

This chapter provides data and analysis in support of airfield improvements needed to accommodate near- and long-term aviation demand at Pangborn Memorial Airport (EAT). The principal focus of this analysis is on aircraft operations of current and projected users. This chapter is organized into five main sections, as described below.



- **Local Demographic Trends.** The local demographic and socioeconomic context is briefly analyzed in this section to give a background for the airfield planning process from a community perspective.
- **Historical and Projected Aircraft Operations.** This section presents historical aircraft operations counts and operations forecasts developed by the Federal Aviation Administration (FAA).
- **Current Airfield.** This section includes a brief description of the current airfield, with particular emphasis on primary Runway 12/30.
- **Airport Users and Airfield Requirements.** This section presents information documenting the airfield facilities needed to accommodate current and projected demand based on data obtained from airport users, FAA guidance on runway length, and information on potential expanded airline service for the community.
- **Airfield Improvement Summary and Recommendation.** This section summarizes the runway length requirements of the Airport's users and analysis methods, and provides a recommended runway length based on FAA guidance.

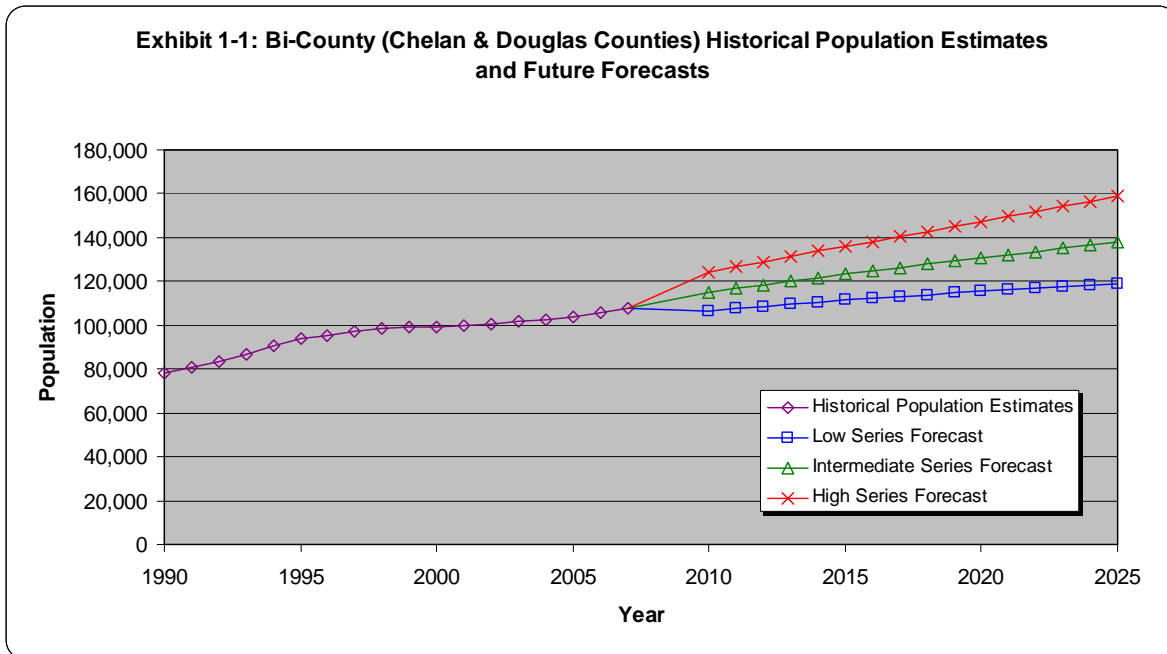
1.1 Local Demographic Trends

The following subsections describe the socioeconomic characteristics of the region served by Pangborn Memorial Airport, including population, employment, and per capita income. This is provided as background information describing local trends and their impact on local aviation activity.

1.1.1 Regional Population

An airport's catchment area, sometimes referred to as its service area, is the geographic area surrounding the airport from which that airport can reasonably expect to draw commercial passengers and aircraft users. The population of an airport's catchment area represents the size of the aviation market served by that airport. Catchment area population has an effect on the extent of aviation activity at the airport.

For the purpose of this study, Pangborn's catchment area consists of Douglas and Chelan Counties. Historical population estimates for these two counties combined are depicted in **Exhibit 1-1**. These estimates are produced by the State of Washington Office of Financial Management (OFM). Exhibit 1-1 also shows low, intermediate, and high series population forecasts developed by the OFM in 2000 as mandated by the State Growth Management Act. The OFM updates the historical estimates each year, but only updates forecasts every 10 years.



Source: State of Washington Office of Financial Management

The population of the two counties experienced expansive growth throughout the 1990s. Population growth remains strong but has cooled off since that time. Catchment area population growth outpaced statewide average growth rates over the last 20 years (1.91% vs. 1.81%) but has not kept pace with statewide growth over the last 10 years (0.98% vs. 1.35%). However, statewide population growth rates are skewed by the faster-growing major metropolitan regions such as Seattle-Tacoma and Spokane. In terms of population growth, the Wenatchee Valley area has fared well in the recent past in relation to other small metropolitan and rural areas in Washington. The OFM low, intermediate, and high series forecasts show strong expected population growth for the catchment area through 2025.

1.1.2 Regional Employment

Regional employment also affects aviation activity. Analysis of employment over time reflects the strength of a region's economy and its capacity for growth. A growing local economy and its increasing integration into the national and global economies create growth in aviation activity. This occurs as more business travelers utilize the local airport, more local residents have the financial means to consider air travel as a transportation option, and more outside travelers consider the region as a destination.

| Year | Employment |
|-----------------------|--------------|
| 2001 | 43,745 |
| 2002 | 43,724 |
| 2003 | 44,224 |
| 2004 | 46,250 |
| 2005 | 47,660 |
| 2006 | 48,877 |
| CAGR 2001-2006 | 2.24% |
| Statewide CAGR | 1.17% |

Source: U.S. Bureau of Labor Statistics

CAGR = Compounded Annual Growth Rate

Employment figures for the two counties from 2001 to 2006 are shown in **Table 1-1**. The U.S. Bureau of Labor Statistics has annualized the numbers to correct for seasonal variations. Comparison of population to employment shows that employment growth is outpacing population growth within the catchment area, leading to lower unemployment. The annual regional population growth rate of 2.24% is nearly double the statewide employment growth rate of 1.17% over the same period. Aviation activity at Pangborn has contributed to the catchment area's strong employment growth since 2001, and continued economic growth is expected to encourage further aviation activity.

1.1.3 Regional Per Capita Income

Growth in a region's per capita income often leads to an increase in airport operations as well, as more residents are financially able to access air travel for their business and recreational transportation needs. Historical per capita income for Douglas County, Chelan County, and the Wenatchee Metropolitan Statistical Area (MSA) are shown in **Table 1-2**. Regional per capita income has grown since 1989, with income growth accelerating in the last 10 years.

| Year | Douglas County | Chelan County | Wenatchee, WA (MSA) |
|-----------------------|----------------|---------------|---------------------|
| 1989 | \$22,622 | \$25,855 | \$24,779 |
| 1995 | \$21,887 | \$27,098 | \$25,329 |
| 2000 | \$24,391 | \$28,465 | \$27,127 |
| 2005 | \$24,047 | \$29,657 | \$27,789 |
| CAGR 1989-2005 | 0.38% | 0.86% | 0.72% |
| CAGR 1995-2005 | 0.95% | 0.91% | 0.93% |

Source: U.S. Bureau of Economic Analysis

All figures in 2005 dollars, adjusted for inflation by Mead & Hunt using the Consumer Price Index.

1.1.4 Summary of Socioeconomic Trends

The Pangborn Memorial Airport catchment area has shown consistent growth in population, employment, and per capita income over the past two decades. Population growth since 2000 has outpaced the State of Washington OFM's low series forecasts and is on track to keep up with intermediate series forecasts. The region's economic growth has been particularly robust, with strong rates of growth in employment and per capita incomes. These recent local economic trends are an indication that scheduled passenger service, on-demand charter services, and other airport uses are expected to play an increasing role in connecting the local economy with wider regional and national markets. As aviation activity grows, airport management will need to take steps to better serve existing users and accommodate future aviation activity that will occur at Pangborn.

1.1.5 Community Benefits of the Airport

Pangborn is the Wenatchee Valley area's gateway to the domestic and international aviation system. In the modern transportation system and its relationship to the national economy, access to air transportation is essential for local residents and the local economy, as it facilitates faster access to other regions and markets. This is the case for the movement of passengers, goods, and services to and from the Wenatchee Valley area.

Besides providing access to the rest of the world, Pangborn generates real economic benefits for the Wenatchee Valley area. Aviation activity has a ripple effect on the local economy as a result of aviation-related employment and local economic transactions made possible by aviation activity. In a 2001 study done for the Washington State Department of Transportation, it was estimated that Pangborn contributed \$47.7 million to the local economy in 2000 in direct, indirect, and induced impacts.

The economic benefits of Pangborn are only part of its overall local community benefit. According to FAA data, aircraft based at Pangborn have increased over 50% since 1995, from 80 to 126. In addition to their use for business purposes, these aircraft are used by local residents for recreational, training, and transportation purposes.

Many airport operations play a crucial role in preserving local public health and safety. Emergency air ambulance operations conducted at Pangborn are essential for residents in need of medical treatment that cannot be provided at local hospitals. The airfield must be properly improved and maintained to ensure that these emergency operations can be accommodated in the future. In previous years, a U.S. Forest Service (USFS) air/fire attack base was located at Pangborn to fight nearby wildfires. The USFS moved to Grant County Airport in 2001, which is farther from many forests, increasing response times to wildfires. The move was partially due to runway length and pavement strength concerns. However, the USFS continues to use Pangborn for aircraft refueling and fire retardant refilling.

In short, Pangborn is a vital connection between the local community and the greater domestic and international marketplace. It is an essential public facility providing tangible benefits to the community.

1.2 Historical and Projected Aircraft Operations

The following subsections describe and analyze historical annual aircraft operations counts estimated by the FAA, as well as the FAA-developed Terminal Area Forecast (TAF) of future aircraft operations at Pangborn. The purpose of this section is to provide background on the changing nature of airfield needs at Pangborn.

1.2.1 Historical Aircraft Operations

Total historical aircraft operations at Pangborn Memorial Airport, as reported by the FAA, are shown in **Table 1-3**. An operation is one take-off or landing of an aircraft; therefore, one trip to and from the airport counts as two operations. Over 99% of Pangborn's historical operations are listed by the FAA as either commuter/air taxi operations or general aviation operations, while less than 1% of total operations have been military operations.

