# MASTER PLAN UPDATE | HOULTON INTERNATIONAL AIRPORT

Prepared for:
Houlton International Airport

Prepared by:
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# 1.0 INTRODUCTION

This master plan updates a master plan completed in 2002 for Houlton International Airport (HUL[1] ). Funding for this Airport Master Plan Update (AMPU) is in part through a grant from the Airport Improvement Program (AIP), which covers 90% of the project costs. The remaining 10% comes from a grant from the Maine Department of Transportation (MaineDOT), and local funding from the Town of Houlton.

## 1.1 AIRPORT MASTER PLAN PROCESS

An airport master plan is a comprehensive study of the airport's current facilities and potential future needs. It assesses the airport's current situation against future market and other demands to develop a detailed plan for the airport's future. It typically describes short-, medium-, and long-term plans for airport development. This master plan update for Houlton includes the following elements:

### 1.1.1 Pre-Planning

The pre-planning process included an initial needs determination to assess what the study needed to include, development of the study work plan, negotiation of the consultant fee and contract, and an application for study financing. This update is funded through a grant with the Federal Aviation Administration (FAA) and the AIP, which are covering 90% of the total project costs. The remaining costs were borne equally through a grant from the MaineDOT and the Town of Houlton (5% each).

### 1.1.2 Public Involvement

The public involvement program for this AMPU includes the selection and appointment of a Planning Advisory Committee (PAC), appointed by the Town of Houlton. Over the course of the study, the public involvement program will encourage information sharing and collaboration among the PAC members. The PAC includes representatives from the town, users and tenants, resource agencies, elected and public officials, residents, and the public in general, comprising stakeholders who have an interest in the outcome of the study. Collectively, members of the PAC will solicit advice, ideas, and feedback from the community to ensure the final airport master plan will serve community needs. There will be three PAC meetings throughout the project and a public information meeting at the end of the project to present the draft findings of the AMPU.

[1] HUL is the official Federal Aviation Administration identifier for the airport.

### 1.1.3 Existing Facilities

The existing facilities section is a snapshot of what the airport looks like at the beginning of the project, providing an inventory and baseline of pertinent data for use in subsequent plans.

### 1.1.4 Aviation Forecasts

The aviation forecasts project what the airport will potentially look like in terms of based aircraft, local and itinerant operations, and other pertinent conditions in the next five, 10, and 20 years (short-, medium-, and long-term).

### 1.1.5 Facility Requirements

The facility requirements section is an assessment of the ability of the existing airport, both airside and landside, to support the future forecasted demand. It identifies at what point increased demand levels will trigger the need for facility additions or improvements and estimates what new facilities may be required to meet that demand.

### 1.1.6 Alternatives Development

This section identifies growth options for the airport. Based on potential market demand, a series of options (alternatives) are developed that would meet that demand by means of facility upgrades. It assesses how each alternative would perform against a wide range of evaluation criteria, including the operational, environmental, and financial impacts it would generate. A recommended development alternative, called the preferred alternative, will emerge from this process and will be further refined in subsequent tasks. This section will also develop the purpose and need statement needed for subsequent planning and environmental documents.

### 1.1.7 Airport Layout Plan Set

The airport layout plan set (ALP) is one of the key products of a master plan. It is a set of drawings that provides a graphic representation of the long-term development plan for an airport. The primary drawing in this set is titled the ultimate ALP, which becomes the official airport blueprint. The ALP must be approved by FAA in order to receive AIP funding.

### 1.1.8 Facilities Implementation Plan

The facilities implementation plan provides a summary of recommended improvements and associated costs. The schedule for needed improvements will depend largely on market demand, which will trigger any need for expansion of existing facilities. These recommended facility improvements are presented for each of the three planning periods (short, intermediate, and long terms) and include estimated costs of construction and likely funding sources. The recommended short-term improvements (0-5 years) typically become the airport's capital improvement program (CIP) and are incorporated into MaineDOT's and FAA's budgetary process.

### 1.1.9 Financial Feasibility Analysis

The financial feasibility analysis provides a financial plan for the airport, describes how the Town of Houlton will finance the projects recommended in the master plan, and demonstrates the financial feasibility of the program.

## 1.2 PROJECT PURPOSE

The purpose of this AMPU is to revise the existing conditions, forecasts, facility requirements, and alternatives that were developed as part of the Houlton International Airport 2002 Master Plan Update. In addition, an implementation schedule will include cost estimates and environmental impacts for the recommended improvements.

## 1.3 BACKGROUND

The last Houlton International Airport Master Plan Update for the Town of Houlton was completed in 2002. Characteristic of any master plan, the key findings and recommendations in the previous master plan update identified several desired goals and objectives to ensure the airport remained competitive in the region. The main objective was to "provide a safe runway and taxiway system that adheres to FAA standards by 2007." Secondary goals of the previous master plan update were to upgrade the airport's instrument approaches, the airport beacon, the terminal facilities, the apron area, and to provide the community with economic development opportunities.

In the process of developing this project's scope of work, Stantec Consulting Services (hereinafter referred to as the Consultant) met with the Town of Houlton to develop their updated goals and objectives for the airport as part of the airport master planning process; goals that reflect the aviation, political, and public vision for the airport. Airport safety continues to be a goal of the airport and will be addressed in this AMPU.

## 1.4 PROJECT FOCUS FOR HOULTON

There are several key areas where the Town wants to direct the focus of this update. These include the following seven areas:

1. Update the ALP to reflect the Town's long-term vision for the airport and to ensure consistency with current FAA design standards and FAA and MaineDOT policies;
2. Evaluate the length of the primary runway;

3. Determine if the crosswind runway should be returned to its original length, some other length, or returned to closed status;
4. Evaluate and identify obstructions within the TERPS Visual Approach Surface (VAS);
5. Evaluate land use to determine if there is land in excess of aviation demand;
6. Conduct a wildlife hazard site visit;
7. Evaluate for compliance with current FAA standards;
8. Hangar development.

## 1.5 PRODUCTS OF THE MASTER PLANNING PROCESS

The products of this master planning process will include the following deliverables:

### 1.5.1 Technical Report

The Master Plan Technical Report includes the ALP and documents the data and logic that were used to develop the plan. This report contains the following sections and appendices:

- Chapter 1 – Introduction
- Chapter 2 – Inventory of Existing Conditions
- Chapter 3 – Forecasts of Aviation Activity
- Chapter 4 – Facility Requirements
- Chapter 5 – Alternatives Analysis
- Chapter 6 – Airport Layout Plan
- Chapter 7 – Implementation Plan
- Appendix A – Terms and Abbreviations
- Appendix B – Wildlife Hazard Assessment Site Visit Report
- Appendix C – ALP Set

### 1.5.2 Airport Layout Plan Drawing Set

As discussed previously, the ALP set is a graphic representation of proposed airport development. It will be produced as a separate set of full-sized drawings. In addition, a smaller-scale version of the ALP will be included in this Technical Report.

## 1.6 FAA AND STATE REVIEW

The recommendations contained in this airport master plan represent the views, policies, and development plans of the Town of Houlton and do not necessarily represent the views of the FAA, MaineDOT, or the Consultant. Acceptance of the master plan by either agency does not constitute a commitment on the part of the United States or the State of Maine to fund or participate in any development depicted in the plan, nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public law.

The FAA and MaineDOT will review all elements of the master plan to ensure that sound planning techniques have been applied. All airport development at federally obligated airports (which includes Houlton) must be done in accordance with an FAA-approved ALP. Any proposed development must be shown on an approved ALP in order to be eligible for AIP funding. FAA approval of the ALP indicates that the existing facilities and proposed development on the ALP conforms to the FAA design standards in effect at the time of the approval - or that an approved modification to standard has been issued. Such approval also indicates that the FAA finds the proposed development to be safe and efficient.

# 2.0 INVENTORY OF EXISTING CONDITIONS

## 2.1 INTRODUCTION

The first step in the airport master planning process is to gather information about the airport and its current surroundings. An inventory of existing conditions is an important part of a master plan since this information will provide a foundation, or baseline, for evaluation of any proposed changes. Existing conditions are a snapshot of the airport as it appears at the project's starting point and serve as a benchmark for measuring changes.

The inventory of existing conditions for the Houlton AMPU includes the following information:

- Airport ownership and management, the general airport setting, transportation access, the airport's relationship to the federal airport system, and a brief airport history;
- Population and socioeconomic information for the geographic area;
- A review of historic and current airport activity;
- An overview of the area's airspace and obstructions;
- Descriptions of facilities and services now provided at the airport, including a general description of airside, landside, terminal, and support facilities;
- A summary of environmental conditions at the airport; and
- A financial overview, including historic revenue and expenses.

The information gathered for this portion of the master plan, to the extent possible, is current as of September 2015. Updated information will be gathered throughout the development of the master plan and will be included in subsequent chapters, thus allowing the final Technical Report to be as current as possible.

## 2.2 TERMS AND ABBREVIATIONS

Throughout this document, the reader will find countless terms and abbreviations common to the aviation industry, in particular to the FAA. While every effort is made to clarify what each term (and abbreviation) means, the reader not familiar with aviation terminology will find Appendix A helpful in providing more detailed explanations.

## 2.3 AIRPORT SETTING AND LOCATION

Incorporated in 1831, Houlton is the oldest community in Aroostook County. The town serves as the county seat for trade and commerce in the region. Houlton is approximately 37 square miles in size[2]. At the 2010 census, the town had a population of 6,123 residents. Houlton sits 119 miles northeast of Bangor, 265 miles northeast of Portland, and 42 miles south of Presque Isle.

The Houlton International Airport (identified as HUL by the FAA) is a general aviation airport located adjacent to the Canadian border and serving southern Aroostook and central New Brunswick areas. The airport was originally constructed in 1940 and was deeded to the U.S. in August 1941 as a military reservation for use by the Army and Air Force. The airport served as a base during World War II until July 14, 1947, when the airport property was transferred back to the Town of Houlton. Many of the buildings at the airport are over 50 years old and may be eligible for listing on the National Register of Historic Places.

The airport has two runways and covers approximately 1,615 acres[3]. Runway 5-23 serves as the airport's primary runway and is 5,015 feet long. The airport's crosswind runway, Runway 1-19, is 2,700 feet long. One main focus of this AMPU is to determine if the length of the crosswind runway is suitable or if a change should be made, such as closing the runway altogether. As a primary point-of-entry airport, Houlton provides by-appointment around-the-clock customs support for airport users.

Other airport specifics include the following:

- FAA Identifier: HUL
- International Identifier: KHUL
- NPIAS [4] Number: 23-0024
- FAA Site Number: 08038.*A
- Maine System Plan Service Level: II [5]
- Latitude/Longitude: 46° 07' 28.59" N / 067° 47' 32.50" W
- Elevation: 489.4'
- Distance from Town: 2.5 miles
- Time Zone: UTC -4 (UTC -5 during Standard Time)

