers Field. The method recommended for developing new forecasts of based aircraft at Bowers Field is a market share technique that compares Bowers Field to the based aircraft population within the seven-state Northwest Mountain Region (ANM)[12] of the FAA. Various demand scenarios were created in the market share analysis.

[12] FAA ANM – Northwest Mountain Region consists of Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Colorado.

The updated based aircraft forecasts are summarized in **Table 3-12**. The existing and updated forecasts are depicted on **Figure 3-6**.

Discarded Forecast Model

A common forecasting method is use of a population-based projection that links the number of based aircraft to a specific population base (e.g., county population). The theory is that an historic relationship exists between based aircraft at a particular airport and the defined population it serves, thereby providing a reliable basis for predicting future airport activity based on changes in population. Once established, assumptions can be defined to determine whether the defined relationship is maintained, increased, or decreased over time. A regression analysis was conducted using Bowers Field historic based aircraft (listed in the FAA's Terminal Area Forecast (TAF)) and Kittitas County population for the 15-year period between 2000 and 2015. While both variables have experienced overall growth, the analysis did not yield a reliable statistical correlation. Among the factors affecting the analysis are small sample size, significant non-linear fluctuations in TAF data, and the limited number of variables being analyzed. As noted earlier, a significant share of based aircraft at Bowers Field have historically been associated with the university flight training program. The university-generated flight activity is not directly impacted by changes in population, which neutralizes a typical population effect that may exist for other based aircraft not involved in flight training. Based on an absence of statistical validation, the use of population-based forecasting models at Bowers Field is not recommended.

FAA NORTHWEST-MOUNTAIN REGION (ANM) BASED AIRCRAFT MARKET SHARE

As noted above, the use of market share analysis is recommended for use in forecasting based aircraft at Bowers Field. The use of a regional, rather than national market share analysis is also recommended as it provides a more geographically relevant indication of system demand for which to compare local activity.

The impact created by the airport's significant level of flight training activity is addressed through specific assumptions about the activity. From a forecasting perspective, having an individual segment of activity account for a large percentage of overall airport activity presents risk, to the extent that unanticipated events associated with that activity can render any forecast obsolete. In the case of Bowers Field, the established institutional connection to flight training activity tempers the risk considerably, but does not eliminate it outright. Historic based aircraft data and the current operational plans of the Central Washington University (CWU) Aviation Department and flight training contractor were analyzed in developing forecast scenarios.

It is recognized that market forces and a variety of operational constraints have the potential of affecting future demand and capacity for flight training at Bowers Field. These factors include overall market demand, competition from other university/college affiliated flight training programs, constraints on staff and fleet acquisition, and operational capacity for the available airspace required to accommodate multiple

practice areas in the local area. It is noted that the runway-taxiway system at Bowers Field has the ability to accommodate significantly greater volumes of air traffic than currently experienced. The use of existing and emerging traffic avoidance technology is expected to allow air traffic to be safely accommodated within currently defined practice areas away from the airport. A variety of operational adjustments are also available, including seasonal or temporary use of other nearby airports and practice areas to absorb peak demands.

Market Share Forecast Scenarios

Four market share projections were developed for the updated based aircraft forecasts.

A review of 2000-2015 TAF data for Bowers Field indicates a market share percentage of approximately 0.23 percent. However, the significant fluctuations in TAF data noted earlier, including two recent examples of underestimated counts appear to affect the reliability of the 15-year market share calculation. Based on actual airport counts conducted for FAA-funded planning projects, Bowers Field accounted for 0.283 percent of the ANM region based aircraft fleet in 2016 and 0.296 percent in 2011. These market shares are considered reasonable "baseline" reference points.

Projections were developed based on *maintaining, increasing, and decreasing* market share, and an additional scenario that involves elimination of CWU flight training at the airport. The first three scenarios provide market share assessments that assume the current composition of airport activity (flight training, non-flight training general aviation, and government activity) will remain relatively unchanged. The distinctions between these scenarios are relatively small, and are related to the overall strength of the local market relative to regional expectations and continued strength in flight training. The fourth scenario was developed to illustrate the significance of flight training on Bowers Field's overall activity and the potential impact on the airport if the current/historic levels of flight training were not maintained in the future.

2017 NOTE: (INFORMATION UPDATED AS PART OF FAA FORECAST REVIEW; ORIGINAL FORECAST SCENARIOS HAVE NOT BEEN MODIFIED) ONGOING CONTRACT AND OPERATIONAL ISSUES LED TO A CWU DECISION IN EARLY 2017 TO BRING FLIGHT OPERATIONS IN HOUSE AND ELIMINATE USE OF SUBCONTRACTORS TO PROVIDE THEIR AIRCRAFT FLEET AND FLIGHT INSTRUCTION. IFT'S CURRENT CONTRACT EXPIRES IN 2018 AND CWU INDICATES THAT IT WILL NOT BE RENEWED.

The forecasts are presented in **Table 3-12** and depicted on **Figure 3-6**. Each of the forecasts reflect the net change from current based aircraft levels and include reductions of existing aircraft through fleet attrition, relocation, and pilot inactivation. The forecasts include both flight training and non-flight training aircraft.

The **Maintain ANM Market Share** forecast maintains Bowers Field's 2016 share of the ANM region at 0.283 percent. The projection results in an increase from 60 to 79 based aircraft (+19) by 2035, which represents an average annual growth rate of **0.95 percent**. This projection assumes that Bowers Field's growth in based aircraft will mirror the regional average over the next twenty years, which suggests an ability to respond to demand for facilities and services.

The **Decreasing ANM Market Share** forecast gradually reduces Bowers Field's share of the ANM region from 0.283 to 0.260 percent. The projection results in an increase from 60 to 73 based aircraft (+13) at Bowers Field by 2035, which represents an average annual increase of **0.53 percent**. This projection assumes that Bowers Field's growth in based aircraft will increase at approximately half the forecast rate as the ANM region (0.53% vs 0.96%). The lower growth projection reflects a combination of factors, including the ability to accommodate demand for facilities and services.

The **Increasing ANM Market Share** forecast gradually increases Bowers Field's share of the ANM region from 0.283 to 0.3050 percent. The projection results in an increase from 60 to 85 based aircraft (+25) at Bowers Field by 2035, which represents an average annual growth rate of **1.34 percent**. This projection assumes that Bowers Field's growth in based aircraft will exceed the forecast average annual growth rate for the overall fleet by approximately 40 percent (1.34% vs 0.96%). As with the other increased market share projection, the underlying strength of the established flight training market and the Airport's ability to attract and accommodate new aircraft are key factors in outperforming the region.