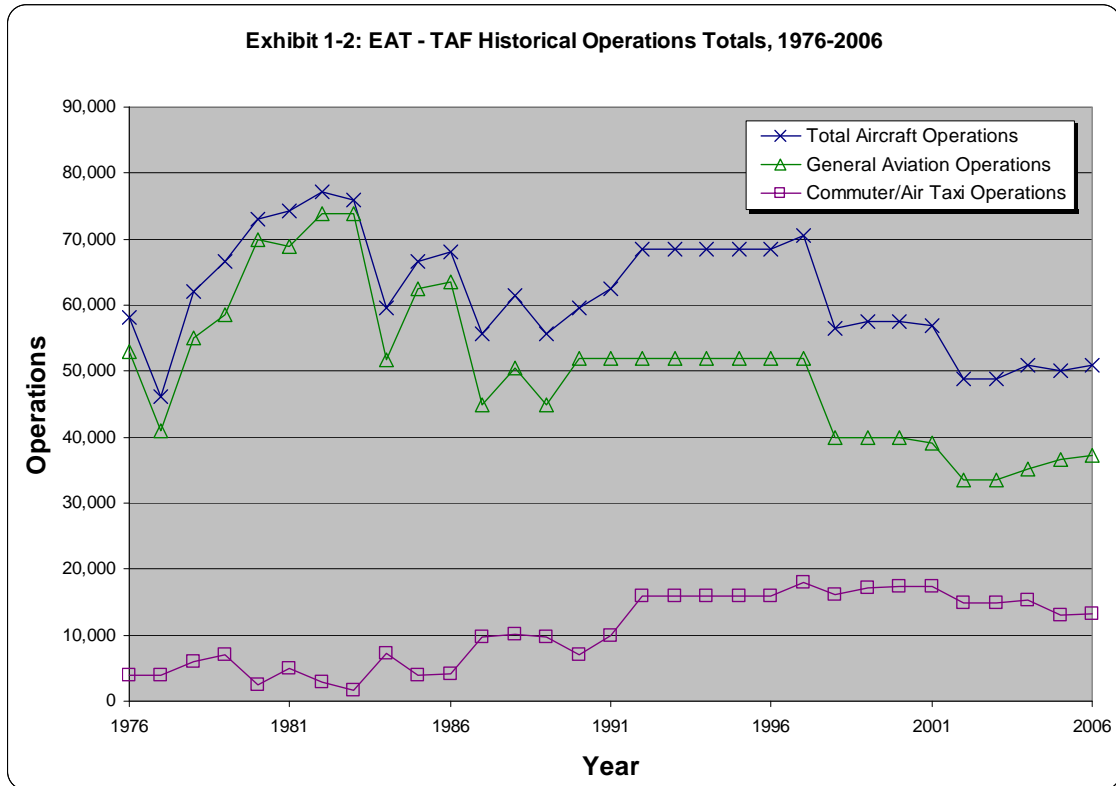
| Year | Total Operations |
|------|------------------|
| 1996 | 68,500 |
| 1997 | 70,500 |
| 1998 | 56,412 |
| 1999 | 57,508 |
| 2000 | 57,616 |
| 2001 | 56,924 |
| 2002 | 48,800 |
| 2003 | 48,800 |
| 2004 | 50,814 |
| 2005 | 50,058 |
| 2006 | 50,832 |

Source: FAA 2006 Terminal Area Forecast

Commuter/air taxi operations are defined as operations by aircraft designed to have a maximum seating capacity of 60 seats or less, or a maximum payload capacity of 18,000 pounds or less, carrying passengers or cargo for hire or compensation. This category includes regional service by commercial airlines, as well as charter operations. Horizon Air, the commercial airline with scheduled passenger service from Wenatchee to Seattle, previously utilized the 37-seat Bombardier Q-200 turboprop aircraft on its Wenatchee flights. Therefore, Horizon's historical operations fall into the commuter/air taxi category. However, Horizon's fleet management plans involve phasing out its Q-200 aircraft and replacing it with the 76-seat Bombardier Q-400 turboprop airplane. The larger Q-400 falls into the FAA's air carrier category, which includes all commercial aircraft of more than 60 seats. As the replacement of the Q-200 with the Q-400 at Pangborn is expected to be complete in October 2008, future Horizon Air operations at Pangborn will be recorded as air carrier operations.

General aviation operations are defined as operations by all civil aircraft, except those classified as air carrier, commuter/air taxi, and military operations. General aviation operations include those conducted by recreational users, non-military government users, business users flying their own aircraft, flight training schools, and fractional-ownership operators.

While total aircraft operations have declined at Pangborn in recent years, this has mainly been due to a trend of reduction in general aviation operations at Pangborn. As shown in **Exhibit 1-2** on the following page, total aircraft operations closely tracked general aviation operations during the late 1970s and early 1980s. During the late 1980s and early 1990s, however, the character of Pangborn changed as general aviation operations decreased somewhat and commuter/air taxi operations increased significantly.



Source: FAA 2006 Terminal Area Forecast

Commuter/air taxi operations have fallen slightly since 2000 for several reasons. First, Horizon Air discontinued its service from Pangborn to Moses Lake in 2001, leaving Seattle as Pangborn's only commercial destination. Second, Horizon Air has reduced their number of operations to increase their load factor. The airline's load factor has consistently been around 80% for the past few years, nearly 30% higher than it was during the 1990s, and continues to exhibit an upward trend.

Finally, Pangborn has experienced what many similar airports have during a volatile time for the airline industry. Following the events of September 11, 2001, airlines reduced their emphases on regional feeder operations that they developed during the 1990s and focused their energies on their core markets at larger airports. Increased fuel costs have also affected Pangborn's aviation activity. As the commercial aviation industry continues to regain its footing, regional markets like the one served by Pangborn are expected to increase in their importance to airlines.

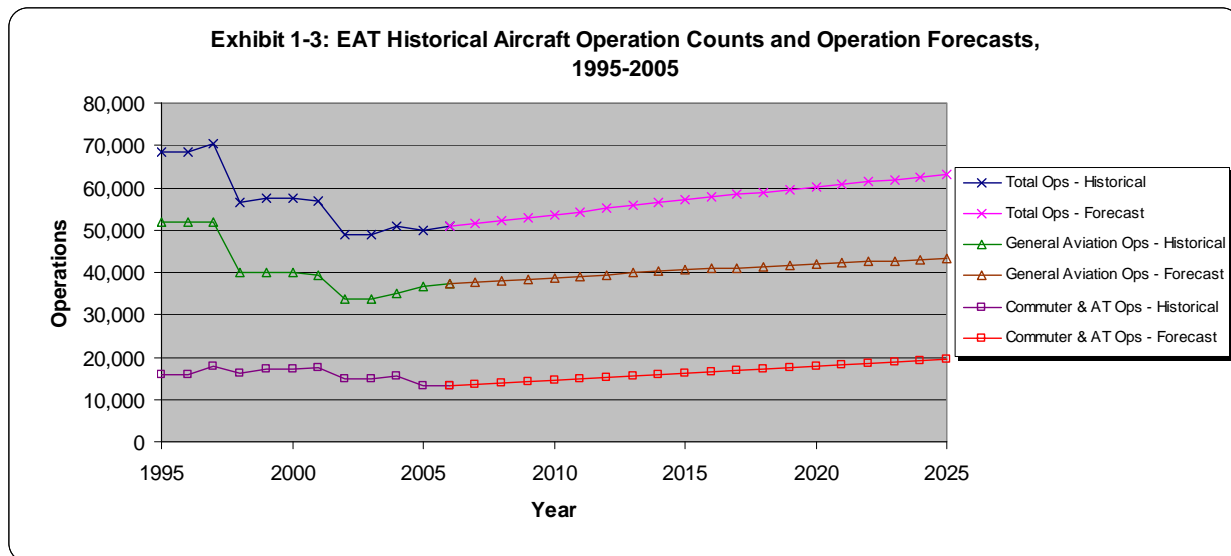
1.2.2 FAA Terminal Area Forecast

Each year, the FAA prepares its Terminal Area Forecast (TAF) for use in their decision-making and planning process. The TAF includes all U.S. airports that have at least one of the following: an airport traffic control tower; commercial airline service; 60,000 itinerant or 100,000 total annual operations; or at least 10 based aircraft. Pangborn Memorial Airport falls into two of these categories, as it has commercial airline service and more than 10 based aircraft. This analysis is based on the 2006 TAF for and projects annual activity through 2025.

The 2006 20-year TAF is shown in **Table 1-4** and depicted graphically in **Exhibit 1-3**. The TAF assumes a consistent 1.55% annual growth rate for total aircraft operations, with similar rates of consistent growth in both general aviation operations and commuter/air taxi operations.

| Year | Commuter/ Air Taxi Operations | C/AT Share | General Aviation Operations | GA Share | Military Operations | Military Share | Total Operations |
|-----------------------|-------------------------------------|---------------|-----------------------------------|-------------|------------------------|-------------------|---------------------|
| 2006 | 13,330 | 26.2% | 37,202 | 73.2% | 300 | 0.6% | 50,832 |
| 2010 | 14,148 | 26.2% | 39,595 | 73.3% | 300 | 0.5% | 54,043 |
| 2015 | 15,243 | 26.1% | 42,808 | 73.4% | 300 | 0.5% | 58,351 |
| 2020 | 16,422 | 26.1% | 46,280 | 73.5% | 300 | 0.4% | 63,002 |
| 2025 | 17,689 | 26.0% | 50,036 | 73.6% | 300 | 0.4% | 68,025 |
| CAGR 2006-2025 | 1.50% | | 1.57% | | 0.00% | | 1.55% |

Source: FAA 2006 Terminal Area Forecast



Source: FAA 2006 Terminal Area Forecast

The TAF predicts that the shares of total operations for general aviation operations and commuter/air taxi operations will remain fairly constant. While the overall growth rate is consistent with historical aviation trends for Pangborn, the TAF does not account for the historical trend of a growing share of total operations being filled by commuter/air taxi operations. The TAF also does not take into account Horizon Air’s future fleet transition strategy, which will lead to many commuter/air taxi operations being transferred to the air carrier category and may incite additional demand due to a greater number of available seats. Furthermore, the TAF does not consider the possibility of additional air carriers initiating service to Pangborn, which would provide more available seats, more convenient scheduling options, and potentially lower ticket prices due to competition.



1.3 Current Airfield

Pangborn Memorial Airport has two runways, primary Runway 12/30 (5,700 feet long and 150 feet wide) and crosswind Runway 7/25 (4,460 feet long and 75 feet wide). Runway 12/30 connects to a full parallel taxiway system, the main terminal apron, aviation businesses, and aircraft storage facilities such as hangars and aprons. A partial parallel taxiway system connects Runway 7/25 to the main passenger terminal area, aviation businesses, and aircraft storage facilities. A former runway on the western side of the airfield has been closed, with a portion of it converted to taxiway.

Due to its greater length and width, navigational aids, instrument approach procedure, and alignment with terrain and prevailing winds, Runway 12/30 is the preferred runway used by most aircraft under most conditions. A significant change in wind direction will generally result in smaller aircraft using crosswind Runway 7/25. Larger aircraft will also occasionally utilize Runway 7/25 as weather conditions require.

Runway 12/30 is an asphalt-paved runway with gross weight bearing capacities of 75,000 pounds for single-wheel landing gear, 100,000 pounds for dual-wheel landing gear, and 250,000 pounds for dual-tandem landing gear. These gross weight bearing capacities are expected to remain adequate for aircraft projected to use the airfield throughout the 20-year planning period, assuming the performance of periodic, routine pavement maintenance.

Runway 12/30 has recently undergone changes to its length, which until 2006 was 5,500 feet. In 2006, due to changes in FAA design criteria and policy, Runway End 12 was relocated 600 feet southwest, and Runway End 30 was relocated 800 feet southwest (with new pavement). This shifting of the runway ends provided the current runway length of 5,700 feet and resulted in 600 feet of unusable pavement beyond Runway End 12.

The airfield at Pangborn currently has an Airport Reference Code (ARC) of B-III, as defined in FAA Advisory Circular (AC) 150/5300-13 *Airport Design*, and as reflected in the 2004 Airport Layout Plan (ALP). The letter contained in the ARC refers to the Aircraft Approach Category, which is a grouping of aircraft based on 1.3 times their stall speed in their landing configuration at the certified maximum flap setting and maximum landing weight in standard atmospheric conditions. The categories are as follows:

- Category A: Speed less than 91 knots
- Category B: Speed of 91 knots or more but less than 121 knots
- Category C: Speed of 121 knots or more but less than 141 knots
- Category D: Speed of 141 knots or more but less than 166 knots
- Category E: Speed of 166 knots or more

The Roman numeral contained in the ARC refers to an aircraft's Airplane Design Group (ADG), which is a grouping of airplanes based on wingspan or tail height. When an airplane is in two categories, the most demanding category should be used. The groups are shown in **Table 1-5**.

| Group | Tail Height (ft) | Wingspan (ft) |
|--------------|-------------------------|----------------------|
| I | <20 | <49 |
| II | 20 - <30 | 49 - <79 |
| III | 30 - <45 | 79 - <118 |
| IV | 45 - <60 | 118 - <171 |
| V | 60 - <66 | 171 - <214 |
| VI | 66 - <80 | 214 - <262 |

Source: FAA AC 150/5300-13 Airport Design

The existing ARC of B-III at Pangborn is based on the current design aircraft, the Bombardier Q-200, that has historically been used by Horizon Air on its daily flights to Seattle-Tacoma International Airport. However, as described in Section 1.2.1, Horizon Air is replacing the Q-200 with the Q-400, which has a faster approach speed. The Q-400 has an ARC of C-III.

The ARC standards do not determine runway length requirements, but do determine runway width requirements, required runway safety area and protection zone dimensions, required separations between runway and taxiway centerlines, and other geometric standards. Required changes in ARC-related airfield dimensional requirements will be discussed in subsequent chapters.