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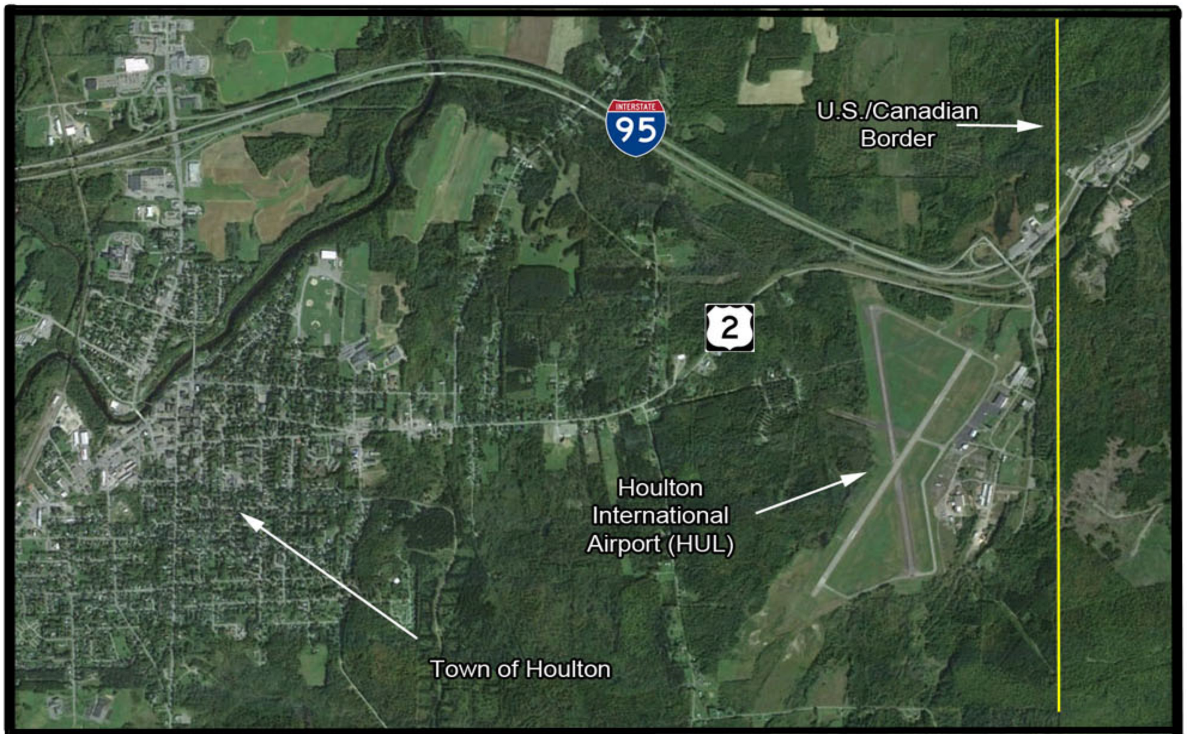
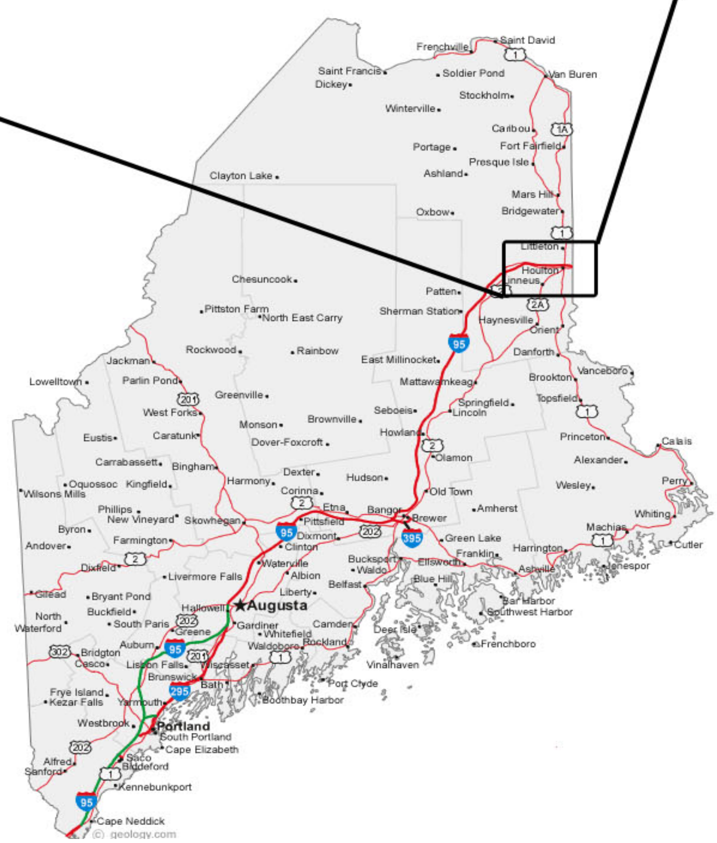
[2] United States Census Bureau
[3] Form 5010-1 – *Airport Master Record*
[4] The National Plan of Integrated Airport Systems (NPIAS) identifies nearly 3,400 existing and proposed airports that are significant to national air transportation and thus eligible to receive federal grants under the Airport Improvement Program (AIP). It also includes estimates of the amount of AIP money needed to fund infrastructure development projects that will bring these airports up to current design standards.
[5] Maine Aviation Systems Plan Update, Phase II, Wilbur-Smith Associates (2006). It was recommended in this Systems Plan Update that Houlton's service level be upgraded to Level I.




Houlton is a town in Aroostook County, Maine, on the United States-Canada border, located 42 miles south of Presque Isle, the nearest commercial service airport, and 119 miles northeast of Bangor, Maine, the second largest city in the state. The town has a population of approximately 6,100 and is at the northern terminus of Interstate 95.

Figure 2.1 | Houlton International Airport Location Map

The airport terminal is located off Airport Drive, which connects to U.S. Route 2 and takes the user directly into the center of Houlton. The airport can also be accessed via Interstate 95 to U.S. Route 2, which turns into Airport Drive. Airport Drive terminates at the airport. An important feature of the airport is its location in relation to the Canadian border. As shown on Figure 1 Area Map, the U.S.-Canada border runs directly along the airport's eastern property line.

Additional data is provided in the Airport Master Record, FAA Form 5010-1 and is discussed later in this chapter.

## 2.4 Management Structure

Airport oversight is provided by the Town of Houlton, the FAA sponsor of record. Administrative support and financial oversight is also provided by the Town of Houlton. Maintenance is also the responsibility of the town. The town manager is the airport manager and is assisted by a full-time airport supervisor.

## 2.5 Activity

This section is divided into two parts: based aircraft and aircraft operations. This information is typically gathered for general aviation airports and serves as a benchmark for measuring growth leading up to this point and then forecasting changes for future planning.

**Table 2.1 | Based Aircraft Fleet Mix**

| Aircraft Group | Number of Aircraft | Percent of Total |
|---|---|---|
| Single Engine Piston | 19 | 79.2% |
| Multiengine Piston | 4 | 16.6% |
| Turboprop | 0 | 0.0% |
| Jet | 0 | 0.0% |
| Rotorcraft | 1 | 4.2% |
| **Total** | **24** | **100%** |

Source: Airport Management, August 2015

## 2.6 Based Aircraft

Houlton is a relatively low-activity airport. In December 2015, the airport has 24 based aircraft, including one helicopter owned and operated by the U.S. Customs Service. Out of the 24 total based aircraft, Houlton is home to four multi-engine piston and 19 single-engine piston aircraft. There are no jet aircraft based at Houlton. See Table 2-1.

## 2.7 Operations

Aircraft operations are reported at 12,700[6]. This number includes 7,000 local (55%), 5,000 itinerant (39%), and 700 military (6%) operations. According to industry standards, operations at an airport typically range from 300-500 operations per based aircraft (OPBA), with a higher OPBA at airports with active flight schools or other types of activity that attract increased use. The reported activity at Houlton indicates an OPBA of 530. On first examination, this count

[6] Airport Master Record, FAA Form 5010-1 (Retrieved 10/1/2015)

seems high; however, the airport does have a fairly robust level of transient activity because of the U.S. Customs Service and recreational activity from neighboring Canada. Thus, the reported operations activity of 530 will be used for planning purposes. Table 2-1 lists the baseline operations levels.

## 2.8 Fleet Mix – Aircraft and Operations

The fleet mix identifies the classes or types of aircraft that are based at the airport as well as the airport's operations, which are classified as local or itinerant. Table 2-2 describes the fleet mix.

## 2.9 Peak Hour Operations

Peak-hour operations (PH) are calculated to help determine facility requirements, for example, the amount of transient aircraft parking needed and space required for passenger and pilot facilities. The months of July and August are typically the busiest at most general aviation airports in the northern latitudes.

Standard planning guidelines suggest that 15 percent of all annual operations occur in the peak month (PM), and that the peak month's average day (PMAD) is 1/30 of the PM. The PH is assumed 20 percent of PMAD. Given this, the PH for Houlton is 13 operations, which is calculated as follows:

- PM = Total Operations (TO) * 15%
- PMAD = PM / 30
- PH = PMAD * 20%

Thus:

- PM = 12,700 * 15%
- PMAD = 1,905 / 30

**Table 2.2 | Operations by Type and Fleet Mix**

| Activity | Count | Percent of Total |
|---|---|---|
| **Operations** | | |
| Local | 7,000 | 55% |
| Itinerant[7] | 5,700 | 45% |
| **Total** | **12,700** | **100%** |
| **Fleet Mix – Local Operations** | | |
| Single Engine Piston | 5,400 | 77.1% |
| Multi Engine Piston | 1,300 | 18.7% |
| Turboprop | 0 | 0.0% |
| Jet | 0 | 0.0% |
| Rotorcraft | 300 | 4.2% |
| **Total** | **7,000** | **100%** |
| **Fleet Mix – Itinerant Operations** | | |
| Single Engine Piston | 2,500 | 43.9% |
| Multi Engine Piston | 1,300 | 22.8% |
| Turboprop | 1,000 | 17.5% |
| Jet | 600 | 10.5% |
| Rotorcraft | 300 | 5.3% |
| **Total** | **5,700** | **100%** |

[7] Includes 700 military operations

- PH = 64 * 20%

Therefore, the number of operations at Houlton for its peak hour is 13.

## 2.10 AIRPORT DESIGN CRITERIA

One of the more critical decisions made early in the master planning process is establishing design standards for the airport; both existing and future. This decision establishes the size and location of two key infrastructure elements of the airport, including the design aircraft and the Airport Reference Code.

The FAA classifies airports according to the size of the aircraft that the airport is designed to accommodate. This aircraft is called the design aircraft. The classification system used to make sure the design of the airport relates to the size and other characteristics of the airplanes operating at the airport (typified by the design aircraft) is known as an Airport Reference Code (ARC) and Runway Design Code (RDC) as described in FAA AC 150/5300-13A, Airport Design.

Identifying a design aircraft enables planners and engineers to design an airport that satisfies the operational requirements of that aircraft and meet national safety standards. Examples of such standards include the size of the runway safety area, the runway object free area; the runway and taxiway width and runway length, and the distance between runways and taxiways as well as between fixed objects such as buildings. In general, the faster an aircraft is on final approach and the wider its wingspan (or tail height), the bigger and farther apart airport features must be.

### 2.10.1 Houlton's Design Aircraft

The existing design aircraft at Houlton is the Beechcraft King Air 200. The future design aircraft will be established in the next chapter of this Plan, the Forecasts.

The King Air (see Figure 2.2) is a widely used twin-engine turboprop aircraft with a seating capacity of up to 13 passengers plus crew. Aircraft specifications include:

- Wingspan: 54'-6"
- Length: 43'-9"
- Tail Height: 15'-0"
- Approach Speed: 105 knots
- Takeoff Distance: 3,086' (at MGTOW [8] at HUL)
- Landing Distance: 2,800'

[8] Maximum Gross Takeoff Weight

### 2.10.2 Houlton's Airport Reference Code (ARC)

The ARC is determined by a combination of the design aircraft approach category (speed of aircraft) and the wingspan or tail height, whichever is more restrictive. The characteristics of this system are shown in Table 2.3. The Airport is currently designated as an ARC B-II facility based on the King Air design aircraft as shown in blue on Table 2.3 This classification is then cross-referenced to FAA design criteria.

Figure 2.2 | Beech King Air 200 (Houlton Design Aircraft)

### 2.10.3 Houlton's Runway Reference Code

In 2013 the FAA added additional criteria to classify an airport. This was done by adding a Runway Design Code (RDC), which categorizes individual runways rather than generalizing an entire airport. Further, the RDC also incorporates the runway's visibility minimums (Table 2.4). Typically, the most restrictive RDC is used as the airport's overall ARC. However, the King Air cannot under normal circumstances use the shorter, more restrictive crosswind runway (Runway 1-19) at Houlton. Thus, the design aircraft for Runway 1-19 is the Cessna 172 Skyhawk, a single engine piston aircraft with a wingspan of just under 35 feet and an approach speed of 75 knots. The Skyhawk has an ARC classification of A-I shown in red on Table 2.3.

| Table 2.3 \| Airport Reference Coding System | | | |
|---|---|---|---|
| **Aircraft Approach Category (AAC)** | | **Airplane Design Group (ADG)** | |
| **Category** | **Aircraft Approach Speed** | **Group** | **Aircraft Wingspan** |
| A | Speed less than 91 knots | I | Up to 49 ft. |
| **B** | **Speed of 91 knots or more, but less than 120 knots** | **II** | **49 ft. up to 78 ft.** |
| C | Speed of 121 knots or more, but less than 140 knots | III | 79 ft. up to 117 ft. |
| D | Speed of 141 knots or more, but less than 165 knots | IV | 118 ft. up to 170 ft. |
| E | Speed of 166 knots or more | V | 171 ft. up to 213 ft. |
| | | VI | 214 ft. up to 262 ft. |

Source: FAA AC 5300-13B. Airport Design

| Table 2.4 \| FAA Reference Code Visibility Breakout | |
|---|---|
| **Runway Visibility (feet)** | **Instrument Flight Visibility Category (statute mile)** |
| 5,000 | Not lower than 1 mile |
| 4,000 | Lower than 1 mile but not lower than ¾ mile |
| 2,400 | Lower than ¾ mile but not lower than ½ mile |
| 1,600 | Lower than ½ mile but not lower than ¼ mile |
| 1,200 | Lower than ¼ mile |

Source: FAA AC 5300-13B. Airport Design

### 2.10.4 Current Design Standards for Houlton

As noted above, the design aircraft for the Houlton Airport is the King Air 200, a B-II aircraft, which is applicable to the airport as a whole and the primary runway. It is shown in blue on Table 2.3. The Cessna Skyhawk 172, an A-I aircraft, is the design aircraft for the crosswind runway.