The **Maintain ANM Market Share/No Institutional Flight Training** forecast was developed to illustrate the significance of flight training on Bowers Field's overall activity. This scenario underscores the inherent vulnerability that exists when a single user generates a large portion of an airport's overall activity. Although not considered comparable to the other forecasts in terms of likelihood, it does present an alternative condition that could exist if flight training at the airport was eliminated or significantly downsized. It is recognized that institutional aviation activity may be less vulnerable than other segments of general aviation to dramatic changes in activity, although it is not entirely immune to them.

The recent change in Central Washington University (CWU) flight training contractors resulted in a temporary interruption of flight training activity at Bowers Field that adversely affected airport operations. The reliance on outside contractors, and periodic changes in these contractors, create an element of risk for CWU to provide fight training without interruption, which in turn, creates ongoing risk exposure for the airport. Options for developing a fully integrated program with a university-owned aircraft fleet, physical facilities, and adequate staffing may reduce this risk exposure, but would require a significantly greater commitment of resources than previously established for the program. As with university academic programs in general, maintaining or increasing funding levels perpetually cannot be assumed, since the process is subject to a variety of outside influences. Similarly, realignments within the existing aviation program are possible, which could include full or partial relocation of flight training activity to another airport.

However unlikely, a variety of risk factors exist that are not controlled by the airport that could contribute to significant decline, or elimination of institutional flight training at Bowers Field during the current planning period.

This scenario assumes that the current institutional flight training (CWU) will end within the first five years of the forecast period, resulting in an immediate loss of flight training aircraft (currently accounting for 24 percent of Bowers based aircraft). Non-flight training based aircraft are projected to increase at the same rate as the ANM region during the planning period. It is assumed that flight training may be reconstituted, but at significantly lower (non-institutional) levels than currently exist.

The overall projection results in a decrease from 60 to 55 based aircraft (-5) at Bowers Field by 2035, which represents an average annual growth rate of **-9.55 percent.**

Summary (Based Aircraft Forecast)

The maintain ANM market share forecast is recommended as the preferred based aircraft forecast for use in the airport master plan. This projection assumes that Bowers Field will be able sustain growth that is in line with forecast growth **(0.951 percent annually)** for the region that is made up of seven northwestern and mountain states. Continued growth of the local flight training aircraft fleet is assumed. Based on projected enrollments, the flight school indicates a need for 18 to 24 aircraft during the next five years. Current and recent fleet numbers have fluctuated between 10 and 16 aircraft. It is assumed that upon reaching a sustainable fleet size between 16 and 18 aircraft, growth will level off and be consistent with regional expectations for based aircraft growth through the remainder of the twenty-yearplanning period. The net increase (+19) in based aircraft includes both flight training and non-flight training aircraft. The forecast levels also account for periodic reductions of existing based aircraft through fleet attrition, relocation, and pilot inactivation.

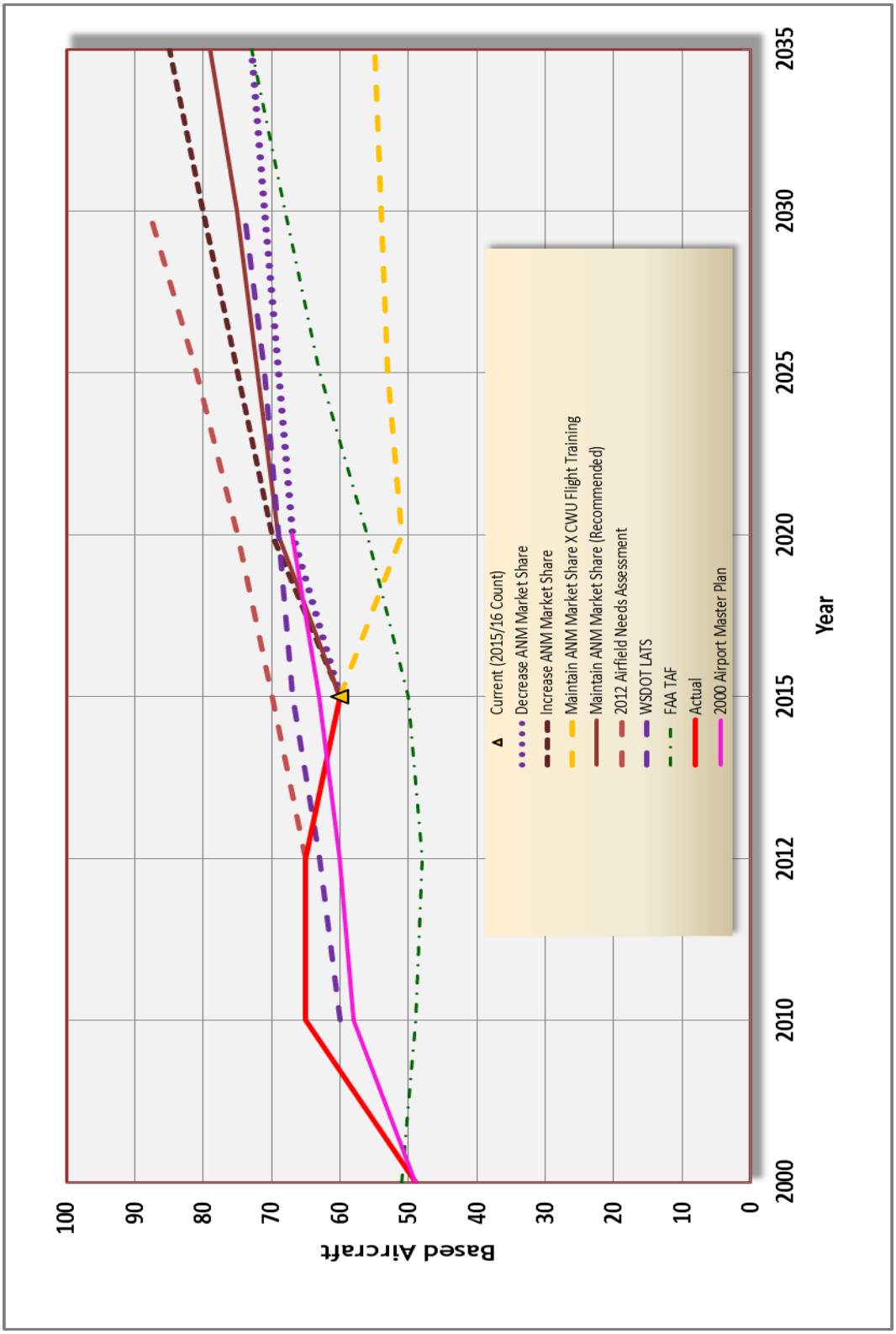
TABLE 3-12: BASED AIRCRAFT FORECAST (MARKET SHARE OF NW-MTN REGION)