1.4 Airport Users and Airfield Requirements

This section presents information documenting the need for a longer runway to accommodate current and projected demand at Pangborn Memorial Airport. The information contained in this section, taken as a whole, justifies runway improvements at Pangborn. The airfield improvement justification provides the “purpose and need” necessary for a subsequent environmental process and document that would be required to implement a runway improvement project. This section is organized into the following subsections:

- Critical Design Aircraft Needs
- FAA Runway Length Guidance
- Future Additional Airline Aircraft Needs

1.4.1 Critical Design Aircraft Needs

This subsection identifies the key users and critical design aircraft at Pangborn, which are used in subsequent sections to determine runway length requirements at Pangborn. FAA Advisory Circular (AC) 150-5325-4B, *Runway Length Requirements for Airport Design*, defines critical design aircraft as the “the listing of airplanes that results in the longest recommended runway length.” The AC states that the first step to determining a required runway length is to “identify the list of critical design airplanes that will make regular use of the proposed runway for an established planning period of at least five years.” This makes forecasts of critical design aircraft operations the main determinant of runway length requirements. The AC further states that “the design objective for the main primary runway is to provide a runway length for all airplanes that will regularly use it without causing operational weight restrictions.” Thus, all operations that are weight-restricted due to inadequate runway length are considered, regardless of the nature of the weight restrictions.

The information contained herein comes from two key users of Pangborn – Horizon Air and Executive Flight – and is supported by information regarding itinerant corporate jet operations. Both Horizon Air and Executive Flight have long histories at Pangborn and have indicated their existing and expected airfield needs based on current and projected operational activity. The following subsections describe actual and forecasted aircraft operations by critical design aircraft users where runway length has been and is expected to be a limiting factor, based on specific user data. They also provide an overview of the total annual operations by specific aircraft types that will be used to determine a required runway length in subsequent sections.

1.4.1.1 Horizon Air

Portland-based Horizon Air is a commercial passenger carrier airline operating in the northwestern United States and Canada, using a fleet of 70 aircraft as of July 2008, including 20 Bombardier CRJ-700s (76 seats), 33 Bombardier Q-400s (76 seats), and 17 Bombardier Q-200s (37 seats). Horizon Air is the sole commercial passenger airline serving Pangborn, operating the 85 nautical miles between Seattle-Tacoma International Airport four to five times daily using the Q-200 and Q-400. As discussed in Section 1.2.1, Horizon Air is transitioning its fleet, replacing the Q-200 with the Q-400. Currently, an occasional Q-400 serves Pangborn among the usual Q-200s, but the phasing out of the Q-200 for all Horizon routes is expected by October 2008. The ARC is B-III for the Q-200 and C-III for the Q-400.

The service Horizon Air provides to the Wenatchee Valley area is essential. The area has strongly supported existing service with high load factors consistently around 80% for the past few years. Future population and economic growth in the Wenatchee Valley, as discussed in Section 1.1, will only increase the importance of Horizon Air service in particular and scheduled passenger service in general.

As the Q-400 is a larger and faster aircraft than the Q-200, the Q-400 requires a longer runway than the Q-200. However, Pangborn's primary runway length of 5,700 feet is sufficient for Q-400 operations in most weather conditions. During dry, warm weather, the Q-400 can generally take off without limitation on a 5,700-foot runway at temperatures up to 105° F. During dry, cold weather, the Q-400 can take-off without limitation on a 5,700-foot runway at temperatures as low as 41° F.

The presence of weather below 41° F, in combination with precipitation or precipitation-related runway contamination, creates icing conditions, which change aircraft operational requirements. Under icing conditions, the Q-400 requires runway length greater than 5,700 feet, or the aircraft must operate under restrictive weight limitations. These limitations generally require the removal of passengers so the aircraft's weight is reduced to a load that can operate on the available runway. Restricted aircraft operations compromise the efficiency, effectiveness, and overall purpose of Horizon's service to Pangborn. These compromised situations are undesirable and inconvenient, translating to loss of reliability for the community and a loss of revenue for the airline.

The maximum certificated landing weight of the Q-400 is 62,000 pounds. During icing conditions, the Q-400 takes a weight penalty of 3,500 pounds to land on 5,700 feet of runway, reducing the maximum landing weight to 58,500 pounds. During icing conditions, the Q-400 can land at 62,000 pounds on 6,000 feet of runway with no tailwind, and on 6,500 feet with a five knot tailwind. Based on information provided by Horizon Air, they expect to be able to perform most Q-400 operations adequately on a runway length of 6,300 feet.

Based on weather data collected at Pangborn's on-field Automated Surface Observation System (ASOS) and distributed by the National Climatic Data Center, there were an average of 53 days per year from 1997 to 2006 with temperatures below 41° F and precipitation. With Horizon providing four flights daily as of July 2008, an annual average of 212 Q-400 landing operations are projected not to be able to occur at Pangborn without restrictive weight limitations due to inadequate runway length.

The number of daily flights by Horizon Air to and from Pangborn has varied slightly in recent years. In 2006, Horizon provided five daily departures from Wenatchee to Seattle, for a total of 10 daily operations. For a portion of 2006, Horizon reduced the number of departures from five to four. This schedule reduction was primarily related to crew scheduling issues and increased fuel costs. In 2007, Horizon Air returned their schedule to five daily departures. Between April and June of 2008, the airline again reduced its schedule to four daily departures from Pangborn (again, as a temporary measure to respond to higher crew and fuel costs). Looking forward, it is expected that Horizon will maintain a schedule of at least four daily departures with the Q-400 over the next five years. It is further expected that the schedule will increase to five daily departures in the long-term. **Table 1-6** summarizes projected total and restricted operations by Horizon Air at Pangborn over the near- and long-term.

| Table 1-6: Horizon Air – Forecast of Total and Restricted Operations at EAT | | | |
|--|-------------|-------------|-------------|
| Aircraft | 2007 | 2013 | 2028 |
| Total Operations | | | |
| Q-200 Total Operations | 3,102 | 0 | 0 |
| Q-400 Total Operations | 0 | 2,920 | 3,650 |
| Restricted Operations | | | |
| Q-200 Restricted Operations | 0 | 0 | 0 |
| Q-400 Restricted Operations | 0 | 212 | 265 |

Sources: Horizon Air, Mead & Hunt

Horizon Air has indicated in written testimonial (see Appendix A) that to successfully transition its aircraft fleet, maintain and grow its business, and continue its service to Pangborn, a runway length of at least 6,300 feet is needed. Without a runway length of 6,300 feet, 212 annual Horizon Air operations are adversely affected in the near-term (assuming a schedule with four daily departures).

1.4.1.2 Executive Flight

Executive Flight, Inc. is a charter jet, air ambulance, and aircraft storage and maintenance service provider based at Pangborn. The company's 65,000 square foot headquarters is located on the west side of the airfield, adjacent to the Pangborn Airport Business & Technology Park. This subsection provides a summary of the data provided by Executive Flight.

Executive Flight owns seven jet aircraft based at Pangborn: three Learjet 35A aircraft, two Learjet 31A aircraft, one Learjet 60, and one Canadair Challenger 600. The company also owns four additional Learjet 35A aircraft based at King County International Airport in Seattle, which are used regularly to conduct air ambulance operations to and from Pangborn. The ARC is C-I for the Learjets and C-II for the Challenger. Until October 2007, the company also owned and operated two Gulfstream Commander 840 turboprop airplanes for air ambulance operations. These air ambulance operations are now conducted with the company's Learjet 30 Series aircraft.

In 2007, Executive Flight conducted 1,754 aircraft operations at Pangborn. The distribution of these operations among the different aircraft types is displayed in **Table 1-7**.

| Table 1-7: Distribution of Executive Flight Aircraft Operations at EAT in 2007 | |
|---|-------------------|
| Aircraft | Operations |
| Learjet 31A & 35A | 1,436 |
| Learjet 60 | 110 |
| Canadair Challenger 600 | 92 |
| Gulfstream Commander 840 | 116 |
| Total | 1,754 |

Source: Executive Flight

The Learjet 31A and Learjet 35A operations are consolidated, as these aircraft have very similar performance characteristics and are used for similar missions. Executive Flight estimates its typical haul length at 300 nautical miles, with actual lengths ranging from 38 to 1,803 nautical miles. The Learjet 60 was added to the fleet in 2005, and there are plans to acquire another in the near future, which will lead to high annual growth in Learjet 60 operations. Acquisition of an additional Learjet 31A in the near future is anticipated to replace one of the Learjet 35As.

Executive Flight is frequently required to reduce an aircraft's useful load to complete operations at Pangborn, due to runway length restrictions given weather conditions at the time of the operation. During such situations, payload is reduced, and/or a fuel stop is added during the mission. Although Executive Flight has built considerable flexibility into its business model to deal with these situations, in some cases they are unable to adjust their load sufficiently to carry out the operation. The weight restrictions the company experiences due to inadequate runway length have significant impacts on Executive Flight's ability to fully suit their customers' needs. The restrictions also have significant implications for the company's ability to maximize operational efficiency by taking off with an ideal fuel load, as acquiring another company's fuel at another airport is more costly and less convenient than using their own fuel.

The extent to which weather conditions affect Executive Flight's aircraft operations varies by aircraft type, mission purpose, and stage length (travel distance). Stage lengths for Executive Flight aircraft takeoff operations in 2007, excluding those for the Commander 840, are listed in **Table 1-8**.

| Aircraft | Flights of less than 80 nm | Flights of 80 to 300 nm | Flights of greater than 300 nm |
|-------------------|-----------------------------------|--------------------------------|---------------------------------------|
| Learjet 31A & 35A | 224 | 410 | 84 |
| Learjet 60 | 13 | 36 | 6 |
| Challenger 600 | 9 | 20 | 17 |
| Total | 246 | 466 | 107 |

Source: Executive Flight

Executive Flight staff indicates that weight-restricted takeoff operations typically occur only at stage lengths of 80 nautical miles or greater. The company analyzed the 573 takeoffs for trips of 80 nautical miles or greater to determine an approximate number of weight-restricted departures. All 819 landing operations by these aircraft were analyzed, as stage length does not affect required runway length for landings. Although the company indicated that many landings by the Commander 840 aircraft were also restricted, these operations were omitted from analysis as Executive Flight will no longer use this aircraft.

Weight restrictions for aircraft operations are usually due to runway length requirements during warm weather conditions, wet runway conditions, and conditions when the runway is contaminated with ice or snow. Executive Flight identified the weather conditions listed in **Table 1-9** as situations in which they are required to adjust useful load to conduct takeoff operations. Weather conditions are grouped into two main categories: hot day runway conditions, and wet/contaminated runway conditions. The annual frequency of these weather conditions were estimated based on historical averages for the years 1997 to 2006, provided by Pangborn's on-field Automated Surface Observation System (ASOS).

| Table 1-9: Historical Weather Conditions at EAT 1997-2006 | | |
|---|------------------------------|---------------------------|
| Weather Condition | Average Days per Year | Percentage of Year |
| Wet/contaminated runway | | |
| Moderate contamination ($\leq 32^\circ$ with precipitation) | 19 | 5.2% |
| Icing conditions ($\leq 40^\circ$ & $> 32^\circ$ with precipitation) | 30 | 8.2% |
| Wet runway ($> 40^\circ$ with precipitation) | 70 | 19.2% |
| Hot day runway | | |
| Greater than 75° but less than 90° | 70 | 19.2% |
| Greater than or equal to 90° | 37 | 10.1% |

Source: NOAA National Climatic Data Center

Applying the weather conditions in Table 1-9 to aircraft flight manual performance data, Executive Flight estimates that approximately 423 operations (120 takeoffs and 303 landings) of their aircraft were weight-restricted in 2007 due to insufficient runway length at Pangborn. Restricted operation calculations are based on ideal takeoff weights for the two stage length categories greater than 80 nautical miles, or on ideal landing weights. The restricted operations estimates for each category are listed in **Table 1-10** alongside a median runway length requirement for these operations. Calculations and aircraft performance data used to determine the runway length requirements in Table 1-10 are contained in Appendix B.

| Table 1-10: Executive Flight's Restricted Operations at EAT in 2007 | | | | | |
|--|-----------------------------------|----------------------------|----------------------------|------------------------------------|---|
| Aircraft | Weather condition category | Restricted Takeoffs | Restricted Landings | Total Restricted Operations | Median Runway Length Requirement |
| Learjet 31A & 35A | Wet/contaminated runway | 67 | 234 | 301 | 7,200 feet |
| | Hot day runway | 25 | 0 | 25 | 6,800 feet |
| Learjet 60 | Wet/contaminated runway | 4 | 16 | 20 | 7,433 feet |
| | Hot day runway | 1 | 0 | 1 | 6,350 feet |
| | Dry runway | 0 | 39 | 39 | 6,384 feet |
| Challenger 600 | Wet/contaminated runway | 12 | 14 | 26 | 7,600 feet |
| | Hot day runway | 11 | 0 | 11 | 6,400 feet |
| Total | | 120 | 303 | 423 | |

Sources: Executive Flight, Aircraft Flight Manual Performance Data

Executive Flight is a Federal Aviation Regulations (FAR) Part 135 on-demand operator and is required to comply with regulations contained in FAR Part 135. Section 135.385 of these regulations addresses landing limitations and is commonly known as the "60 percent rule", as it requires aircraft to come to a full stop landing within 60 percent of the effective length of a runway. Furthermore, on wet runways an additional 15 percent requirement applies. Section 135.385 is the driving force behind Executive Flight's weight-restricted landing operations and their median runway length requirements in Table 1-10. Section 135.385 text and calculations are included in Appendix B.