Tables 2.5 and 2.6 indicate the current conditions and the required standards at Houlton based on existing FAA design criteria.

| Table 2.5 \| Runway 5-23 Design Standards | | |
|---|---|---|
| **Runway Standard** | **Current Condition** | **Required Standard** |
| **Design Aircraft** | **King Air 200** | **N/A** |
| Runway Design Code | B-11-5000 | B-11-5000 |

| Table 2.5 \| Runway 5-23 Design Standards | | |
|---|---|---|
| **Runway Standard** | **Current Condition** | **Required Standard** |
| Runway Width | 100’ | 75’ |
| Runway Centerline to Taxiway Centerline | 530’ | 240’ |
| Runway Centerline to Parking Apron | 650’ | 250’ |
| Apron Visibility Minimums | 1 mile | 1 mile |
| Runway Protection Zone | Inner 500’<br>Outer 700’<br>Length 1000’ | Inner 500’<br>Outer 700’<br>Length 1000’ |
| Runway Safety Area (RSA) | Width 150’<br>Length 300’ | Width 150’<br>Length 300’ |
| Obstacle Free Zone (OFZ) | Width 400’<br>Length 200’ | Width 400’<br>Length 200’ |
| Obstacle Free Area (OFA) | Width 500’<br>Length 300’ | Width 500’<br>Length 300’ |

Source: FAA AC 5300-13A. Stantec Consulting Services (2015)

| Table 2.6 \| Runway 1-19 Design Standards | | |
|---|---|---|
| **Runway Standard** | **Current Condition** | **Required Standard** |
| **Design Aircraft** | **Cessna 172** | **N/A** |
| Runway Design Code | A-I-VIS | A-I-VIS |
| Runway Width | 60’ | 60’ |
| Runway Centerline to Taxiway Centerline | N/A | 225’ |
| Runway Centerline to Parking Apron | N/A | 200’ |
| Apron Visibility Minimums | Visual | Visual |
| Runway Protection Zone | Inner 500’<br>Outer 700’<br>Length 1000’ | Inner 500’<br>Outer 700’<br>Length 1000’ |
| Runway Safety Area (RSA) | Width 120’<br>Length 240’ | Width 120’<br>Length 240’ |
| Obstacle Free Zone (OFZ) | Width 250’<br>Length 200’ | Width 250’<br>Length 200’ |
| Obstacle Free Area (OFA) | Width 400’<br>Length 240’ | Width 400’<br>Length 240’ |

Source: FAA AC 5300-13A. Stantec Consulting Services (2015)

## 2.11 HOULTON'S DEVELOPMENT HISTORY

Table 2.6 lists the improvements made and the FAA grant history for Houlton International Airport since the last update in 2002.

**Table 2.7 | Houlton Airport Development History (2002 to Present)**

| Year | Project Description | AIP Number |
|---|---|---|
| 2002 | SRE Acquisition | 3-23-2300-03 |
| 2003 | Install new airport beacon | |
| 2003 | Vegetation and wildlife management plan, Obstruction removal | 3-23-0024-08 |
| 2004 | Design of aircraft apron | 3-23-0024-09 |
| 2006 | Apron reconstruction | 3-23-0024-11-2006 |
| 2008 | Design for rehab of Runway 5-23 | 3-23-0024-12-2008 |
| 2009 | Runway 5-23 rehabilitation | 3-23-0024-12-2009 |
| 2010 | Perimeter fence construction | 3-23-0024-13-2010 |
| 2012 | Tie down area reconstruction, taxiway edge lighting improvements | 3-23-0024-14-2012 |
| 2014 | SRE building construction | 3-23-0024-15-2014 |
| 2015 | Airport Master Plan Update | 3-23-0024-15-2015 |

Source: FAA AC 5300-13A. Stantec Consulting Services (2015)

## 2.12 AIRPORT AS IT EXISTS TODAY

Today, in 2015, Houlton is a general aviation airport[9], serving the town of Houlton and the surrounding communities in northeastern Maine, which is part of Aroostook County, the largest county in the state. The airport occupies 1,615 acres of land, all within the municipal boundary of the Town of Houlton, which is the owner/operator of the airport, and the FAA sponsor of record. As discussed in this section, the airport has two runways with a network of taxiways feeding traffic to and from the parking aprons and hangar areas. The airport is a public use facility serving primarily general aviation aircraft, with some commercial air taxi service but no scheduled air carrier service. There is no air traffic control tower serving Houlton, which means it is classified as a "non-towered" airport. This simply means there is insufficient air traffic to justify a control tower and that pilots "self-announce" their movement and intentions on and around the airfield, which is a common practice at airports with low activity levels (under 100,000 operations, give or take, per year).

[9] As classified by the National Plan of Integrated Airports System (NPIAS).

Figure 2-3 is a copy of the FAA Airport Master Record (Form 5010-1). Figure 2-4 is an aerial photograph of the airport that illustrates the key facilities, and Figure 2-5 is the FAA's airport diagram.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

**AIRPORT MASTER RECORD**

PRINT DATE: 12/02/2015
AFD EFF 10/15/2015
Form Approved OMB 2120-0015

>1 ASSOC CITY: HOULTON
>2 AIRPORT NAME: HOULTON INTL
3 CBD TO AIRPORT (NM): 02 E
4 STATE: ME
6 REGION/ADO: ANE/NONE
LOC ID: HUL
5 COUNTY: AROOSTOOK ME
7 SECT AERO CHT: HALIFAX
FAA SITE NR: 08038.*A

**GENERAL**

10 OWNERSHIP: PU
>11 OWNER: TOWN OF HOULTON
>12 ADDRESS: 21 WATER STREET
HOULTON, ME 04730
>13 PHONE NR: 207-532-7111
>14 MANAGER: BUTCH ASSELIN
>15 ADDRESS: 21 WATER ST.
HOULTON, ME 04730
>16 PHONE NR: 207-532-7111
>17 ATTENDANCE SCHEDULE:
ALL MON-FRI 0700-1700
ALL SAT-SUN UNATNDD

18 AIRPORT USE: PUBLIC
19 ARPT LAT: 46-07-28.5900N ESTIMATED
20 ARPT LONG: 067-47-32.5000W
21 ARPT ELEV: 489.4 SURVEYED
22 ACREAGE: 1615
>23 RIGHT TRAFFIC: NO
>24 NON-COMM LANDING: NO
25 NPIAS/FED AGREEMENTS: NGPRY3
>26 FAR 139 INDEX:

**SERVICES**

>70 FUEL: 100LL A
>71 AIRFRAME RPRS: MAJOR
>72 PWR PLANT RPRS: MAJOR
>73 BOTTLE OXYGEN: NONE
>74 BULK OXYGEN: NONE
75 TSNT STORAGE: HGR, TIE
76 OTHER SERVICES:

**FACILITIES**

>80 ARPT BCN: CG
>81 ARPT LGT SKED: SEE RMK
>82 UNICOM: 122.800
>83 WIND INDICATOR: YES-L
84 SEGMENTED CIRCLE: YES
85 CONTROL TWR: NONE
86 FSS: BANGOR
87 FSS ON ARPT:
88 FSS PHONE NR:
89 TOLL FREE NR: 1-800-WX-BRIEF

**BASED AIRCRAFT**

| | |
|---|---|
| 90 SINGLE ENG: | 18 |
| 91 MULTI ENG: | 5 |
| 92 JET: | 0 |
| TOTAL: | 23 |
| 93 HELICOPTERS: | 1 |
| 94 GLIDERS: | 0 |
| 95 MILITARY: | 0 |
| 96 ULTRA-LIGHT: | 5 |

**OPERATIONS**

| | |
|---|---|
| 100 AIR CARRIER: | 0 |
| 102 AIR TAXI: | 0 |
| 103 G A LOCAL: | 7,000 |
| 104 G A ITNRNT: | 5,000 |
| 105 MILITARY: | 700 |
| TOTAL: | 2,700 |

OPERATIONS FOR 12 MONTHS ENDING 12/31/2015

| | | | | | |
|---|---|---|---|---|---|
| **RUNWAY DATA** | | | | | |
| >30 RUNWAY IDENT: | | 01/19 | 05/23 | | |
| >31 LENGTH: | | 2,700 | 5,015 | | |
| >32 WIDTH: | | 60 | 100 | | |
| >33 SURF TYPE-COND: | | ASPH-G | ASPH-G | | |
| >34 SURF TREATMENT: | | | | | |
| 35 GROSS WT: | SW | | 30.0 | | |
| 36 (IN THSDS) | DW | | 57.0 | | |
| 37 | DTW | | | | |
| 38 | DDTW | | | | |
| >39 PCN: | | | | | |
| **LIGHTING/APCH AIDS** | | | | | |
| >40 EDGE INTENSITY: | | | MED | | |
| >42 RWY MARK TYPE-COND: | | BSC - P / BSC - P | NPI - P / NPI - P | - / - | - / - |
| >43 VGSI: | | / | P4L / P2L | / | / |
| 44 THR CROSSING HGT: | | / | 43 / 51 | / | / |
| 45 VISUAL GLIDE ANGLE: | | / | 3.00 / 3.00 | / | / |
| >46 CNTRLN-TDZ: | | - / - | - / - | - / - | - / - |
| >47 RVR-RVV: | | - / - | - / - | - / - | - / - |
| >48 REIL: | | / | Y / Y | / | / |
| >49 APCH LIGHTS: | | / | / | / | / |
| **OBSTRUCTION DATA** | | | | | |
| 50 FAR 77 CATEGORY: | | A(V) / A(V) | C / B(V) | / | / |
| >51 DISPLACED THR: | | / | / | / | / |
| >52 CTLG OBSTN: | | / TREE | TREE / TREE | / | / |
| >53 OBSTN MARKED/LGTD: | | / | / | / | / |
| >54 HGT ABOVE RWY END: | | / 17 | 30 / 31 | / | / |
| >55 DIST FROM RWY END: | | / 413 | 1,235 / 230 | / | / |
| >56 CNTRLN OFFSET: | | / 35R | 100R / 250L | / | / |
| 57 OBSTN CLNC SLOPE: | | 50:1 / 12:1 | 34:1 / 1:1 | / | / |
| 58 CLOSE-IN OBSTN: | | N / N | N / Y | / | / |
| **DECLARED DISTANCES** | | | | | |
| >60 TAKE OFF RUN AVBL (TORA): | | / | / | / | / |
| >61 TAKE OFF DIST AVBL (TODA): | | / | / | / | / |
| >62 ACLT STOP DIST AVBL (ASDA): | | / | / | / | / |
| >63 LNDG DIST AVBL (LDA): | | / | / | / | / |

(>) ARPT MGR PLEASE ADVISE FSS IN ITEM 86 WHEN CHANGES OCCUR TO ITEMS PRECEDED BY >

>110 REMARKS:

| | |
|---|---|
| A 042 | RWY 01 RWY 01 ALL MARKINGS EXTREMELY FADED. |
| A 042 | RWY 05 RWY 05 ALL MARKINGS EXTREMELY FADED. |
| A 042 | RWY 19 RWY 19 ALL MARKINGS EXTREMELY FADED. |
| A 042 | RWY 23 RWY 23 ALL MARKINGS EXTREMELY FADED. |
| A 058 | RWY 23 RY 23 HAS +3-10 FT BRUSH & TREES 60 FT. TO 200 FT. FROM THRESHOLD, 70 FT. TO 250 FT. RIGHT OF CENTERLINE; +3 FT. TO 20 FT. TREES & BRUSH 90 FT. TO 200 FT. FROM THRESHOLD, 90 FT. TO 225 FT. LEFT OF CENTERLINE. |
| A 070 | FOR FUEL AFTER HRS CALL 207-532-9079 OR 207-538-7997 (CELL). |
| A 081 | RWY APT DUSK-DAWN. ACTVT MIRL RY 05/23 & REIL RYS 05 & 23 - CTAF. |
| A 110-001 | USDA RECATERING FACILITY AVBL. |
| A 110-003 | DEER ON & INVOF ARPT. |
| A 110-005 | FOR AFTER HOURS ACCESS TO TERMINAL BUILDING USE FREQ 122.8. |

111 INSPECTOR: ( C ) 112 LAST INSP: 08/15/2015 113 LAST INFO REQ:

FAA Form 5010-1 (5-91) SUPERSEDES PREVIOUS EDITION

Figure 2.3 | Airport Master Record (Form 5010-1) December 2015


Figure 2.4 | Houlton International Airport (HUL) Google Earth Photo
Imagery Date July 2013