YEAR	BASED AIRCRAFT BOWERS FIELD	FAA – ANM BASED AIRCRAFT[1]	% OF ANM BASED AIRCRAFT AT BOWERS FIELD
Historic			
2000-2015	--	--	0.00228[2]
2011	65	21,991	0.00296
2016	60/66*	23,303	0.00283
Forecast – Increase Share (1.34% AAR) [2]			
2020	70	24,223	0.00283
2025	75	25,456	0.00283
2030	80	26,639	0.00283
2035	85	27,891	0.00283
Forecast – Decrease Share (0.532% AAR)			
2020	67	24,223	0.00275
2025	69	25,456	0.00270
2030	71	26,639	0.00265
2035	73	27,891	0.00260
Forecast – Maintain Share (0.951% AAR) (Recommended)			
2020	**69**	24,223	0.00290
2025	**72**	25,456	0.00295
2030	**75**	26,639	0.00300
2035	**79**	27,891	0.00305
Forecast – Maintain Market Share for Non-Flight Training/No CWU Flight Training (-0.955% AAR)			
2020	51	24,223	0.00290
2025	53	25,456	0.00295
2030	54	26,639	0.00300
2035	55	27,891	0.00305

1. FAA Terminal Area Forecast Summary, Fiscal Years 2015-2040
2. 15-year average based on TAF for ELN and ANM

* Actual BAC count Q3 2016/Projected BAC total in Q4 2016 based on flight training enrollments

FIGURE 3-6: BOWERS FIELD - BASED AIRCRAFT FORECASTS



BASED AIRCRAFT FLEET MIX

The airport's current mix of based aircraft consists of primarily single- and multi-engine piston aircraft, with three business class turbine aircraft (1 multi-engine turboprop and 2 business jets) and one helicopter. **Table 3-13** summarizes the projected based aircraft fleet mix for the planning period. **Figures 3-7** and **3-8** depict the current (2015) and long-term (2035) distribution of based aircraft by type. The based aircraft fleet mix during the planning period is expected to continue being predominantly single-engine and multi-engine piston aircraft, with a growing number of turbine aircraft and helicopters.

TABLE 3-13: FORECAST BASED AIRCRAFT FLEET MIX

ACTIVITY	2015	2020	2025	2030	2035
Single Engine Piston	48	54	55	56	57
Multi-Engine Piston	6	8	8	9	10
Turboprop	1	1	2	2	3
Business Jet	2	2	2	3	3
Helicopter	1	2	2	2	3
Other (Experimental, etc.)	2	2	3	3	3
Total Based Aircraft	60	69	72	75	79

FIGURE 3-7: BOWERS FIELD - BASED AIRCRAFT FLEET MIX (2015)

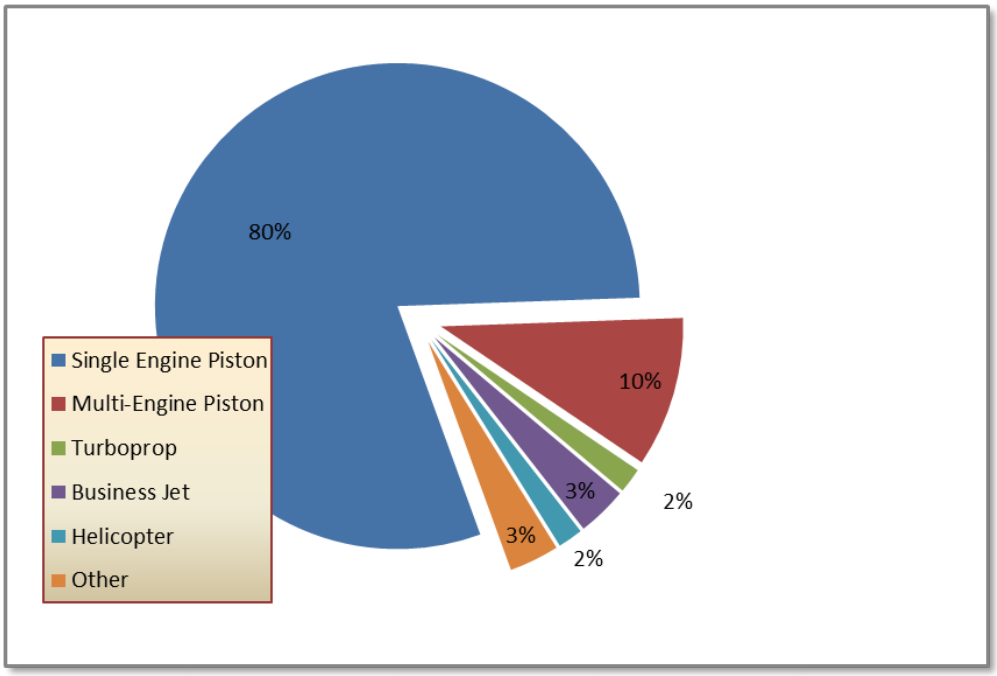
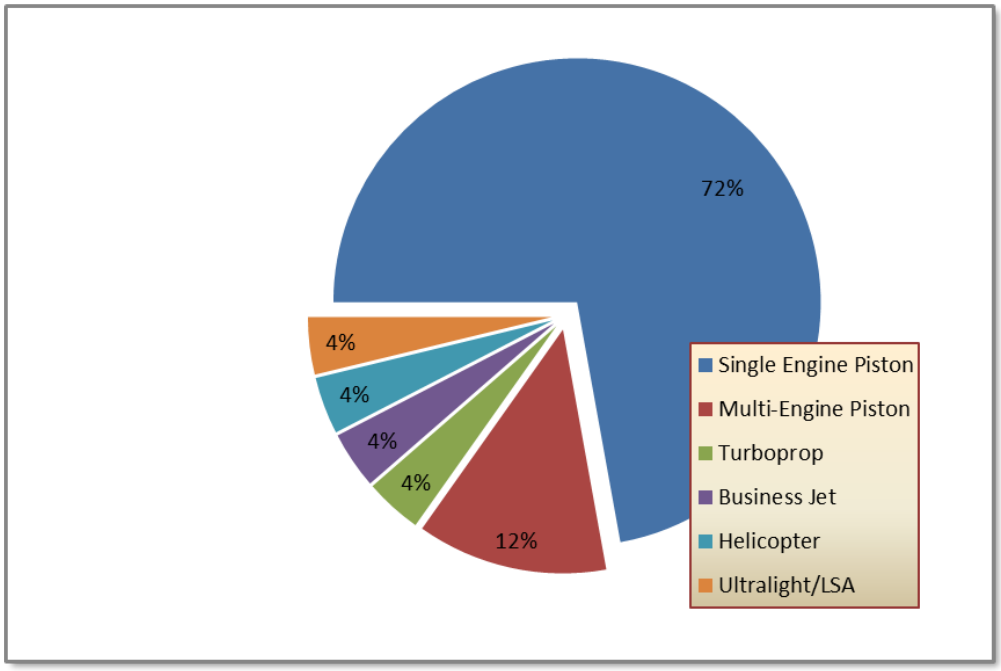