Executive Flight has written in their testimonial/documentation (see Appendix B) that to successfully maintain and grow its business, and to continue and expand its aircraft operations at and charter service to Pangborn, a runway length of 7,000 feet is needed.

1.4.1.3 Itinerant Corporate Users

To determine aircraft types, trip frequencies, operational trends, and airfield needs at Pangborn, airport user survey forms were prepared and distributed to approximately 100 local (based at Pangborn) and itinerant (based at another airport) Airport users other than Horizon Air and Executive Flight. The survey instrument is included in Appendix D. The survey was also made available in the airport terminal and in on-airport businesses. The survey solicited information about users' current and desired aircraft, operating weights, stage lengths, accelerate/stop distances, insurance requirements, and historical operations. Completed surveys were received from 24 users, and follow-up correspondence was conducted via telephone and electronic mail with an additional 17 users of demanding aircraft types. Other operational information was obtained from service records of Pangborn's fixed-base operator (FBO) Wings of Wenatchee and from airport hangar tenant lists.

The user survey results, FBO records, and airport hangar tenant lists indicate that Pangborn supports several daily air cargo operations and significant numbers of small general aviation aircraft, businesses, facilities, and services. However, these users are not currently limited by the existing runway length, nor are they expected to be in during the 20-year planning period. These users are expected to benefit from a longer runway, but will not be considered in the justification for such an improvement.

Corporate users, both based and itinerant, utilize Pangborn to conduct business, transporting people to facilities and meetings for the purpose of gathering information, making decisions, and taking action. These trips are conducted in personal and time-sensitive situations when automobile or commercial air travel will not suffice. Data collection shows that a number of corporate turbojet aircraft frequent Pangborn, and this corporate traffic shows signs of growth. **Table 1-11** lists the itinerant corporate aircraft that require greater than 5,700 feet of runway, the number of confirmed operations by these aircraft at Pangborn in 2007, and projected operations for the 5- and 20-year planning periods. The ARC classifications for these aircraft range from B-II to C-III.

| Table 1-11: Itinerant Corporate Operations at EAT by Aircraft Requiring Greater than 5,700 feet of Runway | | | | | |
|--|---|-------------------------------|-----------------------------------|---------------------------|---------------------------|
| Aircraft Make/Model | Required Runway Length | | Total Itinerant Operations | | |
| | Sea Level/ Standard Day Temperature* | Adjusted for EAT** | 2007 Actual | 2013 Projected | 2028 Projected |
| Bombardier BD-700 | 6,300 ft | 8,126 ft | 2 | 4 | 9 |
| Gulfstream G-V | 6,110 ft | 7,884 ft | 8 | 14 | 36 |
| Gulfstream G200 | 6,080 ft | 7,846 ft | 4 | 7 | 18 |
| Dassault Falcon 900 | 5,880 ft | 7,472 ft | 8 | 14 | 36 |
| Dassault Falcon 900 EX | 5,880 ft | 7,472 ft | 2 | 4 | 9 |
| Canadair Challenger 600 | 5,700 ft | 7,363 ft | 2 | 4 | 9 |
| Canadair Challenger 604 | 5,700 ft | 7,363 ft | 26 | 47 | 117 |
| Embraer Legacy 600 | 5,551 ft | 7,174 ft | 12 | 21 | 54 |
| Rockwell Sabreliner 65 | 5,450 ft | 7,046 ft | 2 | 4 | 9 |
| Hawker-Siddeley 125 | 5,380 ft | 6,957 ft | 2 | 4 | 9 |
| Learjet 55B | 5,310 ft | 6,868 ft | 2 | 4 | 9 |
| Israel 1125 Westwind Astra | 5,300 ft | 6,855 ft | 6 | 11 | 27 |
| Gulfstream G-III | 5,280 ft | 6,830 ft | 4 | 7 | 18 |
| Gulfstream G-IV | 5,280 ft | 6,830 ft | 14 | 25 | 63 |
| Cessna Citation X | 5,140 ft | 6,652 ft | 34 | 61 | 154 |
| Hawker-Siddeley 800XP | 5,030 ft | 6,512 ft | 16 | 28 | 72 |
| Learjet 36A | 5,000 ft | 6,474 ft | 8 | 14 | 36 |
| Learjet 35A | 5,000 ft | 6,474 ft | 2 | 4 | 9 |
| Cessna Citation VII | 4,850 ft | 6,283 ft | 2 | 4 | 9 |
| Canadair Challenger 300 | 4,810 ft | 6,232 ft | 2 | 4 | 9 |
| Total Itinerant Ops Requiring Greater than 5,700 feet of Runway | | | 158 | 283 | 712 |

Sources: Airport User Survey, FBO Records, Aviation Week & Space Technology Aerospace Source Books

*Standard Day Temperature is 59° F at mean sea level and 54.7° F at Pangborn

**Sea Level/Standard Day Temperature runway length requirement adjusted for Pangborn's elevation, mean daily maximum temperature of the hottest month, and maximum difference in runway centerline elevation

The FAA design objective for main primary runways, as stated in AC 150/5325-4B, "is to provide a runway length for all airplanes that will regularly use it without causing operational weight restrictions." The runway length requirements for these aircraft at maximum takeoff weight are published as FAA takeoff field lengths. FAA takeoff field lengths for each aircraft, listed as the Sea Level/Standard Day Temperature Required Runway Length in Table 1-11, were adjusted using the FAA runway length calculator to arrive at runway length requirements specific to Pangborn. The FAA runway length calculator applies the following three adjustment factors to the FAA Takeoff Field Length:

- An increase of 7% in length for each 1,000' of airport elevation above mean sea level (the airport elevation at Pangborn is 1249');

- An increase of 0.5% in length for each degree of the mean daily maximum temperature for the hottest month above the standard day temperature (the mean daily maximum temperature for Pangborn is 88.6° F); and
- An increase of 10 feet in length for each foot difference between the maximum and minimum elevations of the runway centerline (the difference is 11 feet for Runway 12/30).

As shown in Table 1-11, 158 itinerant corporate operations are confirmed to have occurred at Pangborn in 2007 by aircraft with runway length requirements greater than 5,700 feet. Operations by these aircraft were projected for the 5-year and 20-year planning periods using the expected 10.2 percent annual growth rate in business jet hours published by the FAA in *FAA Aerospace Forecast: Fiscal Years 2006-2017* for the years 2008 through 2018. A more conservative 5 percent growth rate in operations was applied for the years 2019 through 2028. These growth rates lead to 283 itinerant operations by these aircraft at Pangborn in 2013, and 712 operations in 2028.

Fractional jet ownership companies such as NetJets, Flight Options, CitationShares, and Bombardier FlexJet operate an assortment of corporate jets at Pangborn. However, the type of aircraft and frequency of use are owner-driven, making it difficult for the fractional operators to estimate the number of trips with a specific aircraft, and the seasonal distribution of those flights. In 2007, NetJets conducted 36 operations at Pangborn, 12 of these with the Cessna Citation X. NetJets is not able to operate its two largest aircraft – the Gulfstream G-V and the Boeing Business Jet – at Pangborn due to insufficient runway length. Between 2003 and 2007, Flight Options conducted an average of 80 annual operations at Pangborn. The *FAA Aerospace Forecast: Fiscal Years 2006-2017* projects operations by fractional ownership companies will contribute a considerable portion of the expected 10.2 percent annual increase in business jet hours.

In addition to the calculated runway lengths in Table 1-11, some users responded with runway length requirements specific to their aircraft operations practices. Eight corporate users indicated ideal runway lengths greater than the current 5,700 foot length. Seven of these users indicated an ideal runway length between 6,000 and 7,500 feet, and one user indicated 9,000 feet. These users and their stated ideal runway lengths are listed in **Table 1-12**.

| Table 1-12: Corporate Users with Ideal Runway Lengths Greater than 5,700 feet | | | |
|--|-------------------------|---------------|----------------------------|
| Airport User Company Name | Current Aircraft | Base | Ideal Runway Length |
| Avista Corporation | Cessna Citation VII | Spokane, WA | 9,000 feet |
| Nordstrom, Inc. | Challengers 300 & 604 | Seattle, WA | 7,000 feet |
| The Buckle, Inc. | Cessna Citations I & X | Kearney, NE | 7,000 feet |
| The Pacific Institute Aviation Corp | Gulfstream G-III | Seattle, WA | 7,000 feet |
| Flight Options, LLC | Various | Cleveland, OH | 6,500 to 7,500 feet |
| Duncan Aviation | Cessna Citation III | Lincoln, NE | 6,000 to 7,000 feet |
| Costco Wholesale | Gulfstream G-V | Seattle, WA | 6,000 to 7,000 feet |
| Wilson Construction Co. | Cessna CJ-1 | Aurora, OR | 6,000 feet |
| Bethlehem Construction | Cessna Citation 500 | Wenatchee, WA | 6,000 feet |

Source: Airport User Survey

For corporate users to successfully maintain and grow their businesses, and continue and expand their aircraft operations at Pangborn, a runway length greater than 5,700 feet will be required.

1.4.1.4 Summary of Critical Design Aircraft Needs

A benchmark of 500 annual critical design aircraft operations is defined by AC 150-5325-4B, *Runway Length Requirements for Airport Design*, as a “substantial use threshold” for airfield improvements. The collected analyses of operations by Horizon Air, Executive Flight, and itinerant corporate users demonstrate that there were 581 weight-restricted aircraft operations at Pangborn in 2007 requiring a runway length greater than 5,700 feet. The total of 581 restricted operations in 2007 exceeds the FAA’s “substantial use threshold” of 500 operations for airfield improvements. Summarized forecasts of these operations and their runway length requirements are contained in Table 1-21 of Section 1.5.

1.4.2 FAA Runway Length Guidance

The FAA provides guidance for determining required runway lengths in Advisory Circular (AC) 150/5325-4B, *Runway Length Requirements for Airport Design*. The goal of the AC is “to construct an available runway length for new runways or extensions to existing runways that is suitable for the forecasted critical design airplanes.” This section applies the aircraft operations data presented in Section 1.4.1 to the methodology described in AC 150/5325-4B to determine runway length requirements at Pangborn Memorial Airport. The results of this methodology demonstrate the need for a primary runway length of 7,000 feet at Pangborn.

The first step in the AC's five-step "Procedure and Rationale for Determining Recommended Runway Lengths" is to identify the list of critical design aircraft that will make regular use of the proposed runway for an established planning period of at least five years. The critical design aircraft were identified by user consultation and the survey instrument as described in Section 1.4.1, and are listed in **Table 1-13**.