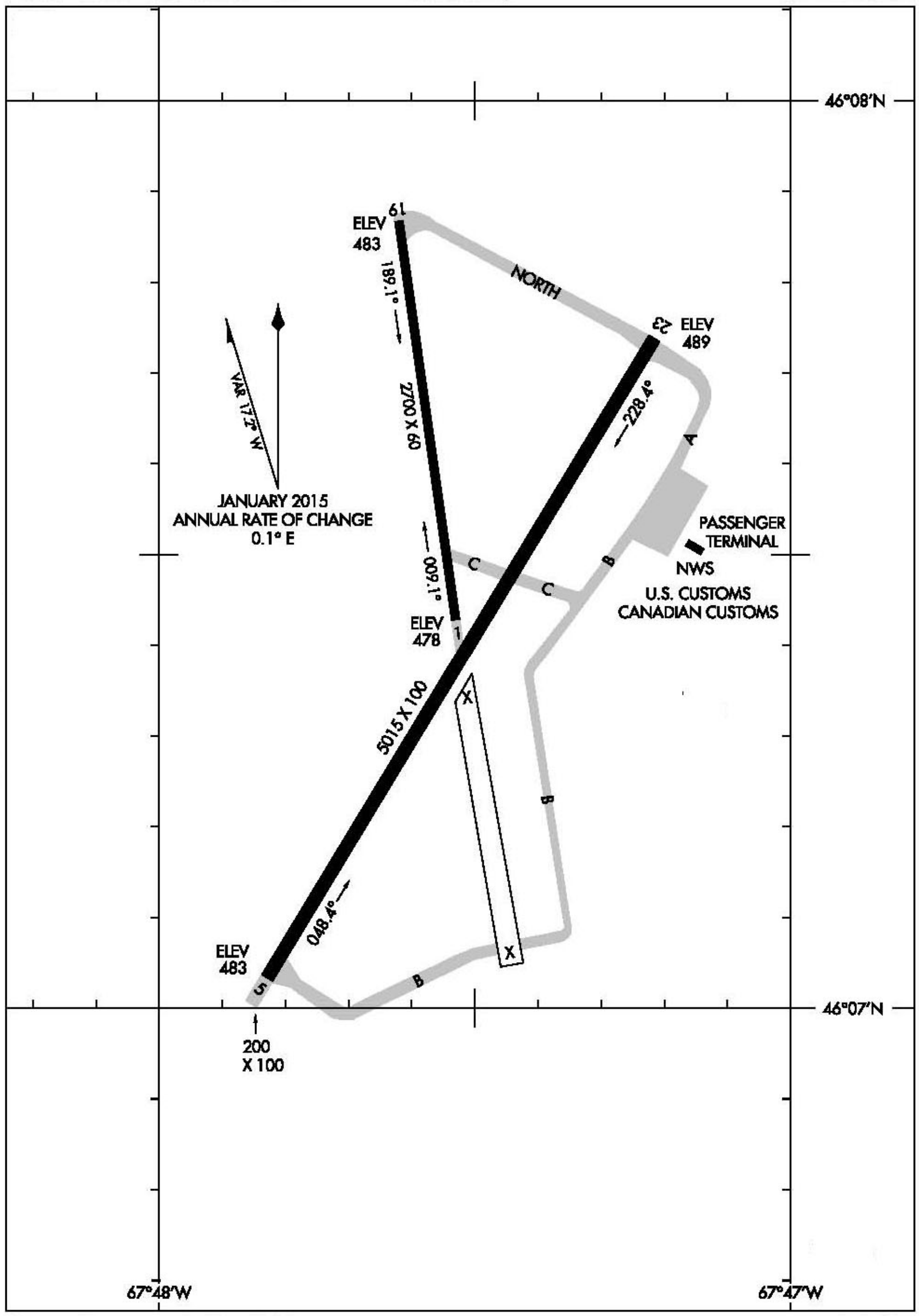



Figure 2.5 | HUL Airport Diagram

# 2.13 AIRSIDE FACILITIES

## 2.13.1 Houlton's Runways

Houlton has two runways (see Figures 2-4 and 2-5). The primary runway[10], Runway 5-23, is 5,015 feet long and 100 feet wide. The runway is paved and grooved. The asphalt is in excellent condition. The approach to Runway 5 has a four-light Precision Approach Path Indicator (PAPI) at a glide path of 3.00 degrees. The approach to Runway 23 has a two-light PAPI at a glide path of 3.00 degrees. The runway has medium-intensity runway lights (MIRLs) indicating the edge of runway pavement in addition to runway end identifier lights (REILs). The MIRLs are spaced at 300 feet along the runway, as prescribed by FAA regulations. All runway lighting is in excellent condition. The runway is marked for non-precision approaches and all markings are in good condition. The runway was overlaid in 1996 and fully reconstructed in 2009.

Houlton's crosswind runway, Runway 1-19, is currently 2,700 feet long and 60 feet wide[11]. The runway is paved and the asphalt is in fair condition. There are no Navigational Aids (NAVAIDs) on either approach to the runway. The runway has basic markings appropriate for visual approaches. All markings for this runway are in good condition. Runway 1-19 does not have any edge lighting. Runway 1-19 was overlayed in 2009.

Table 2.8 provides additional runway details.

**Table 2.8 | Runway Data**

| Runway End | Elevation (feet) | True Bearing | Weight Bearing | Markings | Lighting | IAP | Conditions | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Surface | Markings |
| 5 | 483' | 031° | SW: 30K<br>DW: 57K | Non-Precision | MIRL | RNAV VOR | Excellent | Good |
| 23 | 489.2' | 211° | SW: 30K<br>DW: 57K | Non-Precision | MIRL | N/A | Excellent | Good |
| 1 | 477.7' | 352° | SW: 30K | Basic | N/A | N/A | Fair | Good |
| 19 | 483' | 172° | SW: 30K | Basic | N/A | N/a | Fair | Good |

Source: FAA Form 5010-1, Airport Master Record, Stantec Consulting Services

### *Runway Safety Areas*

The Runway Safety Area (RSA) is required by FAA design standards to be properly graded and adequately drained. The RSA adds additional clear space at the end of each runway in order to protect an aircraft from further damage should the pilot land short of or overrun a runway.

[10] The primary runway is typically the longest and the surface with instrument approach procedures with the lowest minimums

[11] Runway 1-19 was originally 4,960 feet long and at one point was closed. Today, the Runway 1 threshold begins 160 feet from the northern edge of Runway 5-23 and serves small category aircraft only.

The RSA for Runway 5-23 is 150 feet wide, beginning 300 feet before the runway threshold, and ends 300 feet beyond the runway threshold. The overall requirements for dimensions of a runway RSA are taken from the runway's designated Runway Design Code (RDC), which, in this case, is B-II-5000.

The RSA for Runway 1-19 is 120 feet wide, beginning 240 feet prior to the runway threshold, and ends 240 feet beyond the runway threshold. The RDC for Runway 1-19 is A-I-VIS.

#### *Runway Protection Zones*

The Runway Protection Zone (RPZ) protects people and property on the ground. Where practical, airport owners should own the property within the RPZ in fee simple interest and maintain the area clear of incompatible objects and activities[12].

The runway protection zones for all runway ends includes an inner width of 500 feet, an outer width of 700 feet, and a length of 1,000 feet, encompassing 13.77 acres.

### 2.13.2 Taxiways

Houlton has three paved taxiways (see Figures 2-3 and 2-4). Taxiway A leads aircraft from the Taxiway C stub to the approach ends of Runways 23 and 19 after running parallel to the apron area for roughly 1,000 feet. Taxiway B leads from the Taxiway C stub south to the approach end of Runway 5. Taxiway C is a stub taxiway that intersects the other two taxiways near the midpoint of Runway 5-23. It is the remaining pavement from a now-closed runway.

Taxiway A is approximately 3,900 feet long, Taxiway B is approximately 4,300 feet long, and Taxiway C is approximately 500 feet long. All three are 50 feet wide.

### 2.13.3 Visual Navigation Aids

Visual navigation aids consist of light apparatus and signs. These include runway edge and threshold lights, taxiway lights, beacons, and other elevated lights as well as various signs that provide direction and guidance to pilots. Table 2.9 provides details on the condition of Houlton's navigation aids.

[12] FAA Memorandum, "Interim Guidance on Land Uses Within a Runway Protection Zone", 9/27/2012

**Table 2.9 | Airport Navigation Aids**

| NAVAID | Purpose | Condition | Photograph |
|---|---|---|---|
| MIRLs (Runway 5-23) | Outline Runway edge | Good |  |
| Rotating Beacon | Marks location of airport | Good |  |
| Signage | Directional information for pilots in navigation to taxiways, runways, and aprons | Good |  |
| PAPI (Runway 5-23) | Visual glideslope | Good |  |
| Lighted Windcone | Provides wind direction | Good |  |

Source: FAA Form 5010-1, Airport Master Record, Stantec Consulting Services

## 2.13.4 Wind Data

Wind is the major factor that influences runway orientation. Ideally, a runway should be aligned with the prevailing wind direction to minimize crosswinds for aircraft landing and taking off. The most desirable runway orientation is the one that has the largest wind coverage and minimum crosswind components. Wind coverage is the percentage of time crosswind components are below an acceptable velocity. The recommended wind coverage for a runway is 95 percent, meaning that the runway is usable 95% of the time. This number is derived from the total number of weather observations.

Houlton has its own weather monitoring station, as shown in 2.13.5, Weather Monitoring System. Wind data was taken from Houlton's previous master plan. Table 2-10 summarizes the airport's wind coverage.

**Table 2.10 | Airport Wind Conditions**

| Weather | Crosswind Component | Main Runway Coverage |
|---|---|---|
| All Weather | 13 Knots | 94.6% |
| IFR | 13 Knots | 94.3% |

Source: 2002 Airport Master Plan Update

## 2.13.5 Weather Monitoring System

The airport has an Automated Surface Observing System (ASOS) installed by the National Weather Service. The ASOS provides a wide range of meteorological information, including cloud coverage and height, temperature and humidity, wind direction and speed, and precipitation measurements. The system is located approximately 1,100 feet northwest of the runway intersection (see Figures 2-3 and 2-4). Data is provided to pilots through the National Data Information Network (NADIN), which uploads data to the National Weather Service for dissemination to the FAA air traffic system, which filters down to pilots through a variety of means. In addition, pilots can obtain the current data directly by tuning their aircraft radio to frequency 132.025 or by telephone: 207-532-1584.

Figure 2.6 | Automatic Surface Observation System at HUL

## 2.14 LANDSIDE FACILITIES

The airport's landside facilities are centrally located with the airport's terminal area along the main airport entrance (see Figure 2-4).

### 2.14.1 Parking Apron

The airport has two parking aprons located on the east side of Runway 5-23. The apron has tiedown space for approximately 13 aircraft, with nine tiedowns.

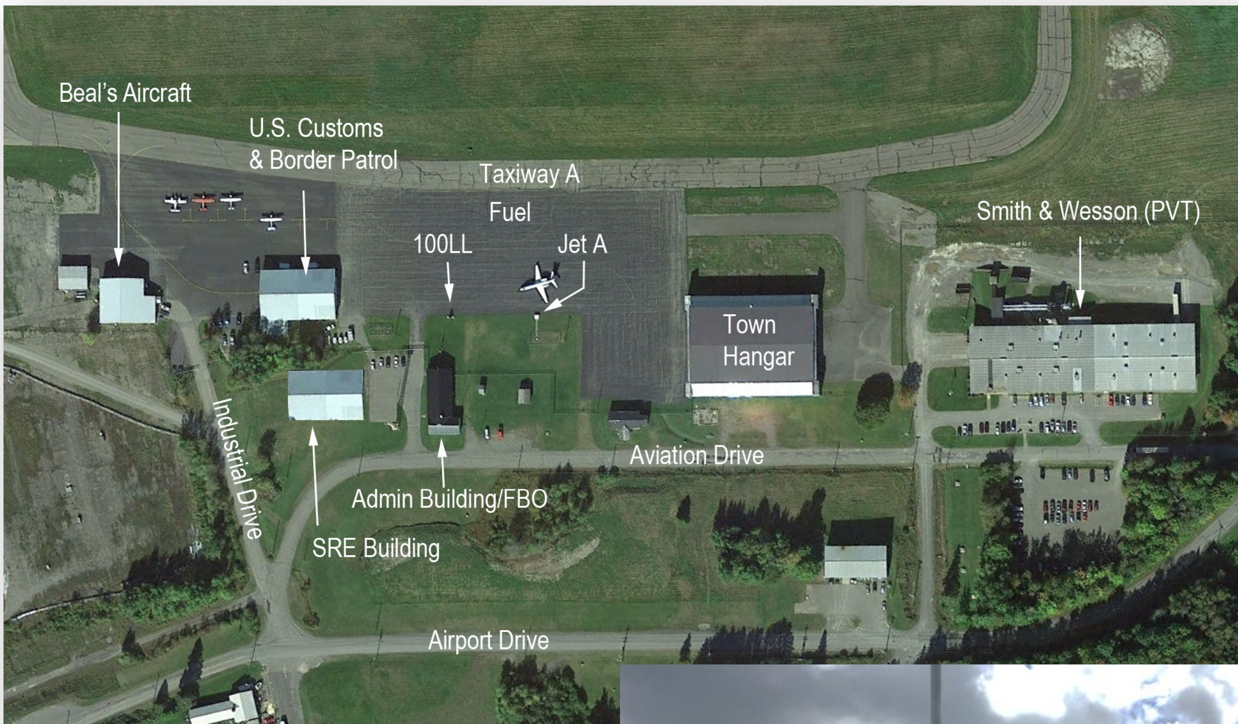



Figure 2.7 | Hoult

### 2.14.2 Administration Building

The airport has a medium-sized administration building centrally located on the aircraft apron (see Figure 2-7). The building provides space for airport administration. The building is approximately 100' x 40' and provides flight-planning resources to pilots. This is also where the airport supervisor's office is located. The


Figure 2.8 | Administration Building

building can be accessed 24 hours a day by entering the UNICOM frequency into the keypad located on the main door. The building is usable and serves the airport well given the volume of traffic and visitors.