FIGURE 3-8: BOWERS FIELD – FORECAST BASED AIRCRAFT FLEET MIX (2035)



AIRCRAFT OPERATIONS

Updated aircraft operations projections have been developed for comparison with existing forecasts in order to identify a selected forecast for the master plan. The updated operations forecasts utilize the 2016 estimate (47,950) as the base for new projections.

As noted earlier, flight training activity has represented the majority of air traffic at Bowers Field for the last twenty years and beyond. This was confirmed during the recent change in flight training contractors in 2014 when AVGAS volume dropped 31 percent from the previous year, then rebounded by 21 percent the following year as activity gradually returned to normal levels. The forecasts of aircraft operations will separate flight training from non-flight training activity due to its unique demand characteristics. As with the current estimate of air traffic presented earlier in this chapter, general aviation non-flight training activity will be projected using an operation per based aircraft ratio (OPBA), common to general aviation airports.

Flight Training

Although the 2014 change in CWU flight training contractors resulted in a temporary interruption and initial reduction in flight training activity, the 2016 year-to-date flight hours logged are on par with recent "pre-transition" levels. The rapid pace of the recent operational build up in flight training is reflected in a 66 percent single-year increase in logged flight hours between 2015 and 2016 reported by CWU's flight training contractor, Iasco Flight Training (IFT). In the first six months of 2016, IFT logged 85 percent of the flight hours it logged in all of 2015 and the current trend is expected to continue in the second half of the year.

Projections provided by the CWU Aviation Department and IFT in June 2016 anticipate significant increases above current levels in active flight students, annual flight hours, and fleet size to be experienced over the next three to five years. The program's year-to-year projected growth in flight hours between 2016 and 2020 ranges from 22 to 50 percent. Overall, the volume of flight training related flight hours is projected to increase from 9,000 to 22,000 hours by 2020, which represents 25 percent average annual growth. The projected additional activity represents 13,000 flight hours above 2016 levels. The Aviation Department and IFT indicate that the strong outlook for flight training is a reflection of both broad market conditions and program-specific objectives.

The current level of flight training activity appears to represent a reliable benchmark. The program and its flight training contractor have demonstrated varying success in accommodating current demand, although it appears that the current organizational structure is capable of accommodating incremental growth in activity through current and expanded resources (aircraft fleet, flight instructors, etc.). However, the ability to achieve sustained, double-digit increases over an extended period is less certain and is subject to a variety of external forces. The ability of any flight training contractor to successfully accommodate significant increases in demand over a short period is affected by internal and regulatory quality control standards, the supply of qualified flight instructors, and the economics associated with fleet expansion.

Competition among accredited flight training programs for the same pool of prospective students also presents a challenge for achieving long-term growth projections.

It is important to note that the CWU Aviation Program is in the currently in the process of redefining itself, which may involve adding/expanding its non-flight programs. The extent and timing of this transformation is unknown at this time. However, even small areas of specialized or focused growth have the potential of raising the overall profile of the program and positively impacting the competitiveness of its flight training program. The potential development of dedicated CWU Aviation Department flight-related and non-flight facilities at Bowers Field would also benefit airport operations and contribute to a "campus effect" that could spin off a variety of complimentary uses for the airfield and industrial park.

From a forecasting perspective, it is important to recognize the composition of existing air traffic and its future growth potential. The approach recommended for developing updated operations forecasts at Bowers Field is to maintain currently-established flight training levels (except where noted), and assign varying confidence levels to the projected (new) growth in this activity anticipated over the next several years. This approach recognizes the existing activity as stable and tempers future expectations to reflect the uncertainty of unrealized growth.

Flight Training Scenario 1. This forecast assumes 100 percent confidence that the projected *additional* flight training demand (estimated to be 13,000 flight hours) is realized by 2020. A ratio of 4 operations per flight hour is used to estimate flight training aircraft operations at the airport. Flight training growth beyond 2020 is projected at an average rate of 0.5 percent, comparable to the FAA's long-term forecast growth in active student pilot certificates between 2020 and 2036. In this projection, flight training activity increases from 36,000 to 94,836 annual operations between 2016 and 2035, which represents an average annual growth rate of **5.23 percent.**

Flight Training Scenario 2. This forecast assumes 66 percent confidence that the projected *additional* flight training demand (13,000 flight hours x .66) is realized by 2020. The operations per flight hour ratio and forecast growth beyond 2020 are unchanged from Scenario 1. In this projection, flight training activity increases from 36,000 to 75,783 annual operations between 2016 and 2035, which represents an average annual growth rate of **4.0 percent.**

Flight Training Scenario 3. This forecast assumes 33 percent confidence that the projected additional flight training demand (13,000 flight hours x .33) is realized by 2020. The operations per flight hour ratio and forecast growth beyond 2020 are unchanged from the previous scenarios. In this projection, flight training activity increases from 36,000 to 57,290 annual operations between 2016 and 2035, which represents an average annual growth rate of **2.48 percent.** This projection represents sustained, moderate growth above current levels of flight training through 2035.