The second step in the FAA runway length determination procedure is to identify the airplanes that will require the longest runway lengths at maximum certificated takeoff weight (MTOW). The methods contained in AC 150/5325-4B provide runway length determination procedures for three separate categories of aircraft: Small Airplanes with MTOW of 12,500 Pounds or Less, Large Airplanes with a MTOW up to and including 60,000 Pounds, and Large Airplanes with a MTOW of More than 60,000 Pounds. For the purpose of these definitions, a Large Airplane is defined as an airplane with a MTOW of more than 12,500. All of the critical design aircraft in Table 1-13 fall into the second or third categories.

| Table 1-13: Critical Design Aircraft at EAT | | |
|--|-------------|------------|
| Aircraft Make/Model | MTOW | ARC |
| Bombardier BD-700 | 95,000 lbs | C-III |
| Gulfstream G-V | 90,900 lbs | C-III |
| Gulfstream G-IV | 73,200 lbs | C-II |
| Gulfstream G-III | 70,200 lbs | C-II |
| Bombardier Q-400 | 64,500 lbs | C-III |
| Embraer Legacy 600 | 49,604 lbs | C-II |
| Dassault Falcon 900EX | 48,300 lbs | C-II |
| Canadair Challenger 604 | 47,600 lbs | C-II |
| Dassault Falcon 900 | 45,500 lbs | B-II |
| Canadair Challenger 600 | 40,125 lbs | C-II |
| Canadair Challenger 300 | 39,000 lbs | B-II |
| Cessna Citation X | 35,700 lbs | C-II |
| Gulfstream G200 | 35,600 lbs | C-II |
| Hawker-Siddeley 800XP | 28,000 lbs | C-II |
| Rockwell Sabreliner 65 | 24,000 lbs | B-II |
| Israel 1125 Westwind Astra | 23,500 lbs | C-I |
| Learjet 60 | 23,500 lbs | C-I |
| Hawker-Siddeley 125 | 23,300 lbs | C-II |
| Cessna Citation VII | 22,450 lbs | C-II |
| Learjet 55B | 21,500 lbs | C-I |
| Learjet 36A | 18,300 lbs | C-I |
| Learjet 35A | 18,300 lbs | C-I |
| Learjet 31A | 17,200 lbs | C-I |

Source: Airport Planning Manuals, Aviation Week & Space Technology Aerospace Sourcebooks, Airport User Survey, FBO records

Five of the 23 critical design aircraft identified in Table 1-13 are “Large Airplanes with a MTOW of More than 60,000 Pounds”. For these airplanes, the AC requires detailed runway length requirement documentation for each individual aircraft. Four of these five aircraft are jet airplanes operated by itinerant users, and one is the Q-400 turboprop airplane operated by Horizon Air. The four jet aircraft in this category only accounted for 28 combined, documented operations at Pangborn in 2007. As discussed in Section 1.4.2.1, Pangborn’s current primary runway length is sufficient for takeoff of the Q-400 in most weather conditions. Due to the infrequency of use by the four jet aircraft in this category, as well as the lack of additional required takeoff length for Horizon Air’s Q-400, the runway length determination procedure for “Large Airplanes with a MTOW of More than 60,000 Pounds” is not appropriate to use for Pangborn under the FAA methodology.

The remaining 18 of the 23 critical design aircraft identified in Table 1-13 are “Large Airplanes with a MTOW up to and including 60,000 Pounds”. For these airplanes, detailed runway length requirement documentation for each aircraft is *not* required and the runway length requirements are determined by a family grouping method. As documented in Section 1.4.1, there were 1,768 operations by these 18 aircraft at Pangborn in 2007. Of these 1,768 operations, 1,638 were conducted by the local charter operator Executive Flight and 130 were conducted by a collection of jet aircraft based at other airports. Due to the frequency of use by these 18 aircraft at Pangborn and their demanding runway length requirements, the runway length determination procedure for “Large Airplanes with a MTOW up to and including 60,000 Pounds” is appropriate to use for Pangborn under the FAA methodology.

The third step in the FAA runway length determination procedure is to select the method that will be used for establishing the required runway length. For “Large Airplanes with a MTOW up to and including 60,000 Pounds”, the required runway length is determined according to a family grouping of airplanes having similar performance characteristics and operating weights. The FAA provides four family groupings for which runway length requirements are determined under this method: 75 percent of fleet at 60% useful load, 75 percent of fleet at 90% useful load, 100 percent of fleet at 60% useful load, and 100 percent of fleet at 90% useful load.

The term “percent of fleet” refers to two separate subcategories of aircraft within the category “Large Airplanes with a MTOW up to and including 60,000 Pounds.” Specific airplanes within these two subcategories are listed in Tables 3-1 and 3-2 of AC 150/5325-4B. The two subcategories are referred to in these tables as (1) the “Airplanes that Make Up 75 Percent of the Fleet” and (2) the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet.” The first subcategory is defined in AC 150/5325-4B as those airplanes requiring “less than 5,000 feet” of runway “at mean sea level and at the standard day temperature of 59° F”, and is also referred to in the AC as “75 percent of fleet.” The second subcategory is defined in AC 150/5325-4B as those airplanes requiring “at least 5,000-foot runways” at mean sea level and at the standard day temperature of 59° F, and make up 100 percent of “Large Airplanes with a MTOW up to and including 60,000 Pounds” when combined with the “Airplanes that Make Up 75 Percent of the Fleet.”

The runway lengths determined for “75 percent of fleet” using the FAA methodology satisfy the operational requirements of the “Airplanes that Make Up 75 Percent of the Fleet”, while the runway lengths determined for “100 percent of fleet” satisfy the operational requirements of all “Large Airplanes with a MTOW up to and including 60,000 Pounds.” It should be noted that the operations of the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet” are counted towards the “substantial use threshold” for the “75 percent of fleet” runway length requirements in this analysis, but the operations of the “Airplanes that Make Up 75 Percent of the Fleet” are not counted towards the “substantial use threshold” for the “100 percent of fleet” runway length requirements. This is because the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet” require longer runways than the “Airplanes that Make Up 75 Percent of the Fleet.”

Of the 18 critical design aircraft for Pangborn that are “Large Airplanes with a MTOW up to and including 60,000 Pounds”, six are “Airplanes that Make Up 75 Percent of the Fleet”, nine are the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet”, and three are not subcategorized by the AC (the Embraer Legacy 600, the Gulfstream G200, and the Hawker-Siddeley 125). It should be noted that although there are three aircraft that are not subcategorized by the AC, these three aircraft are, by definition, “Large Airplanes with a MTOW up to and including 60,000 Pounds.” For the purpose of this analysis, these three aircraft are included as part of the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of the Fleet.”

Of the 1,768 operations conducted at Pangborn in 2007 by the 18 “Large Airplanes with a MTOW up to and including 60,000 Pounds”, 1,458 were conducted by “Airplanes that Make Up 75 Percent of the Fleet” and 310 were conducted by the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet”. Since the 310 annual operations by the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet” do not exceed the “substantial use threshold” of 500 annual operations for airfield improvements, the “100 percent of fleet” runway length requirements are not justified. Since there were a total of 1,768 operations by “Large Airplanes with a MTOW up to and including 60,000 Pounds” – 1,458 of which were conducted by “Airplanes that Make Up 75 Percent of the Fleet” – the “75 percent of fleet” runway length requirements are justified.

The AC methodology yields required runway lengths for two distinct family groupings within the “75 percent of fleet” subcategory. These family groupings further divide aircraft operations within the subcategory based on useful loads. Useful load is the difference between the maximum allowable structural gross weight and the operating empty weight of an aircraft. In short, useful load consists of passengers, cargo, and useable fuel. Of the 1,458 operations conducted by “Airplanes that Make Up 75 Percent of the Fleet” at Pangborn in 2007, 1,436 were conducted by Executive Flight’s Learjet 30 Series aircraft. According to Executive Flight, 988 of these 1,436 operations were conducted at stage lengths of 80 nautical miles or greater. When operating at stage lengths of 80 nautical miles or greater, Executive Flight typically carries greater than 60% useful load, with the exception of test and training flights. According to Paragraph 303 of AC 150/5325-4B, the 60% useful load curve “is to be used for those airplanes operating with no more than a 60 percent load factor.” As a result, these 988 operations qualify for inclusion in the “75 percent of fleet at 90% useful load” family grouping.

Of the 310 operations conducted by the “Remaining 25 Percent of Airplanes that Make Up 100 Percent of Fleet” at Pangborn in 2007, 202 were conducted by Executive Flight’s Challenger 600 or Learjet 60. According to Executive Flight, 158 of these 202 operations were conducted at stage lengths of 80 nautical miles or greater. When operating at stage lengths of 80 nautical miles or greater, Executive Flight typically carries greater than 60% useful load, with the exception of test and training flights. As a result, these 158 operations qualify for inclusion in the “100 percent of fleet at 90% useful load” family grouping.

Table 1-14 lists the operations conducted in 2007 by “Large Airplanes with a MTOW up to and including 60,000 Pounds” at greater than 60% useful load. These operations are broken down by aircraft type and subcategory. For the purpose of this analysis, all of the itinerant jet operations listed in the table are assumed to have occurred at MTOW.

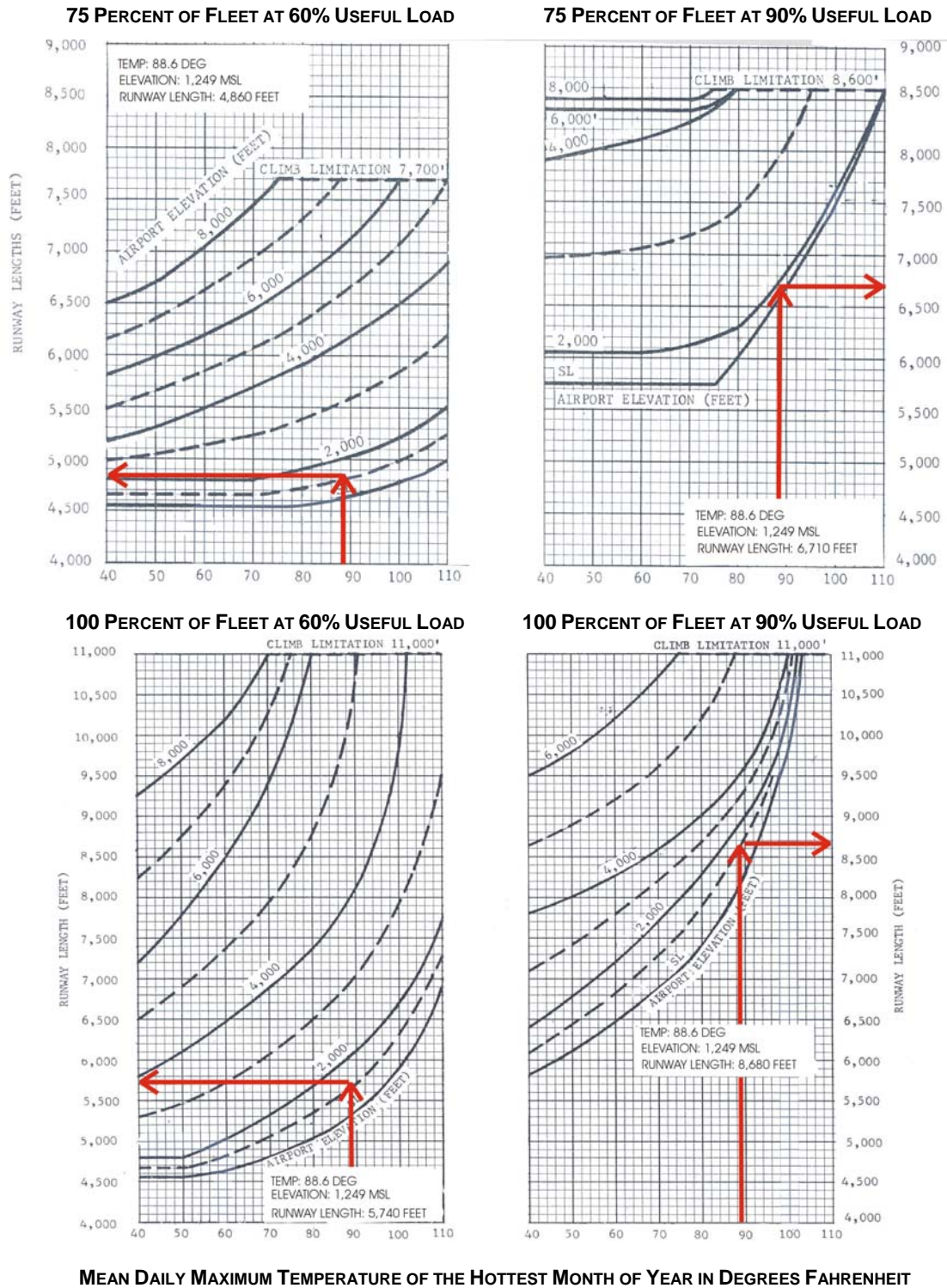
| Table 1-14: Operations by "Large Airplanes with a MTOW up to and including 60,000 Pounds" at greater than 60% Useful Load | | | | |
|--|------------------|--|-----------------------|-----------------------|
| Aircraft Make/Model | User | Total Operations over 60% Useful Load | | |
| | | 2007 Actual | 2013 Projected | 2028 Projected |
| Airplanes that Make Up 75 Percent of the Fleet | | | | |
| Learjet 30 Series | Executive Flight | 988 | 1,324 | 2,753 |
| Learjet 36 | Itinerant | 8 | 14 | 36 |
| Learjet 35A | Itinerant | 2 | 4 | 9 |
| Cessna Citation VII | Itinerant | 2 | 4 | 9 |
| Challenger 300 | Itinerant | 2 | 4 | 9 |
| Dassault Falcon 900 | Itinerant | 8 | 14 | 36 |
| Total Operations by 75 Percent of Fleet | | 1,010 | 1,364 | 2,852 |
| Remaining 25 Percent of Airplanes the Make Up 100 Percent of Fleet | | | | |
| Challenger 600 | Executive Flight | 74 | 98 | 206 |
| Learjet 60 | Executive Flight | 84 | 111 | 234 |
| Dassault Falcon 900 EX | Itinerant | 2 | 4 | 9 |
| Challenger 600 | Itinerant | 2 | 4 | 9 |
| Challenger 604 | Itinerant | 26 | 47 | 117 |
| Rockwell Sabreliner 65 | Itinerant | 2 | 4 | 9 |
| Learjet 55B | Itinerant | 2 | 4 | 9 |
| Israel 1125 Westwind Astra | Itinerant | 6 | 11 | 27 |
| Cessna Citation X | Itinerant | 34 | 61 | 154 |
| Hawker-Siddeley 800XP | Itinerant | 16 | 28 | 72 |
| Gulfstream G200 | Itinerant | 4 | 7 | 18 |
| Embraer Legacy 600 | Itinerant | 12 | 21 | 54 |
| Hawker-Siddeley 125 | Itinerant | 2 | 4 | 9 |
| Total Operations by Remaining 25 Percent of Fleet | | 266 | 404 | 927 |
| Total | | 1,276 | 1,768 | 3,779 |