### 2.14.3 Hangars

The airport has three large hangars used for aircraft storage. One is owned by the Town of Houlton and one is privately owned. Exterior paint is chipping and the overall condition of the Town-owned hangar is in fair condition. Figure 2-9 depicts the structure from the aircraft parking apron. The hangar is approximately 145' x 210' and can adequately accommodate 20-24 aircraft, depending on size and parking orientation.


Figure 2.9 | Town-Owned Hangar

There are two additional hangars on airport property. A private corporation leases the structure to the south of Beal's; no aircraft are currently stored in the building. The U.S. Customs and Border Patrol lease the other hangar.

### 2.14.4 Fixed Base Operator (FBO)

The Town of Houlton acts as the fixed base operator (FBO) at the airport and owns the structure southwest of the terminal building. The FBO offers fuel and aircraft parking.

Beal's Aircraft Service provides mechanical services, including aircraft annual inspections.

### 2.14.5 Automobile Parking and Access

Automobile parking is available in a single lot located adjacent to the terminal building. The area is approximately 5,100 square feet in size and can handle approximately 10 vehicles.

### 2.14.6 Fueling Facilities and Sales

The airport has fueling capabilities for Jet A and 100LL fuels. Both systems are self-service via an electronic payment system. The Jet A tank is 15,000 gallons and the 100LL tank is 10,000 gallons in capacity. Both tanks were installed underground in 1994 and have a 30-year lifespan[13]. The above ground serve systems are located in front of the Administration Building along the aircraft parking apron (see Figure 2-7).

Historically, Jet A fuel sales at Houlton outpace sales for 100LL fuel. This is a common theme in aviation fuel sales, as aircraft that use Jet A use more fuel on average, therefore fuel purchases are larger. Figure 2-8 is a graph of fuel sales in calendar year 2014.

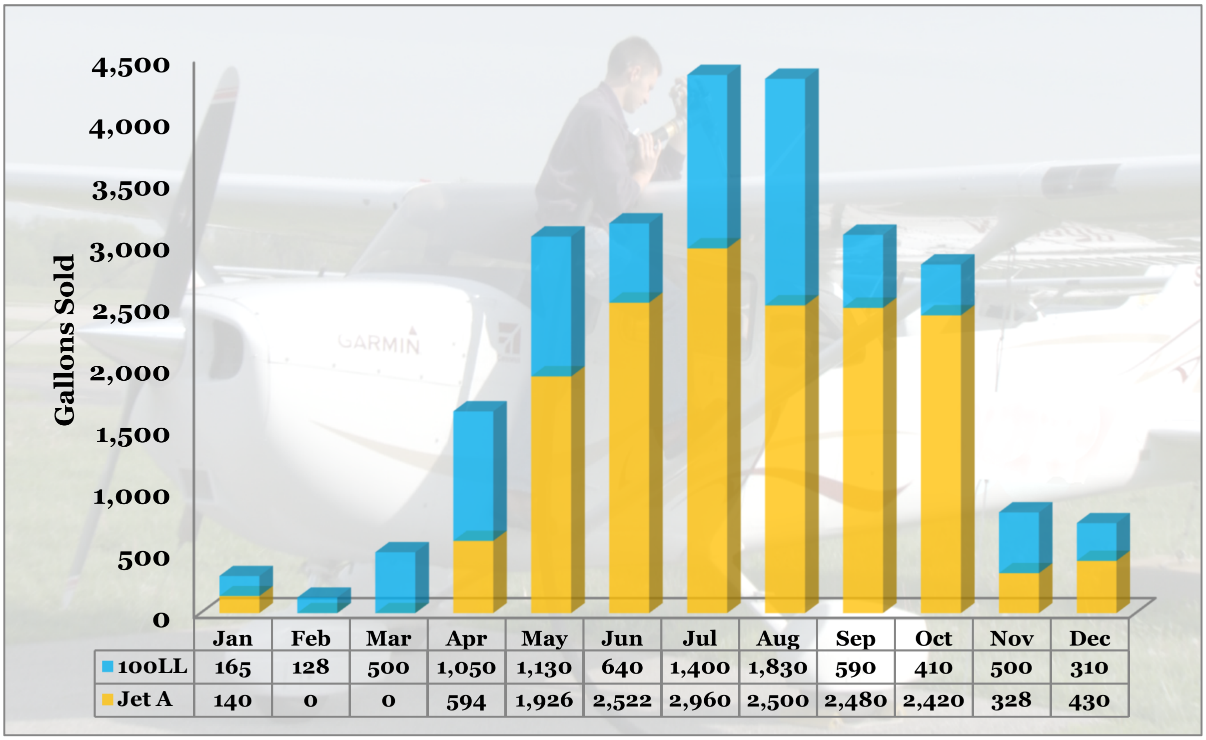



Figure 2.10 | Houlton 2014 Fuel Sales in Gallons Sold

[13] Discussion with airport supervisor


Figure 2.11 | Houlton Aircraft Fueling Stations: 100LL (Left) & Jet A (Right)

## 2.14.7 Snow Removal Equipment and Facilities

Houlton has a new snow removal equipment building located directly south of the terminal building (see Figures 2-7:)[14]. This building houses all of Houlton's snow removal equipment. The airport's snow removal equipment fleet/equipment includes:

- Rotary plow
- Sweeper attachment
- 3,000 ton/hour snow blower unit

Figure 2.12 | Houlton's Snow Removal Equipment Storage Building

[14] Constructed in 2014 under AIP grant #3-23-0024-15-2014

## 2.15 ENVIRONMENTAL

As stated previously in Section 2.3 *Airport Setting and Location*, airport property is comprised of 1,615 acres. Airport property consists primarily of turf areas adjacent to operations buildings and runway and taxiway pavement, and forested habitat around the perimeter of the airfield.

The following sections address only the impacted categories outlined in the FAA Order 5050.4B. The remaining categories not specifically addressed are not applicable or have no impact on the airport.

### 2.15.1 Air Quality

The airport is within an air quality attainment area; however, pollutant concentrations do not exceed the National Ambient Air Quality Standards (NAAQS).

### 2.15.2 Biological Resources

Correspondence with the U.S. Fish and Wildlife Service (USFWS) indicated the airport is located within the range of two species listed as threatened in accordance with the federal Endangered Species Act. The Canada Lynx and the Northern Long-eared Bat are federally protected species that may be present within the vicinity of the airport (no critical habitat occurs on airport property). To avoid accidental takings or other impacts to these species, consultation with the USFWS should be undertaken prior to initiating improvement projects at the airport.

The USFWS Maine Field Office provided further correspondence regarding the Canada Lynx and Northern Long-eared Bat populations in Maine. For Canada Lynx, the airport is outside designated critical habitat, but is within the review area where lynx individuals are more likely to occur. The closest U.S. records of lynx individuals are about 12 miles away and there are more than 45 records within 25 miles of the airport.

The federal Northern Long-eared Bat 4(d) Rule prohibits incidental take that may occur from tree removal activities within 150 feet of a known occupied maternity roost tree during the pup season (June 1 to July 31) or within a 1/4 mile of a hibernation site, year-round. Correspondence with the USFWS Maine Field Office stated that the closest known hibernacula to the airport are approximately 85 miles away. No information on known occupied maternity roost trees was provided from the Maine Field Office.

The proposed alternatives will take place on airport property, and therefore no negative impacts to the Canada Lynx or the Northern Long-eared Bat are anticipated, based on their known distances from the airport.

### 2.15.3 Water Resources

Wetlands are present on airport property. Wetlands to the west of Runway 5-23 and to the south of Taxiway B are associated with Cook Brook. This brook, which flows from the southeast in a west/northwesterly direction, drains a large segment of the airport and is culverted beneath the southwest region of the airfield. A small scrub-shrub wetland is located just north of the Runway 23 end. This depression receives runoff from adjacent upland fields south of Route 2. Wetlands at the airport have been identified, and the proposed development sites do not disturb wetland areas.

The majority of the airport is within an area determined to be outside of the 500-year floodplain. A section of a 100-year floodplain crosses the Runway 5 end and the adjacent taxiway.

There are no listed wild or scenic rivers within the vicinity of the airport.

## 2.16 Financial Overview

The Town of Houlton uses a line item budget process for the airport. Appropriations not expended at the end of the fiscal year are used to offset the following year's appropriations. Consistent with federal statute, revenue is carried over and used exclusively for the airport. The town's fiscal year runs from January 1-December 31.

The airport's budget and actual expenditures for the period January 1, 2016-December 31, 2018 were reviewed and are reported in Table 2-11.

**Table 2.11 | Houlton Revenue and Expenses**

| Calendar Year | Expenses | Revenue | Net Revenue |
|---|---|---|---|
| 2016 | $126,257.90 | $112,432.11 | ($13,825.79) |
| 2017 | $149,187.11 | $137,317.48 | ($11,869.63) |
| 2018 | $158,610.67 | $154,393.22 | ($4,217.45) |

Source: Treasurer, Town of Houlton

## 2.17 Airspace Overview

Developing this master plan also included looking at obstructions that are both on and off airport property. Various trees were surveyed using triangulation and input into a spreadsheet for use in completing an obstruction analysis. This process involved a surveying effort that assesses vegetative and terrain penetrations to the primary and approach surfaces to determine where obstructions exist. Table 2-12 lists each obstruction by number, elevation, and the height of the penetration into the protected surface.

**Table 2.12 | Obstruction Data**

| Obstruction ID | Type | Elevation | Amount Penetration |
|---|---|---|---|
| Runway 1 – Object 1 | Pine tree | 616.5 | -91.4 |
| Object 2 | Spruce tree | 757.7 | NA |
| Object 3 | Spruce tree | 664.8 | -1.5 |
| Object 4 | Antenna | 892.3 | NA |
| Object 5 | Pine tree | 611.6 | -92.0 |
| Object 6 | Pine tree | 809.6 | NA |
| Object 7 | Tree | 569.2 | -79.6 |
| Object 8 | Fir tree | 601.7 | -93.7 |
| Object 9 | Spruce tree | 616.5 | -91.5 |
| Runway 19 – Object 1 | Birch tree | 517.7 | NA |
| Object 2 | Spruce tree | 548.7 | NA |
| Object 3 | Utility pole | 500.7 | 4.7 |
| Object 4 | Spruce tree | 547.8 | 30.1 |
| Object 5 | Spruce tree | 499.3 | 12.0 |
| Object 6 | Spruce tree | 546.9 | NA |
| Object 7 | Utility pole | 497.4 | -2.6 |
| Object 8 | Spruce tree | 545.4 | 22.3 |
| Runway 5 – Object 1 | Maple tree | 541.6 | 21.1 |
| Object 2 | Maple tree | 541.0 | 12.6 |
| Object 3 | Utility pole | 546.6 | -3.6 |
| Runway 6 – Object 1 | Poplar tree | 527.1 | 2.0 |
| Object 2 | Maple tree | Unknown | Unknown |
| Object 3 | Maple tree | 529.0 | 3.2 |

Source: Stantec Consulting Services Analysis

### 2.17.1 Instrument Approach and Departure Procedures

Houlton is served by two instrument approach procedures (IAP), both to Runway 5: a non-precision GPS and a VOR approach.

The GPS approach includes Localizer Performance (LP) minimums down to 960 feet MSL (500 feet AGL) with one-mile visibility. Lower minimums are restricted because of obstructions on the final approach course. Figure 2-13 – RNAV Approach illustrates the RNAV procedure approach plate for Houlton.

The second instrument approach procedure available to pilots at Houlton is a VOR approach. This type of non-precision approach uses radio signals to position an aircraft on the proper path to the runway. The VOR approach to Runway 5 allows for a minimum ceiling height of 1,200 feet MSL and visibility of one mile. Figure 2-14 illustrates the VOR approach plate for Houlton.