Flight Training Scenario 4. This forecast assumes that CWU flight training operations at Bowers Field end by 2020. A residual volume of flight training is assumed to remain at 4,000 annual operations, which would then grow at a pace consistent with the FAA's long-term forecast growth in active student pilot certificates between 2020 and 2036. In this projection, flight training activity decreases from 36,000 to 4,200 annual operations between 2016 and 2035, which represents an average annual growth rate of **-10.69 percent.**

Other General Aviation

Future non-flight training general aviation operations are projected by applying a gradual increase from 225 to 270 operations per based aircraft ratio (OPBA) through the planning period. The projection assumes that aircraft utilization will gradually increase above current levels as the airport attracts increased transient aviation activity and sustains modest growth in locally-generated flight activity. The increase in aircraft utilization also reflects the underlying strength of the local and regional economy and the ability to attract business, recreational and tourism related activity. This projected activity is added to each of the flight training forecast scenarios described above.

DNR Fire Related Activity and Military

The current level of "typical" seasonal flight activity reported by DNR is 600 helicopter operations. Military helicopter traffic is estimated to be 100 annual operations. Maintaining this level of flight activity through the planning period is reasonable for forecasting purposes, although it is recognized that activity can vary greatly depending on factors such as the frequency, severity and location of wildfires; and the response requirements for natural disasters. This projected activity is added to each of the flight training forecast scenarios described above.

Summary (Aircraft Operations Forecast)

Existing and updated aircraft operations forecasts are presented in **Table 3-14**. The updated forecasts incorporate the flight training scenarios described above with non-flight training general aviation activity and DNR/Military helicopter operations.

Based on the degree of uncertainty associated with defining future flight training activity, a median projection was created that plots a course mid-way through the forecast enveloped defined by the four flight training scenarios. The median projection provides a reasonable mid-range forecast within a wide range of activity scenarios and is recommended as the preferred aircraft operations forecast for use in the airport master plan.

The updated operations forecasts reflect a growth rate comparable to the 2011 Airfield Needs Assessment forecasts, due in large part to the continued growth in general aviation flight training at Bowers Field. Non-flight training general aviation activity is tempered slightly through the use of lower activity rations that are

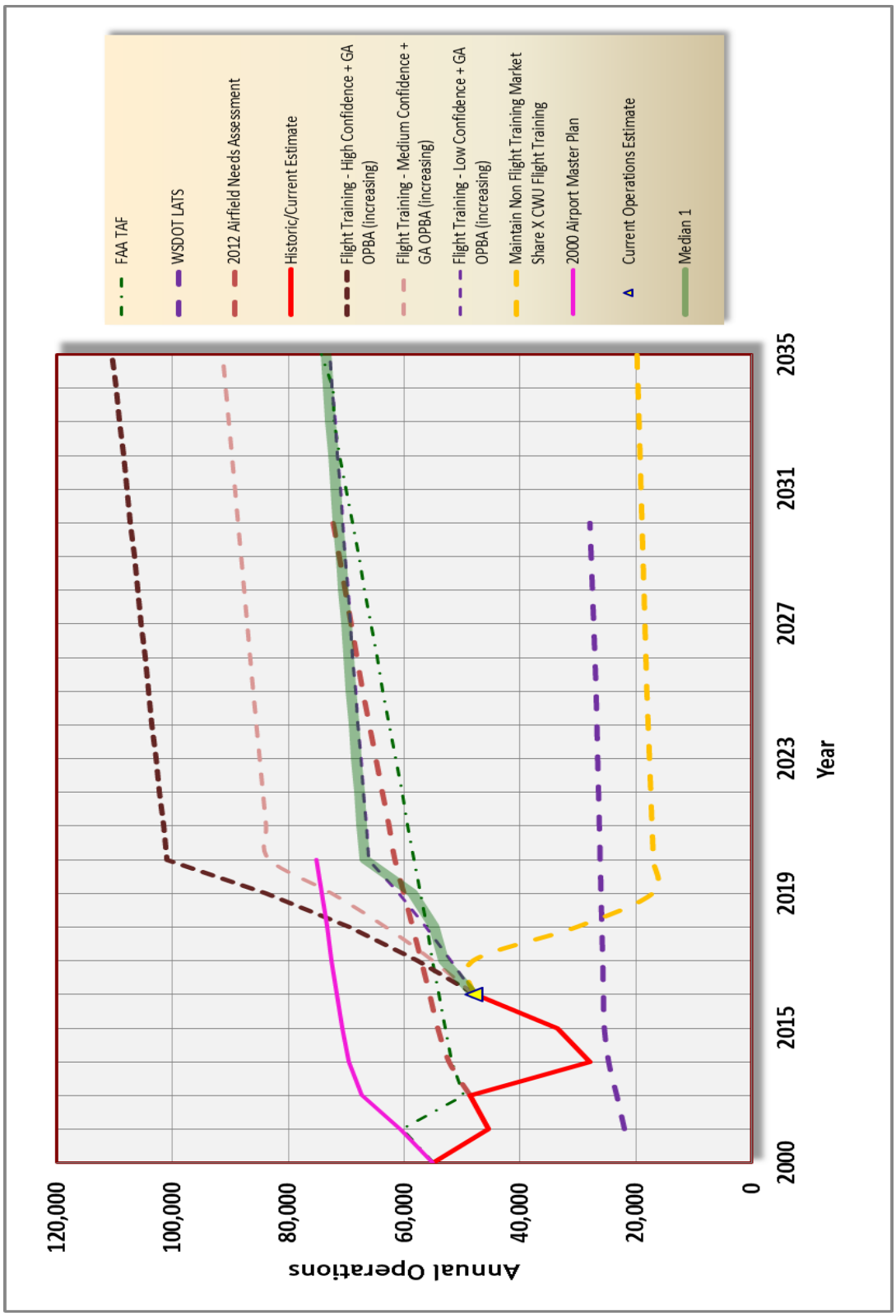
consistent recent national trends (aircraft utilization, fuel consumption, etc.) and the FAA's long-term growth expectations nationally, which have been tempered significantly compared to "pre-recession" forecasts.