Sources: Executive Flight, Airport User Survey, FBO Records

As shown in the Table 1-14, 1,010 documented operations were conducted in 2007 at Pangborn by aircraft in the family grouping “75 percent of fleet at 90% useful load”. Further, there were 266 operations by other aircraft in the category “Large Airplanes with a MTOW up to and including 60,000 Pounds” at greater than 60% useful load. As a result, there were 1,276 operations in 2007 that are counted towards the runway length requirement for the “75 percent of fleet at 90% useful load” family grouping. This number of operations exceeds the “substantial use threshold” of 500 annual operations required by AC 150/5325-4B.

The fourth step in the FAA runway length determination procedure is to select the required runway length from four runway lengths generated by utilizing family grouping performance charts found in AC 150/5325-4B. The performance charts from the AC are shown in **Exhibit 1-4**. The arrows on the performance charts represent runway length requirement calculations for Pangborn based on zero wind, zero runway gradient, and a dry runway. The family grouping performance charts determine runway length based on two factors: 1) mean daily maximum temperature of the hottest month at the airport, and 2) airport elevation. The mean daily maximum temperature for the hottest month (July) at Pangborn is 88.6° F, and the airport elevation is 1,249 feet above mean sea level (MSL).

Exhibit 1-4: Family Grouping Performance Charts for “Large Airplanes with a MTOW up to and including 60,000 Pounds”



MEAN DAILY MAXIMUM TEMPERATURE OF THE HOTTEST MONTH OF YEAR IN DEGREES FAHRENHEIT

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design



To supplement the performance charts in Exhibit 1-4, the FAA has developed a computer application which assists in determining accurate runway length requirements. The computer model adjusts for runway gradient, adding 10 feet in runway length for each one foot difference between the highest and lowest point on the runway centerline. As this difference is 11 feet for Pangborn's Runway 12/30, the model adds 110 feet to the lengths determined from the performance charts. The required runway length results from the performance charts and the computer model are shown in **Table 1-15**. Both assume zero wind and a dry runway surface.

| Table 1-15: FAA Runway Length Requirements for "Large Airplanes with a MTOW of up to and including 60,000 Pounds" at EAT | | |
|---|---|--|
| Performance Category | Required runway length at EAT without runway gradient adjustment | Required runway length at EAT with runway gradient adjustment |
| 75 percent of fleet at 60% useful load | 4,860 feet | 4,970 feet |
| 75 percent of fleet at 90% useful load | 6,710 feet | 6,820 feet |
| 100 percent of fleet at 60% useful load | 5,740 feet | 5,850 feet |
| 100 percent of fleet at 90% useful load | 8,680 feet | 8,790 feet |

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

As stated previously, the required runway length for the family grouping "75 percent of fleet at 90% useful load" is justified based on the 1,276 operations by "Large Airplanes with a MTOW up to and including 60,000 Pounds" at greater than 60% useful load. The required runway length for this family grouping at Pangborn is 6,820 feet.

The fifth and final step in the FAA runway length determination procedure is to apply any necessary adjustments to the runway lengths obtained in step four. The performance charts assume zero wind, a dry runway surface, and a zero effective runway gradient. There is no allowable adjustment for wind. The adjustment for runway gradient was included in the FAA runway length requirement computer model output shown in Table 1-15. For turbojet aircraft landing operations, regulation provides for an increase in required runway length to accommodate wet or slippery runway conditions. Of the 1,276 operations in 2007 by "Large Airplanes with a MTOW up to and including 60,000 Pounds", 638 were landing and 638 were takeoffs. For runway lengths obtained from the 60% useful load curves in Exhibit 1-4, and adjusted for runway gradient in Table 1-14, the increase provided for landing operations is 15% or up to a 5,500-foot runway length, whichever is less. If the gradient-adjusted runway length exceeds 5,500 feet, no adjustment is provided. For runway lengths obtained from the 90% useful load curves and adjusted for runway gradient, the increase provided for landing operations is 15% or up to a 7,000-foot runway length, whichever is less. If the gradient-adjusted runway length exceeds 7,000 feet, no adjustment is provided. The resulting wet or slippery condition-adjusted required runway lengths for turbojet-powered airplane landing operations are shown in **Table 1-16**.

| Table 1-16: FAA Runway Length Requirements for landing operations of turbojet-powered "Large Airplanes with a MTOW up to and including 60,000 Pounds" on wet or slippery runways | |
|---|--------------------------------------|
| Performance Category | Required runway length at EAT |
| 75 percent of fleet at 60% useful load | 5,500 feet |
| 75 percent of fleet at 90% useful load | 7,000 feet |
| 100 percent of fleet at 60% useful load | 5,850 feet |
| 100 percent of fleet at 90% useful load | 8,800 feet |

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

In summary, based on the methodology outlined in the FAA's AC 150/5325-4B, a runway length of 7,000 feet is justified for accommodating the family grouping "75 percent of fleet at 90% useful load", which includes "the airplanes that will require the longest runway lengths at maximum certificated takeoff weight." This length is justified by 638 documented landing operations by "Large Airplanes with a MTOW up to and including 60,000 Pounds" at greater than 60% useful load at Pangborn in 2007. For long-term planning, the required runway length of 8,790 feet for the family grouping "100 percent of fleet at 90% useful load" of the category "Large Airplanes with a MTOW up to and including 60,000 Pounds" should be considered.

1.4.3 Future Additional Airline Aircraft Needs

Pangborn Memorial Airport and the Wenatchee Valley area greatly benefit from and depend on the scheduled passenger service provided by Horizon Air. Horizon provides direct service to Seattle-Tacoma International Airport for passengers traveling to the Puget Sound area, as well as those connecting to flights departing the Northwest for destinations around the world.

However, Pangborn has conducted and continues to pursue planning and marketing activities that explore opportunities for attracting other airlines with a potential financial interest in providing additional flights to compliment the service provided by Horizon Air. It often benefits the traveling public to take the most direct route to their final destination. Since many of the ultimate destinations of passengers departing Pangborn are east and south, instead of north and west, a hub airport providing a route that does not require a stop at Seattle-Tacoma International Airport to connect to Pangborn would provide increased convenience, lower ticket prices, and shortened travel times. The following subsections consider other airlines and their airfield requirements.

1.4.3.1 Delta Connection

Regional air service studies indicate that, based on the ultimate destinations of catchment area passengers, the most likely new scheduled passenger service scenario for Pangborn is a Delta Connection between Salt Lake City International Airport (see Appendix C). Located 532 nautical miles from Wenatchee, Salt Lake City is Delta Airlines' hub in the western United States, connecting passengers in northwestern cities to locations south and east. In June 2007, Delta Connection began service between Salt Lake City and Yakima Air Terminal in Yakima, Washington. Air service analysis of this route indicates that, since Pangborn is 110 miles from Yakima by car, there is no leakage of passengers between the airports. Since each community offers similar passenger markets to the airline, Pangborn is an expected target for Delta Connection.

Based on a 2006 *pro forma* analysis of the Wenatchee-Salt Lake City market, two round trips per day to Salt Lake City are estimated to be supportable by catchment area passengers destined for Southern California, the southwestern and south central United States, and all points east of Salt Lake City. This analysis is based on an assessment of the true market for Pangborn, which is an estimate of the total number of existing air travelers generated by the population of the catchment area. Pangborn only serves 52% of its true market of 170,450 enplaned and deplaned passengers, with 42% of the true market being served by Seattle-Tacoma International Airport and 6% by Spokane International Airport. This occurs despite the long distance that must be traveled via automobile to enplane at these airports. Potential Pangborn passengers do not enplane or deplane at these airports because it is more convenient, but because of economic concerns. Since Horizon flights typically operate with high load factors at Pangborn, the last few remaining seats on flights are often expensive for travelers and the most convenient scheduled departures are usually full. An additional airline such as Delta Connection would alleviate these economic factors and satisfy unmet demand for more air service at Pangborn.

SkyWest Airlines provides service for most Delta Airlines regional feeder flights from western U.S. destinations into Salt Lake City. The most likely SkyWest aircraft to serve a Pangborn flight would be the 50-seat Bombardier CRJ-200 regional jet. The CRJ-200 is a C-II aircraft with a MTOW of 53,000 pounds. AC 150/5325-4B, *Runway Length Requirements for Airport Design*, specifically excludes regional jets from consideration under the family grouping method described in Section 1.4.2 and requires analysis of specific performance data for these aircraft.