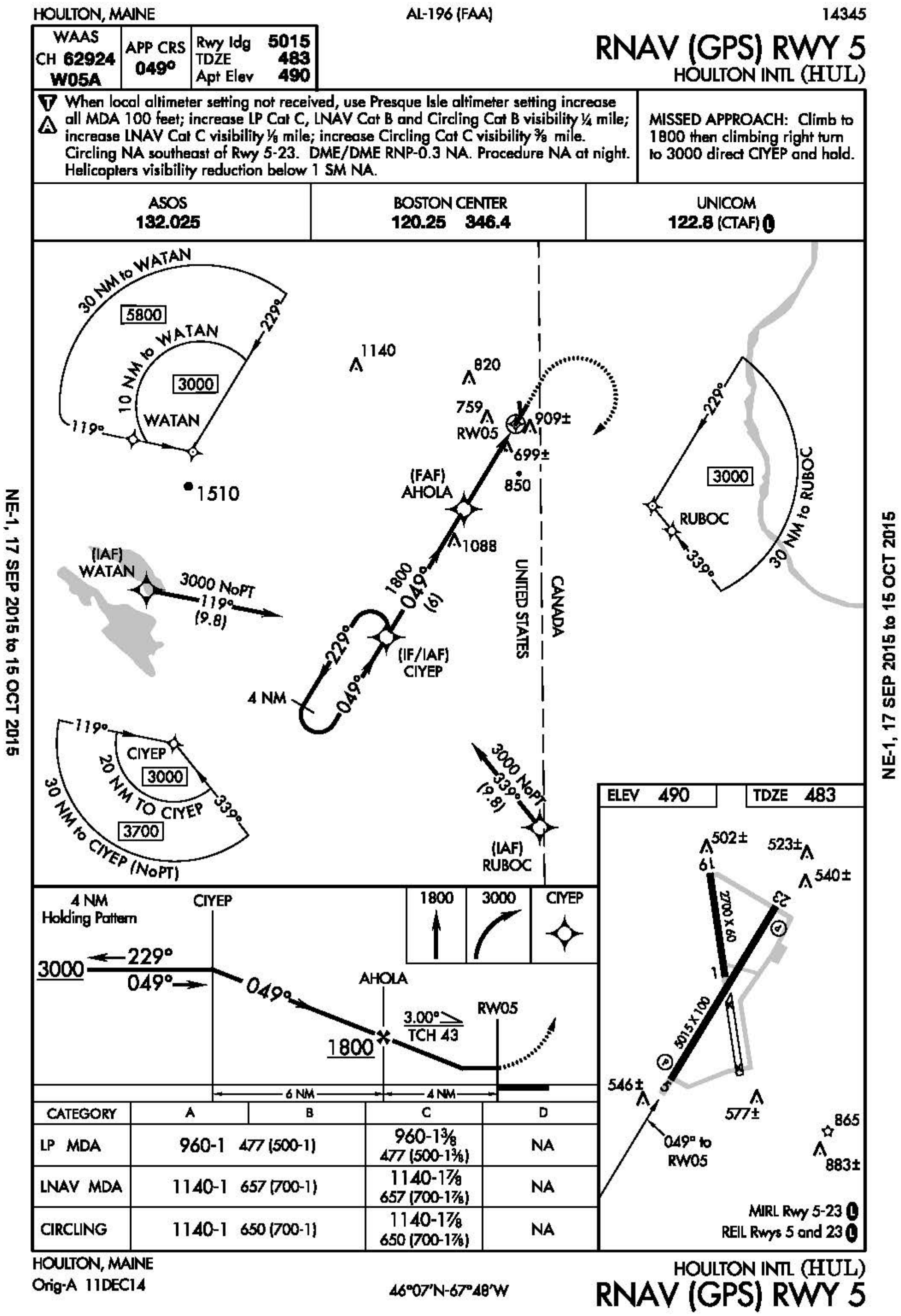



Figure 2.13 | Runway 5 RNAV Instrument Approach Procedure

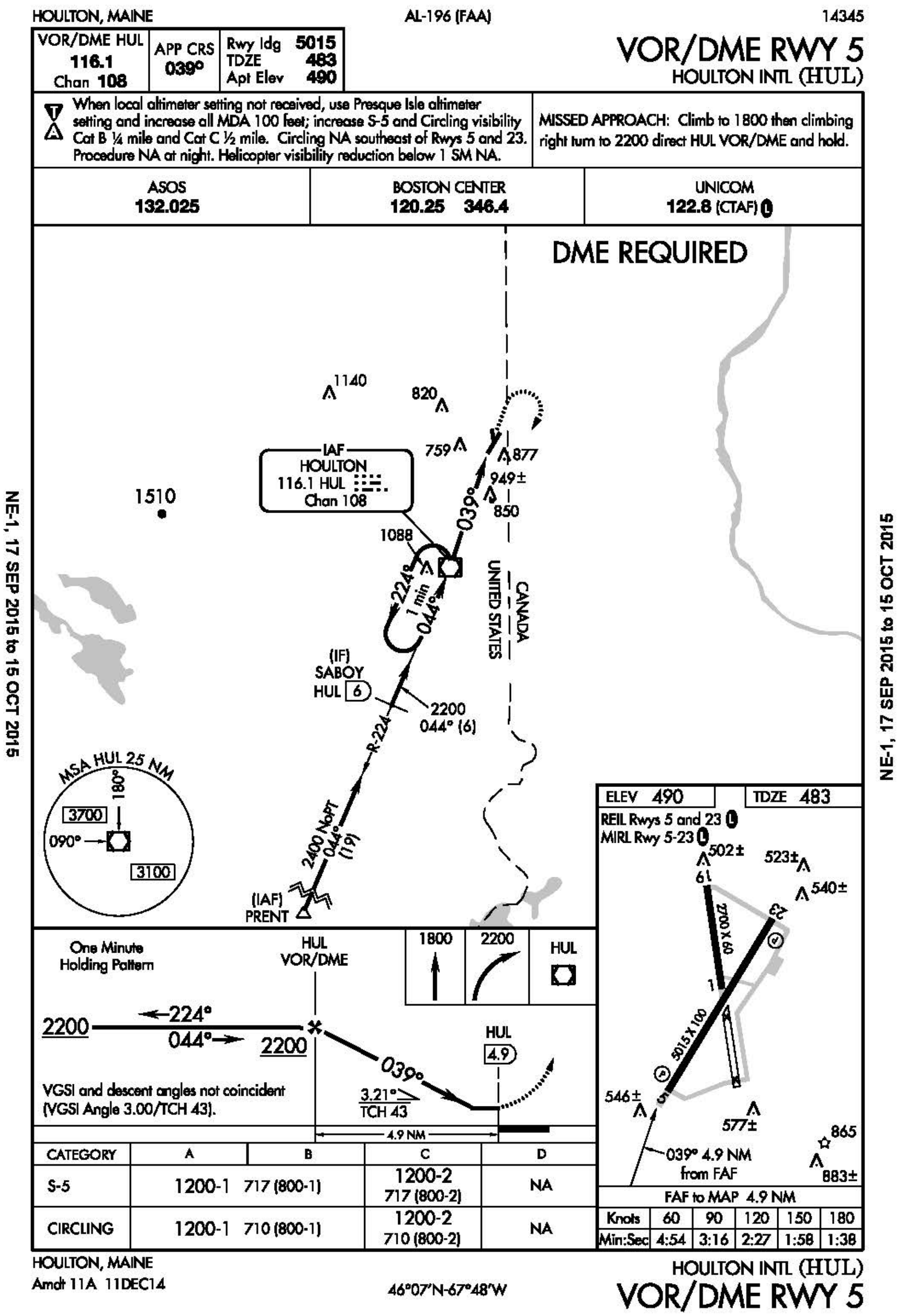



Figure 2.14 | VOR/DME Runway 5 Instrument Approach Procedure

## 2.18 Inventory Summary

Table 2-13 – The below Inventory Summary is a snapshot of Houlton's current operations and infrastructure.

| Table 2.13 \| Inventory Summary | | |
|---|---|---|
| **Condition** | **Measurement** | |
| **Runway 5-23** | **5,015' x 100'** | |
| **Runway 1-19** | **2,700 x 60'** | |
| **Design Aircraft** | **Beechcraft King Air B200 (Runway 5-23)**<br>**Cessna Skyhawk (Runway 1-19)** | |
| **Airport Reference Code** | **B-II (A-I Runway: 1-19)** | |
| **Fleet Mix** | **Aircraft** | **Operations** |
| Single Engine Piston | 19 | 7,900 |
| Multiengine Piston | 4 | 3,308 |
| Turboprop | 0 | 0 |
| Jet | 0 | 200 |
| Helicopter | 1 | 592 |
| Military | 0 | 700 |
| **Total** | **24** | **12,700** |
| **Operations** | | |
| Local | 7,000 | |
| Itinerant | 5,000 | |
| Military | 700 | |
| **Total** | **12,700** | |
| **Hangar Space** | **20-24 Spaces** | |
| **Apron Space** | **13 spaces**<br>**9 tie downs** | |
| **Fuel Storage** | **Jet A: 15,000 gal**<br>**100LL: 10,000 gal** | |
| **Automobile Parking** | **10 – 12 vehicles** | |
| **Population in Service Area** | **24,200** | |

# 3.0 FORECASTS OF AVIATION ACTIVITY

Projecting future aviation activity at an airport is one of the most important and vital steps in the master planning process. All master plan recommendations for facility needs, both airside and landside, will be directly affected by the projected aviation activity levels presented in this chapter. In order to develop the most realistic forecasts possible, a solid understanding of current and historic airport operations, industry trends, and socioeconomic conditions within the Airport's primary catchment area (i.e., market) is vital. These variables must be factored into a range of individual forecast scenarios that together will make up the master plan forecast.

## 3.1 FAA APPROVAL

The forecasts were prepared in December 2015. July 2015 data was used as the source for the base forecast. These forecasts provided the basis for projecting facility requirements, implementation planning, and other analyses as part of the master plan update. The FAA approved these forecasts on September 14, 2017.

## 3.2 AIRPORT MASTER PLANNING PROCESS

As stated in FAA Advisory Circular (AC) *150/5070-6B, Airport Master Plans*, dated January 27, 2015, forecasts are the basis for effective decision-making in airport planning. Further, *FAA Order 5090.3C, Field Formation of the National Integrated Airports Systems (NPIAS)*, states that forecasts should:

- Be realistic;
- Be based on the latest available data;
- Reflect current conditions at the airport;
- Be supported by information in the study; and
- Provide adequate justification for airport planning and development.

The following forecast analysis for Houlton follows these basic guidelines. Other forecasts such as those in the last master plan, and an outdated state systems plan were examined and compared against current and historic aviation activity. The historical activity was then examined alongside other factors and trends that could affect demand. The intent is to provide an updated set of aviation demand projections for the airport that can be incorporated into the facility needs analysis of the master plan.

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

1. Identify Aviation Activity Measures: These are the aviation activities that would affect the capacity of airport facilities. For general aviation, this typically includes based aircraft and operations.
2. Review Previous Airport Forecasts: This may include the FAA Terminal Area Forecast (TAF), any state or regional system plans, and previous master plans.
3. Gather Data: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecasted data.
4. Select Forecast Methods: There are several appropriate methodologies and techniques available; in this study we use trend analysis and market share or ratio analysis, as well as our professional judgment.
5. Apply Forecast Methods and Evaluate Results: Prepare the actual forecasts and evaluate for reasonableness.
6. Summarize and Document Results: Provide supporting text and tables to explain the thinking behind the forecasts.
7. Compare Forecast Results with FAA's Terminal Area Forecast (TAF): Follow guidance in FAA Order 5090.3C. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than a 10-percent variance, supporting documentation should be supplied to the FAA.

## 3.3 FACTORS INFLUENCING AVIATION ACTIVITY

Aviation activity can be affected by a range of local, regional, or national events, making it virtually impossible to predict year-to-year fluctuations of activity or to accurately forecast growth over a 20-year period with certainty. Therefore, it is important to remember that forecasts serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The following forecast analysis for Houlton was produced following these basic guidelines:

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

# 3.4 HOULTON'S BASELINE FORECAST DATA

For this 20-year forecast, Houlton International Airport data as of July 1, 2015 served as the baseline, or base year. The number of aircraft operations is established based on activity type (air taxi and general aviation), fleet mix, and based aircraft count. They are then confirmed from several reliable sources in order to ensure a solid foundation for the forecasts. The airport data and the 2014 FAA Terminal Area Forecasts (TAF) were used as the starting point for this data-gathering effort. In addition to the airport data and the TAF, the following sources will verify and provide additional clarity to the baseline data:

- Airport Records (based aircraft and fuel sales)
- Fixed Base Operator Records
- FAA Traffic Flow Management Systems Count (TFMSC)
- FAA Form 5010 Data (Airport Master Record)

## 3.4.1 Baseline Operations

Table 3-1 details the airport-reported 2014 baseline operations data that will serve as the foundation for the operations forecasts. The operations data is presented by category (air taxi, general aviation, and military), in order to correspond with the individual forecasts that were developed for each activity type.

**Table 3.1 | Airport Baseline Operations**

| Aircraft Category | Operations | Percent of Total |
|---|---|---|
| Air Taxi | 200 | 1.6% |
| General Aviation | 11,800 | 93.0% |
| Military | 700 | 5.4% |
| **Total** | **12,700** | **100%** |

Source: Town of Houlton

The TAF-reported operations and the 2015 Airport baseline operations totals are the same. The totals are as follows:

- Houlton Baseline Operations = 12,700
- TAF Reported Operations = 12,700

### 3.4.2 Based Aircraft Baseline

Projections for the number of general aviation aircraft based at the airport are used for the purposes of determining general aviation facility needs and anticipated general aviation operations, as well as projected revenue derived from fuel sales.

Table 3-2 provides the breakdown of 2015 airport-based aircraft by category. As with most general aviation airports, most based aircraft are single engine piston.