TABLE 3-14: SUMMARY OF AIRCRAFT OPERATIONS FORECASTS

EXISTING FORECASTS	2016	2020	2025	2030	2035
2011 Airfield Needs Assessment (2.11% AAR 2011-2030)	55,659[1]	61,670	67,210	72,330	--
2007 Washington Department of Transportation Long-term Air Transportation Study (LATS) (1.03% AAR 2005-2030)	25,534[1]	26,095[1]	26,795	27,845	--
FAA Terminal Area Forecast (Issued Jan 2016) (1.71% AAR 2014-2035)	54,002	58,275	63,615	68,957	74,298
UPDATED AIRCRAFT OPERATIONS FORECASTS	**2016**	**2020**	**2025**	**2030**	**2035**
Flight Training – High + GA OPBA Ratio Increasing (4.49% AAR 2016-2035)	47,950	100,940	104,172	107,240	110,386
Flight Training – Medium + GA OPBA Ratio Increasing (3.45% AAR 2016-2035)	47,950	83,260	86,046	88,657	91,333
Flight Training – Low + GA OPBA Ratio Increasing (2.22% AAR 2016-2035)	47,950	66,100	68,452	70,619	72,840
No CWU Flight Training/Increasing OPBA Ratio (Non Flight Training GA) (4.56% AAR 2016-2035)	47,950	16,940	18,050	18,890	19,750
Median Projection (2.28% AAR 2016-2035) ***Recommended Forecast***	**47,950**	**66,810**	**69,180**	**71,352**	**73,577**
1. Interpolated between adjacent forecast years.					

Note (2018): The uncertainty surrounding the CWU flight training program that existed during the forecast analysis (fall 2016) is reflected in the long term aviation activity forecasts. The subsequent decision by CWU in 2017 to eliminate its long-established contractor model in favor of in-house aircraft ownership and management suggests the potential exists for greater stability in CWU flight training activity at Bowers Field. However, discussions regarding CWU's future at Bowers Field continue. In mid-2018, Kittitas County and CWU approved an agreement to evaluate issues related to the potential co-sponsorship or management of Bowers Field. CWU has assumed limited FBO responsibilities in conjunction with its recent lease of facilities.

FIGURE 3-9: BOWERS FIELD GENERAL AVIATION OPERATIONS FORECAST



Local and Itinerant Operations

General aviation operations consist of aircraft takeoffs and landings conducted by general aviation aircraft and are classified as local or itinerant. Local operations are conducted in the vicinity of an airport and include flights that begin and end the airport. These include local area flight training, touch and go landings, flightseeing, and other flights that do not involve a landing at another airport. Itinerant operations include flights between airports, including cross-country flights. Itinerant operations reflect specific travel between multiple points, often associated with business and personal travel.

The 2011 Airfield Needs Assessment estimated a 55 percent local and 45 percent itinerant traffic distribution for forecast operations. The current FAA TAF uses a 57/43 percent local-itinerant split. A 55/45 percent split is maintained in the updated operations forecast and is summarized in **Table 3-18**, located at the end of the chapter.

Aircraft Operations Fleet Mix

Currently, single and multi-engine piston aircraft account for approximately 97 percent of airport operations, followed by helicopters and turbine fixed wing aircraft. Although small piston aircraft will continue to generate the majority of aircraft operations at Bowers Field through the planning period, the overall fleet mix will become slightly more diverse based on current trends in aircraft manufacturing and the airport's large regional service area. The volume of business aircraft activity (turboprops and jets) is expected to increase during the planning period. The general aviation aircraft operations fleet mix forecast is summarized in **Table 3-15**.

TABLE 3-15: GENERAL AVIATION FORECAST AIRCRAFT OPERATIONS FLEET MIX

AIRCRAFT TYPE	2016	%	2020	%	2025	%	2030	%	2035	%
Single Engine Piston	43,518	91	60,844	91	62,722	91	64,302	91	65,913	90
Multi Engine Piston	2,880	6	4,000	6	4,200	6	4,500	6	4,800	7
Turboprop	456	<1	530	<1	660	<1	750	1	860	1
Jet	296	<1	396	<1	498	<1	600	<1	704	<1
Helicopter	800	2	1,000	2	1,100	2	1,200	2	1,300	2
Total Operations (100%)	47,950	100	66,810	100	69,180	100	71,352	100	73,577	100
Note: Percentages may not sum due to independent rounding										

Critical Aircraft

As noted earlier, the selection of design standards for airfield facilities is based upon the characteristics of the aircraft that are expected to use the airport. This aircraft or aircraft type is designated as the "critical aircraft." The FAA provides the following definitions:

"*The critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations, but excluding touch-and-go operations. An operation is either a takeoff or landing.*" [13]

The FAA groups aircraft into five categories (A-E) based upon their approach speeds. Aircraft Approach Categories A and B include small propeller aircraft, many small or medium business jet aircraft, and some larger aircraft with approach speeds of less than 121 knots (nautical miles per hour). Categories C, D, and E consist of the remaining business jets as well as larger jet and propeller aircraft generally associated with commercial and military use with approach speeds of 121 knots or more. The FAA also establishes six airplane design groups (I-VI), based on the wingspan and tail height of the aircraft. The categories range from Airplane Design Group (ADG) I, for aircraft with wingspans of less than 49 feet, to ADG VI for the largest commercial and military aircraft.

The combination of airplane design group and aircraft approach speed for the critical aircraft creates the Airport Reference Code (ARC), which is used to define applicable airfield design standards. It is noted that each runway is assigned an ARC through the facility requirements runway use analysis, and the *Airport* ARC is based on the most demanding runway-derived ARC at the airport.

A list of typical general aviation and business aviation aircraft and their respective design categories is presented in **Table 3-16. Figure 3-10** illustrates representative aircraft in various design groups. Aircraft with a maximum gross takeoff weight greater than 12,500 pounds are classified as "large aircraft" by the FAA; aircraft 12,500 pounds and less are classified as "small aircraft."