Takeoff weights for the CRJ-200 at 60%, 90%, and 100% of useful load were determined based on data contained in the aircraft's specific Airport Planning Manual (APM). These weights are shown in **Table 1-17**.

| Table 1-17: Canadair RJ-200 Operating Weights | |
|--|------------|
| Maximum Certificated Takeoff Weight (MTOW) | 53,000 lbs |
| Takeoff Weight @ 90% Useful Load | 50,729 lbs |
| Takeoff Weight @ 60% Useful Load | 43,917 lbs |

Sources: CRJ-200 Airport Planning Manual

Required runway lengths for the different load categories, calculated for various weather conditions based on charts in the Manual, are shown in **Table 1-18**.

| Table 1-18: Takeoff Runway Length Requirements for the CRJ-200 at 1,249' above mean sea level | | | | |
|--|---------------------------|---|---|--------------------------------------|
| Conditions | Degrees Fahrenheit | Required Runway Length @ 60% Useful Load | Required Runway Length @ 90% Useful Load | Required Runway Length @ MTOW |
| ISA | 54.7° F | 4,450 feet | 6,000 feet | 6,550 feet |
| ISA + 8° C | 69.1° F | 4,600 feet | 6,200 feet | 6,800 feet |
| ISA + 15° C | 81.7° F | 4,850 feet | 6,600 feet | 7,200 feet |
| ISA + 20° C | 90.1° F | 5,200 feet | 7,050 feet | 8,025 feet |

Sources: CRJ-200 Airport Planning Manual

APMs provide takeoff runway length data in terms of airport elevation and International Standard Atmosphere (ISA) conditions (59° F, 20 degree flaps, zero wind, and a dry runway at mean sea level). When adjusted for the airport elevation of 1,249' above mean sea level at Pangborn, the ISA temperature is 54.7° F. These data are provided in the form of takeoff runway length requirement charts, with one representing ISA conditions and others representing ISA plus some additional temperature. The AC 150/5325-4B runway length determination procedure for regional jets provides that takeoff length requirement determinations for specific aircraft can be made if the mean daily maximum temperature of the hottest month (88.6° F) at the airport equals or is less than that of a provided ISA chart. As a result, the appropriate takeoff runway length determination chart from the APM for the CRJ-200 is the ISA + 20° C (90.1° F) chart.

As shown in Table 1-18, a takeoff runway length of 6,000 feet is required for the CRJ-200 at 90% useful load in ISA conditions at Pangborn. At 90.1° F, the required takeoff runway length is 7,050 feet at 90% useful load and 8,025 feet at MTOW. The lengths listed in Table 1-18 do not address airline policy operational requirements, or additional requirements related to inclement weather and local terrain, which would likely increase runway length requirements. General landing runway length requirements for this aircraft are significantly lower than those for takeoff, and are not considered in this study.

It is expected that Delta Connection would begin service with two trips daily (two trips being two landings and two takeoffs, totaling four operations), later increasing to three trips daily as the route proves financially successful. This translates to 730 to 1,095 operations per year requiring a longer runway.

Other airlines and hub airports exist that meet Pangborn's needs, but a Delta Connection route serving Salt Lake City is expected to be the greatest immediate opportunity. Based on the preceding analysis, a runway length of 8,025 feet would be required for Delta Connection to reliably and profitably serve Pangborn.

1.4.3.2 Allegiant Air

Airlines with direct flights to popular vacation destinations at discounted prices provide greater convenience and shortened travel times for passengers. One air carrier providing service to leisure destinations is Allegiant Air, operating out of McCarran International Airport in Las Vegas, Nevada. Realizing available opportunities, Allegiant Air provides flights to several northwestern U.S. cities, and it is expected that Pangborn is a future target for Allegiant Air.

Allegiant Air would likely utilize a 130- to 150-seat MD-80 series aircraft to conduct the 715 nautical mile flight between Pangborn and Las Vegas. Half of Allegiant's MD-80 series fleet is made up of the 150-seat MD-83. The MD-83 is a C-III aircraft with a MTOW of 160,000 pounds. Takeoff weights for the MD-83 at 60%, 90%, and 100% of useful load have been determined based on data contained in the aircraft's specific Airport Planning Manual. These weights are shown in **Table 1-19**.

Table 1-19: McDonnell-Douglas MD-83 Operating Weights

| | |
|--|-------------|
| Maximum Certificated Takeoff Weight (MTOW) | 160,000 lbs |
| Takeoff Weight @ 90% Useful Load | 151,969 lbs |
| Takeoff Weight @ 60% Useful Load | 127,874 lbs |

Sources: MD-80 Airport Planning Manual

Required runway lengths for the different load categories, calculated for various weather conditions based on charts in the Manual, are shown in **Table 1-20**.

Table 1-20: Takeoff Runway Length Requirements for the MD-83 at 1,249' above mean sea level

| Conditions | Degrees Fahrenheit | Required Runway Length @ 60% Useful Load | Required Runway Length @ 90% Useful Load | Required Runway Length @ MTOW |
|-------------|--------------------|--|--|-------------------------------|
| ISA | 54.7° F | 4,900 feet | 7,750 feet | 8,300 feet |
| ISA + 15° C | 81.7° F | 5,200 feet | 8,150 feet | 8,550 feet |

Sources: MD-80 Airport Planning Manual

The AC 150/5325-4B runway length determination procedure for “Large Airplanes with a MTOW of More than 60,000 Pounds” provides that takeoff length determinations for specific aircraft can be made if the mean daily maximum temperature of the hottest month (88.6° F) at the airport equals or is less than that of the provided ISA chart. The APM for the MD-83 does not provide a chart fits these criteria. As a result, the runway lengths in Table 1-20 are inadequate for the MD-83 at the mean daily maximum temperature of the hottest month at the respective loads, and further analysis will be required to determine the runway length requirement for the MD-83 at Pangborn.

A takeoff runway length of 7,750 feet is required for the MD-83 at 90% useful load in ISA conditions at Pangborn. At 81.7° F, the required takeoff runway length is 8,150 feet at 90% useful load and 8,550 feet at MTOW. In addition to the takeoff restrictions Allegiant would face at Pangborn, MD-83 aircraft would be unable to land on the existing runway under wet conditions at maximum landing weight (139,500 lbs). These landing operations would require between 5,850 and 6,150 feet of runway, depending on the aircraft flap settings at the time of the operation. It is important to note that these lengths, as well as those listed in Table 1-20, do not address airline policy operational requirements, or additional requirements related to inclement weather and local terrain, which would likely increase runway length requirements.

It is expected that Allegiant Air would begin service with two weekly trips (two trips being two landings and two takeoffs, totaling four operations), and increase to four weekly trips as the route proves financially successful. Other airlines serving leisure destination exist that meet the Airport's needs, but an Allegiant Air route serving Las Vegas is expected to be the greatest immediate opportunity. Based on the preceding analysis, a runway length of 8,550 feet would be required for Allegiant Air to reliably and profitably serve Pangborn.

1.4.3.3 Additional Airline Summary

Pangborn's current runway length limits its ability to attract new commercial service. Commercial airlines are increasingly operating on tighter financial margins, and they are typically unable to initiate air service to destinations where they must take load penalties in demanding weather conditions due to runway length restrictions.

As the current 5,700 foot length of Runway 12/30 is insufficient to support even weight-restricted operations by both Delta Connection and Allegiant Air, neither air carrier will likely begin operations, nor seriously consider serving Pangborn, until a proper runway length is in place. Without adequate runway length, these and other air service opportunities will not occur, and Pangborn will not be able to take advantage of the benefits available, nor provide the best possible service to its community.

1.5 Airfield Improvement Summary and Recommendation

This section provides a runway length recommendation that will allow key users, itinerant corporate users, and anticipated additional users to operate at Pangborn with minimal penalty.

Actual counts and near- and long-term forecasts of critical design aircraft operations that are currently restricted and will continue to be restricted in the future by the current runway length at Pangborn are shown in **Table 1-21**. These counts and forecasts demonstrate that there are currently and will continue to be at least 500 annual aircraft operations that require a longer runway, which exceeds the FAA's "substantial use threshold" of 500 annual operations.

The top portion of Table 1-21 lists the runway length requirements determined using the FAA methodology contained in AC 150/4325-4B *Runway Length Requirements for Airport Design*, and discussed in Section 1.4.2. The middle portion of Table 1-21 lists the current and projected weight-restricted aircraft operations at Pangborn by Executive Flight, Horizon Air, and itinerant corporate users, as discussed in Section 1.4.1. The bottom portion of Table 1-21 lists the runway length requirements of potential additional commercial airline service by Delta Connection and Allegiant Air, as discussed in Section 1.4.3.

The Horizon Air restricted operations forecast is based on the airline completing its transition to the Q-400 in October 2008, and assumes four daily departures in 2013 and five daily departures in 2028. The Executive Flight forecasts use as base data the number of total and restricted operations for 2007 and apply a five percent annual growth in these operations over the 20-year planning period, based on the company's business plans. The itinerant corporate operator forecast uses as base data confirmed operations in 2007 by turbojet aircraft requiring a runway length greater than 5,700 feet and applies a 10.2 percent growth rate in itinerant jet operations for the years 2008 through 2017, which is consistent with the expected increase in business jet hours found in *FAA Aerospace Forecast: Fiscal Years 2006-2017*. A more conservative five percent growth rate is applied to itinerant operations for the years 2018 through 2028. Based on the ARCs of the critical aircraft listed in Table 1-21 and discussed in Section 1.4.1, the near-term airfield design standard should be C-III.

Based on the data in Table 1-21, the Airport should plan for a near-term primary runway length of 7,000 feet. A required length of 7,000 feet was determined utilizing the FAA AC 150/4325-4B methodology for requirements of the “75 percent of fleet at 90% useful load” family grouping of the category “Large Airplanes with a MTOW up to and including 60,000 Pounds.” This length is justified by the 638 current (2007) annual landing operations at Pangborn by “Large Airplanes with a MTOW up to and including 60,000 Pounds” at greater than 60% useful load, which exceeds the FAA’s “substantial use threshold” of 500 annual operations. This length is further supported by weight-restricted operations data provided by the two key airport users, Executive Flight and Horizon Air, and the runway length requirements of potential additional airlines. A length of 8,790 feet should be planned for in the long-term based on the 20-year forecast of 927 total annual operations by aircraft in the “100 percent of fleet at 90% useful load” family grouping of the category “Large Airplanes with a MTOW up to and including 60,000 Pounds.” The development and evaluation of airfield improvement alternatives in the subsequent chapters of this report will plan for the implementation of a 7,000-foot runway in the near-term and an 8,790-foot runway in the long-term.