**Table 3.2 | Based Aircraft (Baseline)**

| Aircraft Category | Aircraft Count | Percent of Total |
|---|---|---|
| Single Engine Piston | 19 | 79.2% |
| Multi Engine Piston | 4 | 16.6% |
| Turboprop | 0 | 0% |
| Jet | 0 | 0% |
| Rotorcraft | 1 | 4.2% |
| Military | 0 | 0% |
| **Total** | **24** | **100%** |

Source: Town of Houlton

## 3.5 National Forecasts

As with the baseline operations data, the forecast factors (i.e., the annual growth rates to be applied to baseline activity) are collected from multiple sources and adjusted as necessary based on specific airport, market, and industry conditions. The following are the primary sources of the national data used in this forecast:

- FAA Terminal Area Forecast (TAF) (as of December 2014), and
- FAA Aerospace Forecast, Fiscal Years (2015-2035).

### 3.5.1 Terminal Area Forecasts (TAF)

The TAF[15] is the official FAA forecast of aviation activity for U.S. airports. It contains data on all active airports in the National Plan of Integrated Airport Systems (NPIAS), including FAA towered airports, Federal contract towered airports, nonfederal towered airports, and non-towered airports. Forecasts are prepared for major users of the National Airspace System; these categories include air carrier, air taxi/commuter, general aviation, and military. The forecasts are prepared to meet the budget and planning needs of the FAA and provide information for use by state and local authorities, the aviation industry, and the public.

TAF estimates are developed by the FAA starting with national estimates of aviation activity. These estimates are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast. In reality, TAF data for smaller GA airports such as Houlton is fairly marginal. That is, the data usually does not reflect any significant effort in forecasting, but is instead a carryover from older data, such as the airport's annual reporting of aircraft and operations. A primary purpose of this master plan update is to

15 FAA Terminal Area Forecasts (https://aspm.faa.gov/main/taf.asp)

create a more accurate forecast and realign the TAF with this customized forecasting effort; thus the requirement for FAA approval discussed in Section 3.2.

The 2014 TAF for Houlton is the most recent version and is the forecast against which all subsequent forecasts presented in this chapter will be compared. The TAF includes historical and forecast data for passenger enplanements, airport operations, and based aircraft, and as such is the benchmark against which the FAA compares all airport activity forecasts. The 2014 forecasts cover the years 2015-2035 and projects activity for the four major users of the air traffic system; air carriers, air taxi/commuters, general aviation, and military, as well as annual enplanements and based aircraft. For this update, we used air taxi and general aviation.

Table 3-3 provides a summary of the 2014 TAF, showing historic data from 2010 to 2014 and projected data from 2015 through 2035.

**Table 3.3 | FAA Terminal Area Forecasts for Houlton International Airport**

| Year | Operations | | | | Based Aircraft |
|---|---|---|---|---|---|
| | Air Taxi | GA | Military | Total | |
| **HISTORICAL** | | | | | |
| 2010 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2011 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2012 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2013 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2014 | 0 | 12,000 | 700 | 12,700 | 27 |
| **PROJECTED** | | | | | |
| 2015 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2020 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2025 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2030 | 0 | 12,000 | 700 | 12,700 | 27 |
| 2035 | 0 | 12,000 | 700 | 12,700 | 27 |

Source: FAA TAF

### 3.5.2 FAA Aerospace Forecasts

The FAA Aerospace Forecast, FY2015-2035, provides an overview of aviation industry trends and expected growth for the commercial passenger carrier, cargo carrier, and general aviation activity segments. National growth rates in enplanements, operations, fleet growth, and fleet mix for the general aviation fleet are provided over a 20-year forecast horizon. For the purposes of Houlton's forecast, the FAA Aerospace Forecasts were used as the basis for determining the growth of the general aviation fleet at Houlton and its composition by type of aircraft (i.e., general aviation fleet mix), as well as its cargo operations growth.

Forecasts for Houlton begin with an examination of the national scene, in particular, historic, and projected changes within the U.S. general aviation market, and specifically, the number of fleet aircraft, the fleet mix and the number of estimated hours flown.

The 2015 Aerospace Forecasts predict that as the economy recovers from the most serious economic downturn since World War II and the slowest economic expansion in recent history, aviation as a whole will continue to grow over the long run. This however, is more applicable to the commercial sector than to the struggling general aviation market. While commercial air travel and air cargo has seen a significant increase in passenger enplanements and cargo moved, the general aviation end of the market has not been as productive. However, while the recreational fleet has been in slow decline for the past 10 years due to fuel prices and the general economy, the high-end general aviation market, (i.e., the business jet aircraft fleet) has grown at a pace faster than the commercial market, for reasons beyond the scope of this study.

As noted in the Aerospace Forecasts, the general aviation market as a whole continues its recovery, with a focus on the high-end business-related sector. Continued concerns about safety, security, and flight delays keep business aviation attractive relative to commercial air travel, which directly impacts general aviation airports. In 2014, the turbo jet sector recorded its first increase in deliveries by U.S. manufacturers since 2008. For the third year in a row, single engine piston deliveries have increased. The long-term outlook for this sector of general aviation is favorable, and the near term also looks promising, especially for piston aircraft activity, which is sensitive to fuel price movements.

While it is slightly lower than predicted last year, the growth in business aviation demand over the long term also continues. As industry experts and prior year's survey results report that a significant portion of piston aircraft hours are also used for business purposes, the FAA Aerospace Forecasts predicts business usage of general aviation aircraft will expand at a faster pace than that for personal and recreational use. Increased demand for turboprop aircraft also contributes to increased turbine fleet and hours. As the fleet grows, the number of general aviation hours flown is projected to increase an average of 1.4 percent per year through 2035.

General aviation highlights from the 2015-2035 forecasts include four basic elements:

### *Fuel Sales (Jet and Aviation Gas)*

This data is an indicator of how much fuel the FAA forecasts in future sales to both turbine aircraft (jet fuel) and recreational aircraft (aviation gasoline or avgas). As noted in Table 3-4, jet fuel sales are expected to increase by 2.5%, while avgas sales will decline by 0.1%. The latter is a function of both declining operating hours by recreational aircraft – the primary users of this type of fuel – and a transition from gasoline based fuels to kerosene based fuels (jet).

| **Table 3.4 \| Projected Fuel Sales** (Millions of U.S. Gallons) | | |
|---|---|---|
| **Year** | **AVGAS** | **Jet A** |
| 2015 | 198.3 | 1,407.5 |
| 2020 | 189.9 | 1,621.2 |
| 2025 | 187.9 | 1,825.6 |
| 2030 | 188.4 | 2,039.6 |
| 2035 | 193.8 | 2,3064 |
| **Avg. Annual Growth** (2015 – 2035) | **-0.1%** | **2.5%** |

Source: FAA Aerospace Forecasts (2015 – 2035)

### *Fleet Aircraft*

The number of aircraft in the active fleet will see a mixed change in the next 20 years. As indicated in Table 3-5, the number of piston aircraft will see an average 0.5% decline, while five of the other six categories will see a healthy increase, averaging 2.5%. The total growth for the general aviation fleet will only increase 0.4% based on the FAA Aerospace Forecasts, as identified in Table 3-5. This was calculated based on the total projected number of increased general aviation aircraft through 2035.

### *Hours Flown*

Hours flown nearly mirrors changes in fleet aircraft, with the healthiest changes in jet, helicopter and sport aircraft as identified in Table 3-6.

### *Active Pilots*

Unfortunately, the number of Active Pilots in the United States will continue its 20-year decline. As noted in Table 3-7, the only area where the number of pilots will show a significant increase is in the Sport Pilot and Helicopter ratings. However, both are positive in terms of growth in the general aviation market, including Houlton.

| Table 3.5 \| FAA Fleet Forecast (2015 - 2035) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **SE Piston** | **ME Piston** | **TP** | **Jet** | **HELO** | **EXP** | **Sport** | **Other** | **Total GA Fleet** |
| 2015 | 122,435 | 13,175 | 9,390 | 11,915 | 10,440 | 24,880 | 2,355 | 4,190 | 198,780 |
| 2020 | 117,770 | 12,920 | 9,315 | 13,115 | 12,195 | 26,795 | 3,170 | 4,130 | 199,410 |
| 2025 | 113,905 | 12,545 | 9,855 | 15,000 | 13,760 | 28,875 | 3,970 | 4,060 | 201,970 |
| 2030 | 110,635 | 12,230 | 11,155 | 17,565 | 15,360 | 30,975 | 4,705 | 4,055 | 206,680 |
| 2035 | 108,810 | 12,135 | 12,970 | 20,815 | 17,110 | 33,040 | 5,360 | 4,020 | 214,260 |
| **Avg. Annual Growth** | **-0.6%** | **-0.4%** | **1.5%** | **2.8%** | **2.5%** | **1.4%** | **4.3%** | **-0.2%** | **0.4%** |

Source: FAA Aerospace Forecasts (2015 – 2035)
Legend: SE – Single Engine; ME – Multi Engine; TP – Turboprop; EXP – Experimental

| Table 3.6 \| Projected General Aviation Hours Flown (2015 - 2035) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **SE Piston** | **ME Piston** | **TP** | **Jet** | **HELO** | **EXP** | **Sport** | **Other** | **Total GA Hours** |
| 2015 | 10,757 | 1,608 | 2,581 | 3,723 | 3,350 | 1,212 | 202 | 133 | 23,566 |
| 2020 | 9,847 | 1,537 | 2,618 | 4,475 | 4,047 | 1,416 | 283 | 132 | 24,355 |
| 2025 | 9,533 | 1,492 | 2,784 | 5,361 | 4,611 | 1,594 | 369 | 130 | 25,874 |
| 2030 | 9,375 | 1,498 | 3,152 | 6,322 | 5,180 | 1,759 | 453 | 130 | 27,869 |
| 2035 | 9,464 | 1,570 | 3,665 | 7,512 | 5,821 | 1,929 | 536 | 130 | 30,626 |
| **Avg. Annual Growth** | **-0.5%** | **-0.2%** | **1.7%** | **3.6%** | **3.0%** | **2.4%** | **5.1%** | **-0.1%** | **1.4%** |

Source: FAA Aerospace Forecasts (2015 – 2035)
Legend: SE – Single Engine; ME – Multi Engine; TP – Turboprop; EXP – Experimental

**Table 3.7 | FAA Forecasts of Active U.S. Pilots**
(2015 - 2035)

| Year | Student | REC | Sport | PVT | COMM | AT | HELO | Glider | Total |
|---|---|---|---|---|---|---|---|---|---|
| 2015 | 119,650 | 220 | 5,600 | 173,750 | 104,250 | 153,000 | 15,335 | 19,885 | 591,690 |
| 2020 | 118,250 | 220 | 7,700 | 171,950 | 105,550 | 154,300 | 16,440 | 19,815 | 594,225 |
| 2025 | 116,300 | 215 | 9,900 | 168,650 | 107,050 | 158,100 | 20,300 | 19,615 | 600,130 |
| 2030 | 114,350 | 210 | 12,450 | 165,900 | 109,700 | 162,900 | 23,010 | 19,730 | 608,250 |
| 2035 | 112,200 | 210 | 14,950 | 163,600 | 113,350 | 168,600 | 24,440 | 19,650 | 617,000 |
| **Avg. Annual Growth** | **-0.3%** | **-0.2%** | **5.2%** | **-0.3%** | **0.4%** | **0.5%** | **2.2%** | **-0.1%** | **0.2%** |

Source: FAA Aerospace Forecasts (2015 – 2035)
Legend: REC – Recreational; PVT – Private; COMM – Commercial; AT – Airline Transport Pilot

### 3.5.3 FAA Aerospace Forecasts Impacts on Houlton

The forecasts presented in Tables 3-4 through 3-7 are all related to the general aviation segment of aviation in the United States, and the data in each table directly connects to Houlton; some more so than others. For example, Table 3-4 indicates that overall, avgas sales will decline by 0.1%, while jet fuel sales will increase by 2.5%. How this affects Houlton is difficult to assess, particularly avgas sales. While pilots who buy jet fuel tend to purchase it when needed, recreational pilots, who are the primary users of avgas, tend to shop around. Thus avgas sales are not only tied to the economy, but to local pricing.

Tables 3-5 and 3-6 indicate that the number of recreational aircraft (primarily single and multi-engine piston aircraft) will see a steady decline both in terms of numbers of aircraft and hours flown, while the business end of the general aviation market will excel. Both segments impact Houlton. While the total number of based aircraft might decline at Houlton, the jet and helicopter fleet may very well see increases in both physical aircraft and operations.

## 3.6 SOCIOECONOMIC TRENDS AFFECTING AVIATION DEMAND AT HOULTON

Multiple variables and factors affect the aviation activity of a particular airport. General aviation airports are typically influenced to a lesser extent by national and regional trends and more by local population, per capita income, employment, airport prominence, and market-based factors, such as the availability of flight training, aircraft maintenance and hangars for rent. Airports that offer superior facilities, more services, and competitive costs will generally attract greater passenger levels and activity. Finally, the airport's prominence (location and size of its catchment area in relation to competing airports) has the potential to drive activity as well.

However, on a macro scale, the factors that have the greatest impact on the growth prospects of an airport are its catchment area's socioeconomic characteristics; population, income, and employment, coupled with the continued availability of reasonable costs through the forecast period. Catchment area population growth or decline has the potential to directly influence an airport's aviation demand. Per capita income is deemed a strong indicator of a community's discretionary income and ability to afford travel. Employment levels, coupled with per capita income, are indicators of the overall strength of an area's economy.