[13] FAA Advisory Circular (AC) 150/5000-17 Critical Aircraft and Regular Use Determination

TABLE 3-16: GENERAL AVIATION AIRCRAFT & DESIGN CATEGORIES

AIRCRAFT	AIRCRAFT APPROACH CATEGORY	AIRPLANE DESIGN GROUP	MAXIMUM GROSS TAKEOFF WEIGHT (LBS)
Grumman American Tiger	A	I	2,400
Cessna 182 (Skylane)	A	I	3,100
Cirrus Design SR22	A	I	3,400
Beechcraft Bonanza A36	A	I	3,650
Socata/Aerospatiale/Daher TBM 700-930	A	I	6,579-7,394
Beechcraft Baron 58	B	I	5,500
Cessna 340	B	I	5,990
Cessna Citation Mustang	B	I	8,645
Embraer Phenom 100	B	I	10,472
Cessna Citation CJ1+	B	I	10,700
Beech King Air A100	B	I	11,800
Beechcraft 400A/Premier I	B	I	16,100
Piper Malibu (PA-46)	A	II	4,340
Cessna Caravan 675	A	II	8,000
Pilatus PC-12	A	II	10,450
Cessna Citation CJ2+	B	II	12,500
Cessna Citation II	B	II	13,300
Cessna Citation CJ3	B	II	13,870
Beech King Air 350	B	II	15,000
Cessna Citation Bravo	B	II	15,000
Cessna Citation CJ4	B	II	16,950
Embraer Phenom 300	B	II	17,968
Cessna Citation XLS+	B	II	20,200
Dassault Falcon 20/200	B	II	28,660
Bombardier Learjet 55	C	I	21,500
Beechcraft Hawker 800XP	C	II	28,000
Gulfstream 200	C	II	34,450
Cessna Citation X	C	II	36,100
Bombardier Challenger 300	C	II	37,500
Gulfstream III	C	II	69,700
Learjet 35A/36A	D	I	18,300
Gulfstream G450	D	II	73,900
Bombardier Global Express 5000	C	III	92,750
Source: AC 150/5300-13, as amended; aircraft manufacturer data.			

A-I

12,500 lbs. or less (small)

Beech Baron 55
Beech Bonanza
Cessna 182
Piper Archer
Piper Seneca

B-I

12,500 lbs. or less (small)

Beech Baron 58
Beech King Air 100
Cessna 402
Cessna 421
Piper Navajo
Piper Cheyenne
Cessna Citation I

A-II, B-II

12,500 lbs. or less (small)

Super King Air 200
Pilatus PC-12
DHC Twin Otter
Cessna Caravan
King Air C90

B-II

Greater than 12,500 lbs.

Super King Air 300, 350
Beech 1900
Cessna Citation Excel
Falcon 20, 50
Falcon 200, 900
Citation II, Bravo XLS+
Citation CJ3

A-III, B-III

Greater than 12,500 lbs.

DHC Dash 7
DHC Dash 8
Q-300, Q-400
DC-3
Convair 580
Fairchild F-27
ATR 72

ATP

C-I, D-I

Lear 25, 35, 55, 60
Israeli Westwind
HS 125-700

C-II, D-II

Gulfstream II, III, IV
Canadair 600
Canadair Regional Jet
Lockheed JetStar
Citation X
Citation Sovereign
Hawker 800 XP

C-III, D-III

Boeing Business Jet
Gulfstream 650
B 737-300 Series
MD-80, DC-9
Fokker 70, 100
A319, A320
Gulfstream V
Global Express

C-IV, D-IV

B-757
B-767
DC - 8-70
DC - 10
MD - 11
L 1011

D-V

B - 747 Series
B - 777

Current and Future Critical Aircraft

Based on current activity and the updated airport master plan forecasts, the critical aircraft identified for Bowers Field are consistent with previous planning. **Table 3-19** summarizes the current and future critical aircraft and airport reference code (ARC) for Bowers Field. An analysis of aircraft use and applicable design standards will be performed in the facility requirements analysis to address specific facility needs.

TABLE 3-19: BOWERS FIELD – SUMMARY OF CRITICAL AIRCRAFT & ARC

"Airport" ARC: B-II
Based on the updated master plan forecasts, the current and future critical aircraft for Bowers Field is included in **Airport Reference Code (ARC) B-II**:
Current Critical Aircraft: ➢ **Raytheon/Beechcraft King Air 250 (representative AC type, multi-engine turboprop)**
Future Critical Aircraft: ➢ **Cessna Citation 550/560 series (representative AC type, multi-engine business jet)**

Airplane Design Group II (ADG II) traffic at Bowers Field has historically included a variety of aircraft types, including single-engine and multi-engine turboprops and business jets. The majority of this activity is generated by Approach Category A and B aircraft, although the airport also accommodates limited amounts of Approach Category C and D aircraft activity (ADG I, II and III). Bowers Field currently accommodates two locally-based ADG II business jets; one ADG II business jet that operates regularly at the airport; and a variety of transient business jets.

In the current mix of ADG II traffic, neither of the primary aircraft types (multi-engine turboprop and business jet) individually reach the FAA's "regular use threshold" of 500 annual operations. However, when combined, the ADG II turbine aircraft reach the 500 annual operations threshold. Forecast growth within this activity segment is anticipated, and ADG II business jets alone are expected to reach and surpass the 500 annual operations during the current twenty-year planning period.

Table 3-20 summarizes forecast activity at Bowers Field by aircraft type, aircraft approach speed (AAC), and airplane design group (ADG).

TABLE 3-20: BOWERS FIELD – FORECAST ACTIVITY FLEET MIX

AIRCRAFT TYPE	AAC + ADG	HISTORIC	FORECAST			
		2016	2020	2025	2030	2035
Cessna 172	A-I	46,298	64,764	66,782	68,642	70,513
TBM 900	A-I	76	100	120	140	160
Beechcraft Baron 58	B-I	100	120	140	160	200
Piper Cheyenne II (PA-31T)	B-I	120	130	140	150	160
Cessna Citation CJ2	B-I	14	40	60	80	100
Pilatus PC-12	A-II	80	100	140	160	180
Beechcraft King Air 250	B-II	180	200	260	300	360
Cessna 550 - Citation Bravo	B-II	250	300	360	420	480
Bombardier Learjet 60	C-I	22	30	40	50	60
Cessna 750 - Citation X	C-II	6	12	18	24	30
Learjet 35	D-I	0	4	6	8	10
Gulfstream IV	D-II	2	6	8	10	12
Gulfstream V	D-III	2	4	6	8	12
Total Operations (Fixed Wing)		**47,150**	**65,810**	**68,080**	**70,152**	**72,277**
Helicopter		800	1,000	1,100	1,200	1,300
TOTAL – ALL OPERATIONS		**47,950**	**66,810**	**69,180**	**71,352**	**73,577**
Subtotals by AAC (FW + Heli)	A	47,254	65,964	68,142	70,142	72,153
	B	664	790	960	1,110	1,300
	C	28	42	58	74	90
	D	4	14	20	26	34
Subtotals by ADG (FW only)	I	46,630	65,188	67,288	69,230	71,203
	II	518	618	786	914	1,062
	III	2	4	6	8	12

Critical Aircraft Conclusions

Based on current and forecast air traffic, ARC B-II is the appropriate design criteria for the twenty-year planning period. The combination of business jet and large multi-engine turboprop activity is expected to the reach the 500 annual operations threshold prior to the 2025 forecast year (the mid-point in the twenty-year planning period).