| Table 1-21: Facility Requirements Analysis Summary for Pangborn Memorial Airport | | | | | | | | | | |
|---|---|----------------|--|-----------------------------------|--------------------------------------|--------------|---------------------|----------------|----------------|---|
| User | Aircraft or Aircraft Category | Operation Type | Scenario/Family Grouping | Typical Aircraft Operating Weight | Maximum Certificated Aircraft Weight | Stage Length | Aircraft Operations | | | Runway Length Required to Eliminate Weight Restrictions for Majority of |
| | | | | | | | 2007 Actual | 2013 Projected | 2028 Projected | |
| Runway Length Guidance provided by FAA Advisory Circular 150/5325-4B Runway Length Requirements for Airport Design | | | | | | | | | | |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | All operations | 100% of fleet at 90% useful load, dry runway | ≤ 60,000 lbs | ≤ 60,000 lbs | > 80 nm | 266 | 404 | 927 | 8,790 ft |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | All operations | 75% of fleet at 90% useful load, dry runway | ≤ 60,000 lbs | ≤ 60,000 lbs | > 80 nm | 1,010 | 1,364 | 2,852 | 6,820 ft |
| Total Operations by "Large Airplanes with a MTOW up to and including 60,000 Pounds" at greater than 60% useful load | | | | | | | 1,276 | 1,768 | 3,779 | |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | All operations | 100% of fleet at 60% useful load, dry runway | ≤ 60,000 lbs | ≤ 60,000 lbs | ≤ 80 nm | 44 | 59 | 122 | 5,850 ft |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | All operations | 75% of fleet at 60% useful load, dry runway | ≤ 60,000 lbs | ≤ 60,000 lbs | ≤ 80 nm | 448 | 600 | 1,248 | 4,970 ft |
| Total Operations by "Large Airplanes with a MTOW up to and including 60,000 Pounds" at 60% useful load or less | | | | | | | 492 | 659 | 1,370 | |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | Landing | 100% of fleet at 90% useful load, wet or slippery runway | ≤ 60,000 lbs | ≤ 60,000 lbs | > 80 nm | 133 | 202 | 464 | 8,790 ft |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | Landing | 75% of fleet at 90% useful load, wet or slippery runway | ≤ 60,000 lbs | ≤ 60,000 lbs | > 80 nm | 505 | 682 | 1,426 | 7,000 ft |
| Total Landing Operations by "Large Airplanes with a MTOW up to and including 60,000 Pounds" at greater than 60% useful load | | | | | | | 638 | 884 | 1,890 | |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | Landing | 100% of fleet at 60% useful load, wet or slippery runway | ≤ 60,000 lbs | ≤ 60,000 lbs | ≤ 80 nm | 22 | 29 | 61 | 5,850 ft |
| All Users | Large Airplanes with a MTOW up to and including 60,000 Pounds | Landing | 75% of fleet at 60% useful load, wet or slippery runway | ≤ 60,000 lbs | ≤ 60,000 lbs | ≤ 80 nm | 224 | 300 | 624 | 5,500 ft |
| Total Landing Operations by "Large Airplanes with a MTOW up to and including 60,000 Pounds" at 60% useful load or less | | | | | | | 246 | 329 | 685 | |
| Current and Projected Weight-Restricted Operations Due to Inadequate Runway Length | | | | | | | | | | |
| Horizon Air | Bombardier Dash-8 Series 400 (Q-400) | Landing | Icing Conditions* | 62,000 lbs | 62,000 lbs | 85 nm | 0 | 212 | 265 | 6,300 ft |
| Executive Flight | Challenger 600 | Takeoff | Moderate contamination** | 39,000 lbs | 41,250 lbs | > 300 nm | 1 | 1 | 3 | 11,350 ft |
| Executive Flight | Challenger 600 | Takeoff | Less than 40° F & greater than 32° F with precipitation | 39,000 lbs | 41,250 lbs | > 300 nm | 1 | 1 | 3 | 8,450 ft |
| Executive Flight | Challenger 600 | Takeoff | Moderate contamination** | 37,500 lbs | 41,250 lbs | 80-300 nm | 1 | 1 | 3 | 7,750 ft |
| Executive Flight | Challenger 600 | Takeoff | Less than 40° F & greater than 32° F with precipitation | 37,500 lbs | 41,250 lbs | 80-300 nm | 2 | 3 | 6 | 7,600 ft |
| Executive Flight | Challenger 600 | Takeoff | Wet runway greater than 40° F | 39,000 lbs | 41,250 lbs | > 300 nm | 3 | 4 | 8 | 7,490 ft |
| Executive Flight | Challenger 600 | Takeoff | Greater than 90° F | 39,000 lbs | 41,250 lbs | > 300 nm | 2 | 3 | 6 | 7,400 ft |
| Executive Flight | Challenger 600 | Landing | Wet runway, all temperatures*** | 36,000 lbs | 36,000 lbs | n/a | 14 | 19 | 39 | 6,454 ft |
| Executive Flight | Challenger 600 | Takeoff | Greater than 75° F & less than 90° F | 39,000 lbs | 41,250 lbs | > 300 nm | 3 | 4 | 8 | 6,400 ft |
| Executive Flight | Challenger 600 | Takeoff | Wet runway greater than 40° F | 37,500 lbs | 41,250 lbs | 80-300 nm | 4 | 5 | 11 | 6,000 ft |
| Executive Flight | Challenger 600 | Takeoff | Greater than 75° F | 37,500 lbs | 41,250 lbs | 80-300 nm | 6 | 8 | 17 | 5,820 ft |
| Executive Flight | Learjet 30 Series | Takeoff | Moderate contamination** | 17,000 lbs | 18,300 lbs | > 300 nm | 5 | 7 | 14 | 9,818 ft |
| Executive Flight | Learjet 30 Series | Landing | Moderate contamination*** | 13,000 lbs | 15,300 lbs | n/a | 37 | 50 | 103 | 7,470 ft |
| Executive Flight | Learjet 30 Series | Takeoff | Moderate contamination** | 15,000 lbs | 18,300 lbs | 80-300 nm | 21 | 28 | 59 | 7,200 ft |
| Executive Flight | Learjet 30 Series | Takeoff | Greater than 75° F | 17,000 lbs | 18,300 lbs | > 300 nm | 25 | 34 | 70 | 6,800 ft |
| Executive Flight | Learjet 30 Series | Landing | Wet runway greater than 32° F*** | 15,300 lbs | 15,300 lbs | n/a | 197 | 264 | 549 | 6,280 ft |
| Executive Flight | Learjet 30 Series | Takeoff | Less than 40° F & greater than 32° F with precipitation | 16,200 lbs | 18,300 lbs | > 80 nm | 41 | 55 | 114 | 6,240 ft |
| Executive Flight | Learjet 60 | Landing | Wet runway, all temperatures*** | 19,500 lbs | 19,500 lbs | n/a | 16 | 21 | 45 | 7,433 ft |
| Executive Flight | Learjet 60 | Landing | Dry runway, all temperatures*** | 19,500 lbs | 19,500 lbs | n/a | 39 | 52 | 109 | 6,384 ft |
| Executive Flight | Learjet 60 | Takeoff | Greater than 90° F | 21,000 lbs | 23,500 lbs | > 300 nm | 1 | 1 | 3 | 6,350 ft |
| Executive Flight | Learjet 60 | Takeoff | Moderate contamination** | 20,200 lbs | 23,500 lbs | > 80 nm | 2 | 3 | 6 | 5,800 ft |
| Executive Flight | Learjet 60 | Takeoff | Wet runway greater than 40° F | 21,000 lbs | 23,500 lbs | > 300 nm | 1 | 1 | 3 | 5,800 ft |
| Executive Flight | Learjet 60 | Takeoff | Less than 40° F & greater than 32° F with precipitation | 21,000 lbs | 23,500 lbs | > 300 nm | 1 | 1 | 3 | 5,740 ft |
| Itinerant/Corporate | Bombardier BD-700-1A10 | All operations | All weather conditions | 95,000 lbs | 95,000 lbs | Various | 2 | 4 | 9 | 8,126 ft |
| Itinerant/Corporate | Gulfstream G-V | All operations | All weather conditions | 90,900 lbs | 90,900 lbs | Various | 8 | 14 | 36 | 7,884 ft |
| Itinerant/Corporate | Gulfstream G200 | All operations | All weather conditions | 35,600 lbs | 35,600 lbs | Various | 4 | 7 | 18 | 7,846 ft |
| Itinerant/Corporate | Dassault Falcon 900 EX | All operations | All weather conditions | 48,300 lbs | 48,300 lbs | Various | 2 | 4 | 9 | 7,472 ft |
| Itinerant/Corporate | Dassault Falcon 900 | All operations | All weather conditions | 45,500 lbs | 45,500 lbs | Various | 8 | 14 | 36 | 7,472 ft |
| Itinerant/Corporate | Challenger 600 | All operations | All weather conditions | 40,125 lbs | 40,125 lbs | Various | 2 | 4 | 9 | 7,363 ft |
| Itinerant/Corporate | Challenger 604 | All operations | All weather conditions | 47,600 lbs | 47,600 lbs | Various | 26 | 47 | 117 | 7,363 ft |
| Itinerant/Corporate | Embraer Legacy 600 | All operations | All weather conditions | 49,604 lbs | 49,604 lbs | Various | 12 | 21 | 54 | 7,174 ft |
| Itinerant/Corporate | Rockwell Sabreliner 65 | All operations | All weather conditions | 24,000 lbs | 24,000 lbs | Various | 2 | 4 | 9 | 7,046 ft |
| Itinerant/Corporate | Hawker-Siddeley 125 | All operations | All weather conditions | 23,300 lbs | 23,300 lbs | Various | 2 | 4 | 9 | 6,957 ft |
| Itinerant/Corporate | Learjet 55B | All operations | All weather conditions | 21,500 lbs | 21,500 lbs | Various | 2 | 4 | 9 | 6,868 ft |
| Itinerant/Corporate | Israel 1125 Westwind Astra | All operations | All weather conditions | 23,500 lbs | 23,500 lbs | Various | 6 | 11 | 27 | 6,855 ft |
| Itinerant/Corporate | Gulfstream III (G-1159A) | All operations | All weather conditions | 70,200 lbs | 70,200 lbs | Various | 4 | 7 | 18 | 6,830 ft |
| Itinerant/Corporate | Gulfstream G-IV | All operations | All weather conditions | 73,200 lbs | 73,200 lbs | Various | 14 | 25 | 63 | 6,830 ft |
| Itinerant/Corporate | Cessna Citation X | All operations | All weather conditions | 35,700 lbs | 35,700 lbs | Various | 34 | 61 | 154 | 6,652 ft |
| Itinerant/Corporate | Hawker-Siddeley 800XP | All operations | All weather conditions | 28,000 lbs | 28,000 lbs | Various | 16 | 28 | 72 | 6,512 ft |
| Itinerant/Corporate | Learjet 36 | All operations | All weather conditions | 18,300 lbs | 18,300 lbs | Various | 8 | 14 | 36 | 6,474 ft |
| Itinerant/Corporate | Learjet 35A | All operations | All weather conditions | 18,300 lbs | 18,300 lbs | Various | 2 | 4 | 9 | 6,474 ft |
| Itinerant/Corporate | Cessna Citation VII | All operations | All weather conditions | 22,450 lbs | 22,450 lbs | Various | 2 | 4 | 9 | 6,283 ft |
| Itinerant/Corporate | Challenger 300 | All operations | All weather conditions | 39,000 lbs | 39,000 lbs | Various | 2 | 4 | 9 | 6,232 ft |
| Total Actual and Projected Weight-Restricted Operations Due to Inadequate Runway Length: | | | | | | | 581 | 1,064 | 2,155 | |
| Runway Length Requirements for Potential Additional Airline Operations | | | | | | | | | | |
| Delta Connection | Canadair RJ-200 | Takeoff | ISA Conditions**** | 50,729 lbs | 53,000 lbs | 532 nm | | | | 6,000 ft |
| | Canadair RJ-200 | Takeoff | ISA + 8° C (69.1° F) | 50,729 lbs | 53,000 lbs | 532 nm | | | | 6,200 ft |
| | Canadair RJ-200 | Takeoff | ISA + 15° C (81.7° F) | 50,729 lbs | 53,000 lbs | 532 nm | | | | 6,600 ft |
| | Canadair RJ-200 | Takeoff | ISA + 20° C (90.1° F) | 50,729 lbs | 53,000 lbs | 532 nm | | | | 7,050 ft |
| | Canadair RJ-200 | Takeoff | ISA Conditions**** | 53,000 lbs | 53,000 lbs | 532 nm | | | | 6,550 ft |
| | Canadair RJ-200 | Takeoff | ISA + 8° C (69.1° F) | 53,000 lbs | 53,000 lbs | 532 nm | | | | 6,800 ft |
| | Canadair RJ-200 | Takeoff | ISA + 15° C (81.7° F) | 53,000 lbs | 53,000 lbs | 532 nm | | | | 7,200 ft |
| | Canadair RJ-200 | Takeoff | ISA + 20° C (90.1° F) | 53,000 lbs | 53,000 lbs | 532 nm | | | | 8,025 ft |
| Allegiant Air | McDonnell-Douglas MD-83 | Takeoff | ISA Conditions**** | 151,969 lbs | 160,000 lbs | 715 nm | | | | 7,750 ft |
| | McDonnell-Douglas MD-83 | Takeoff | ISA + 15° C (81.7° F) | 151,969 lbs | 160,000 lbs | 715 nm | | | | 8,150 ft |
| | McDonnell-Douglas MD-83 | Takeoff | ISA Conditions**** | 160,000 lbs | 160,000 lbs | 715 nm | | | | 8,300 ft |
| | McDonnell-Douglas MD-83 | Takeoff | ISA + 15° C (81.7° F) | 160,000 lbs | 160,000 lbs | 715 nm | | | | 8,550 ft |

*FAA icing criteria includes conditions when moisture is present and the air temperature is 41° F or less.

**Airplane Flight Manuals (AFMs) for these aircraft contain runway length requirement multipliers for use in a variety of weather-related runway conditions. These multipliers increase the required runway length given conditions at the time of an aircraft operation. The moderate contamination multipliers for these aircraft provide conservative runway length requirement estimates for precipitation-related weather conditions under 32° F.

***Runway length requirements for landing operations of these aircraft are calculated in compliance with Federal Aviation Regulations Part 135 Dispatch rules. These rules require that an aircraft come to a complete stop within 60% of a runway's effective length. Therefore, the required runway lengths listed for these aircraft and scenarios add the additional 40% required. Further, for landings on wet runways, FAR Part 135 requires an additional 15% be added to the required runway length. See Appendix B for additional information.

****ISA (International Standard Atmosphere) conditions are defined as 54.7° F, 20° flap settings, zero wind, and a dry runway at the Airport elevation of 1,249' above mean sea level.