The trend toward increased business jet and large turboprop activity at Bowers Field reflects both national conditions (turbine aircraft manufacturing trends), and local conditions (forecast population and economic growth, increased services for turbine aircraft, etc.). As noted earlier, continued growth at Suncadia Resort, in upper Kittitas County is expected to increase air traffic at Bowers Field, including turbine aircraft.

Operational Peaks

It is estimated that peak month activity at Bowers Field occurs during the summer (typically June) and accounts for approximately 11 percent of annual aircraft operations. This level of peaking is consistent with the mix of airport traffic and is expected to remain relatively unchanged during the planning period. Peak day operations are defined by the average day in the peak month (design day) and the busy day in the typical week during peak month (busy day); the peak hour within the design day represents the design hour. The design day is calculated by dividing peak month operations by 30. The busy day is estimated to be 25 percent higher than the average day in the peak month (design day x 1.25). The design hour operations are estimated to equal 15 percent of design day operations. The operational peaks for each forecast year are summarized in **Table 3-21**.

TABLE 3-21: PEAK GENERAL AVIATION OPERATIONS FORECAST

ACTIVITY	2016	2020	2025	2030	2035
Annual Operations	47,950	66,810	69,180	71,352	73,577
Peak Month Operations (11%)	5,275	7,349	7,610	7,849	8,094
Design Day (average day in peak month)	176	245	254	262	270
Busy Day	220	306	317	328	338
Design Hour Operations (assumed % of design day)	26	37	38	39	41

Forecast Summary

The summary of based aircraft and annual aircraft operations forecasts is provided in **Table 3-22**. As with any long-term facility demand forecast, it is recommended that long-term development reserves be protected to accommodate demand that may exceed current projections. For planning purposes, a reserve capable of accommodating a doubling of the twenty-year preferred forecast demand should be adequate to accommodate unforeseen facility needs during the current planning period. However, should demand significantly deviate from the airport's recent historical trend, updated forecasts should be prepared to ensure that adequate facility planning is maintained. Air Taxi activity is projected at 100 annual operations, consistent with the FAA TAF. Government flight activity, which includes Department of Natural Resources (DNR) fire response helicopters and military activity is projected to remain at current levels (700 annual operations) during the planning period. Instrument Operations are projected to account for approximately 1 to 2 percent of total airport operations.

TABLE 3-22: FORECAST SUMMARY

ACTIVITY	2016	2020	2025	2030	2035
Itinerant Operations					
General Aviation	20,777	29,264	30,331	31,308	32,310
Air Taxi	100	100	100	100	100
Military	700	700	700	700	700
Total Itinerant Operations	**21,577**	**30,064**	**31,131**	**32,108**	**33,110**
Local Operations (all GA)	26,373	36,746	38,049	39,244	40,467
Total Local & Itinerant Operations	**47,950**	**66,810**	**69,180**	**71,352**	**73,577**
Based Aircraft	**60**	**69**	**72**	**75**	**79**
Operations Per Based Aircraft (GA)	786	1,000	950	941	921

Comparison with TAF

Master plan forecasts are compared to the FAA's Terminal Area Forecast (TAF), and significant deviations from the TAF must be approved by FAA. For Bowers Field, the evaluation of existing activity described in this chapter revealed significant variances in TAF base year (2015) data, which affects all subsequent forecasts. As a result, the correlation between the TAF and master plan forecasts is low. However, if the TAF data for 2015 was updated to correlate to the master plan data, and the existing TAF forecast growth rate was maintained, the correlation with the master plan would improve significantly. **Table 3-23** compares the master plan based aircraft and operations forecasts with the corresponding TAF forecasts.

TABLE 3-23: BOWERS FIELD – MASTER PLAN FORECAST COMPARED TO TAF

ACTIVITY MEASURE	YEAR	AIRPORT FORECAST	2017 TAF	AF/TAF (% DIFFERENCE)
Enplanements				
Base Year	2016	0	0	0.00%
Base Year + 5 Years	2021	0	0	0.00%
Base Year + 10 Years	2026	0	0	0.00%
Commercial Operations				
Base Year	2016	0	0	0.00%
Base Year + 5 Years	2021	0	0	0.00%
Base Year + 10 Years	2026	0	0	0.00%
Total Operations				
Base Year	2016	47,950	61,699	-22.3%
Base Year + 5 Years	2021	66,810	67,969	-1.7%
Base Year + 10 Years	2026	69,180	74,239	-6.8%

Source: TAF Template provided by FAA.

The recommended master plan based aircraft forecast differs from the TAF in large part due to a significant difference in base year data. The master plan forecast also reflects a specific increase in the number of flight training aircraft planned between 2016 and 2020, which is not reflected in the TAF.

The recommended master plan aircraft operations forecast also reflects a current estimate of activity that reflects specific operational data and changes in airport activity. The master plan aircraft operations forecast projects a significant increase between 2016 and 2020, which is directly attributed to an increase in flight training activity. This anticipated increase in activity is not reflected in the TAF. The average annual growth rate in the master plan aircraft operations forecast is 2.18 percent, compared to 1.70 percent in the TAF.

The FAA forecast approval letter and the TAF Comparison Worksheets for Bowers Field are provided in **Appendix B**.

Fifty-Year Forecast

Per the airport master plan project scope of work, fifty-year demand forecasts were prepared by extrapolating the average annual growth rates (AAGR) for the recommended 20-year based aircraft and aircraft operations forecasts. The purpose of the 50-year projection is to provide an estimate of demand that can be used to approximate long-term aviation use land requirements for the airport. **Table 3-24** summarizes the 50-year forecast including the intermediate 30- and 40-year based aircraft and aircraft operations

TABLE 3-24: 50-YEAR FORECAST

ACTIVITY	2016	2035	2045	2055	2065
Annual Operations	47,950	73,577	92,183	115,493	144,698
Based Aircraft	60	79	91	106	122