Consequently, a clear understanding of local demographic trends and economic forces is important to develop an accurate aviation activity forecast. The Houlton catchment area consists of the town of Houlton, which is an unusually small area. Presque Isle is 42 miles north and Millinocket is 69 miles south, and both have well established, busy airports. This, coupled with the relatively low population in the region, means the service or catchment area within the town should provide adequate data for a reasonable assessment of the socioeconomic trends of the area.

### 3.6.1 Population

The historic and projected populations and corresponding average annual growth rates (AAGR) for the town of Houlton, Aroostook County, the State of Maine and the United States for years 1960 through 2010 (historic) and 2015 through 2035 (projected) are shown in Table 3-8. For the years 1960 through 2010 the population in the town of Houlton and Aroostook County declined by 35.4 and 47.9 percent respectively, while the State of Maine and the U.S. had an average annual growth rate of approximately 26.7 and 42.2 percent. Projections for the period 2015 through 2035 indicate that the town, County, and state population are all forecast to decrease by 4.9, 5.6 and 7.6 percent respectively, while the U.S. population, as a whole will increase by almost 15 percent. Figure 3-1 illustrates the same data from 1960 through 2035.

**Table 3.8 | Population Changes**
(Town, Country State, US) 1960 – 2035

| Year | Houlton | | Aroostook County | | Maine | | United States | |
|---|---|---|---|---|---|---|---|---|
| | Pop | AAGR | Pop | AAGR | Pop | AAGR | Pop (000) | AAGR |
| **HISTORICAL** | | | | | | | | |
| 1960 | 8,289 | -2.15% | 106,064 | | 969,265 | | 179,323 | |
| 1970 | 8,111 | -16.58% | 92,463 | -12.82% | 992,048 | 2.35% | 203,211 | 13.32% |
| 1980 | 6,766 | -2.26% | 91,331 | -1.22% | 1,124,660 | 13.37% | 226,545 | 11.48% |
| 1990 | 6,613 | -3.66% | 86,936 | -4.81% | 1,227,928 | 9.18% | 248,709 | 9.78% |
| 2000 | 6,371 | -2.06% | 72,944 | -16.09% | 1,259,000 | 2.53% | 282,158 | 13.45% |
| 2010 | 6,240 | -1.88% | 72,881 | -0.09% | 1,285,000 | 2.07% | 295,583 | 4.76% |
| **AAGR 1960 – 2010** | **(-35.4%)** | | **(-47.9%)** | | **26.7%** | | **42.2%** | |

**Table 3.8 | Population Changes**
(Town, Country State, US) 1960 – 2035

| Year | Houlton | | Aroostook County | | Maine | | United States | |
|---|---|---|---|---|---|---|---|---|
| | Pop | AAGR | Pop | AAGR | Pop | AAGR | Pop (000) | AAGR |
| **PROJECTED** | | | | | | | | |
| 2015 | 6,012 | -1.81% | 70,050 | -2.31% | 1,362,000 | 2.95% | 322,260 | 3.88% |
| 2020 | 5,957 | -0.91% | 69,264 | -1.12% | 1,396,000 | 2.50% | 334,503 | 3.80% |
| 2025 | 5,886 | -1.19% | 68,306 | -1.38% | 1,423,000 | 1.93% | 347,335 | 3.84% |
| 2030 | 5,792 | -1.60% | 67,068 | -1.81% | 1,250,000 | -12.16% | 359,402 | 3.47% |
| 2035 | 5,718 | -1.28% | 66,142 | -1.38% | 1,259,000 | 0.72% | 370,338 | 3.04% |
| **AAGR 2015 – 2035** | **(-4.9%)** | | **(-5.6%)** | | **(-7.6%)** | | **14.9%** | |

Note: AAGR - Average Annual Growth Rate
Sources:
Maine Office of Policy and Management
United States Census Bureau
University of Maine, Raymond H. Fogler Library

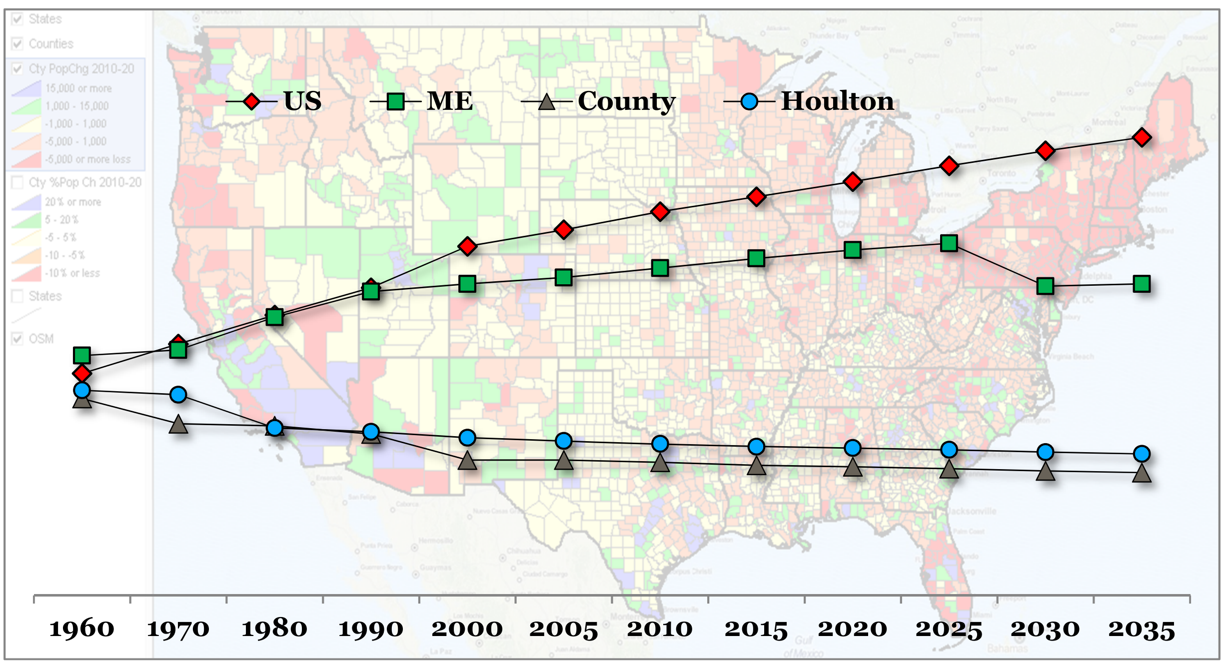



Figure 3.1 | Historic and Project Population Changes

### 3.6.2 Per Capita Personal Income

The historic and projected per capita income for Aroostook County, the State of Maine and the U.S. are shown in Table 3-9. The base year (2015) per capita income for the County was $22,368, which is $6,786 below the state average and $5,361 below the United States average. However, the County AAGR rose at a much higher rate than both the state and country during the same 10-year period. In addition, the County per capita income is forecast to increase at nearly twice the rate as the state. According to data obtained from the U.S. Census, per capita income in Aroostook County will increase by 35 percent in the next 20 years as compared to 18 and 11 percent in Maine and the United States, respectively.

**Table 3.9 | Historic and Projected Per Capita**
Income for Aroostook County, Maine, and the US

| Year | Aroostook County | | Maine | | United States | |
|---|---|---|---|---|---|---|
| | PCPI | AAGR | PCPI | AAGR | PCPI | AAGR |
| **HISTORICAL** | | | | | | |
| 2005 | $18,097 | | $30,349 | | $28,617 | |
| 2007 | $18,951 | 2.31% | $30,473 | 2.71% | $28,519 | 4.57% |
| 2009 | $19,805 | 2.20% | $29,140 | -3.95% | $27,217 | -1.64% |
| 2011 | $20,659 | 2.01% | $28,115 | -0.64% | $27,161 | 0.25% |
| 2013 | $21,566 | 2.58% | $28,645 | 1.69% | $27,066 | 0.88% |
| 2015 | $22,368 | 1.98% | $29,154 | 0.92% | $27,729 | -0.89% |
| **AAGR 2005 – 2015** | | **23.6%** | | **(-3.9%)** | | **(-3.1%)** |
| **PROJECTED** | | | | | | |
| 2016 | $22,795 | 1.91% | $29,434 | 0.96% | $27,896 | 0.60% |
| 2018 | $23,649 | 1.84% | $29,993 | 0.94% | $28,232 | 0.60% |
| 2020 | $24,503 | 1.77% | $30,553 | 0.92% | $28,567 | 0.59% |
| 2022 | $25,358 | 1.71% | $31,113 | 0.91% | $28,902 | 0.58% |
| 2024 | $26,212 | 1.66% | $31,672 | 0.89% | $29,238 | 0.58% |
| 2026 | $27,066 | 1.60% | $32,232 | 0.88% | $29,573 | 0.57% |
| 2028 | $27,920 | 1.55% | $32,791 | 0.86% | $29,909 | 0.56% |
| 2030 | $28,774 | 1.51% | $33,351 | 0.85% | $30,244 | 0.56% |
| 2032 | $29,629 | 1.46% | $33,911 | 0.83% | $30,579 | 0.55% |
| 2034 | $30,483 | 1.42% | $34,470 | 0.82% | $30,915 | 0.55% |
| **AAGR 2016 – 2035** | | **35.6%** | | **18.1%** | | **11.4%** |

Note: AAGR - Average Annual Change in Income
Source: US Census

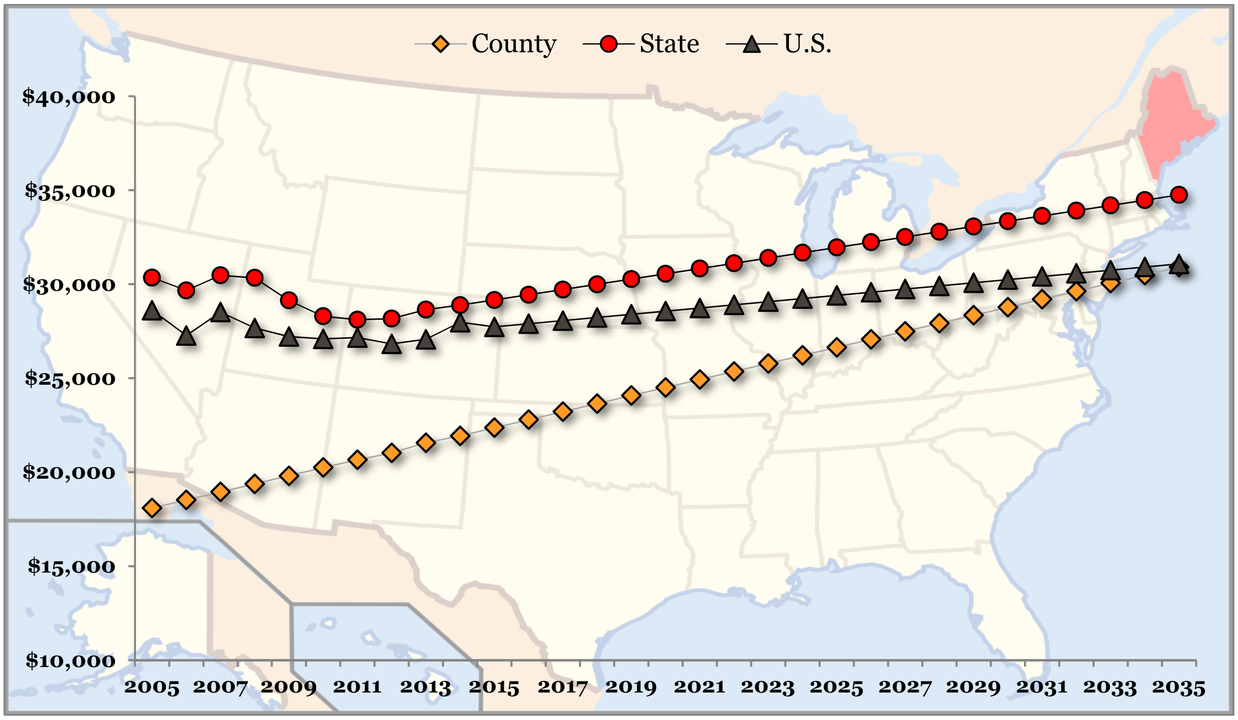



Figure 3.2 | Per Capita Income Levels (Historic and Projected)

### 3.6.3 Total Employment

The historic and projected number of persons employed and percent of population group employed (i.e., persons employed divided by total population) for the Houlton service area, the State of Maine, and the U.S. for years 2000 through 2014 are shown in Figure 3-3. What is obvious, particularly when looking at Figure 3-3, is how the state and County employment levels generally mirrored each other in terms of decline and growth. While the County lagged behind the state and the U.S. in terms of percentage of people employed, both the County and state followed the same employment pattern as the U.S. While forecasts for future changes were not obtained, nor would they be considered reliable, the 14-year trend shown in both the table and the graph are sufficient to provide a level of confidence that future patterns will in all probability be similar. That is, Aroostook County's employment levels will remain consistent with both the State of Maine and the U.S.

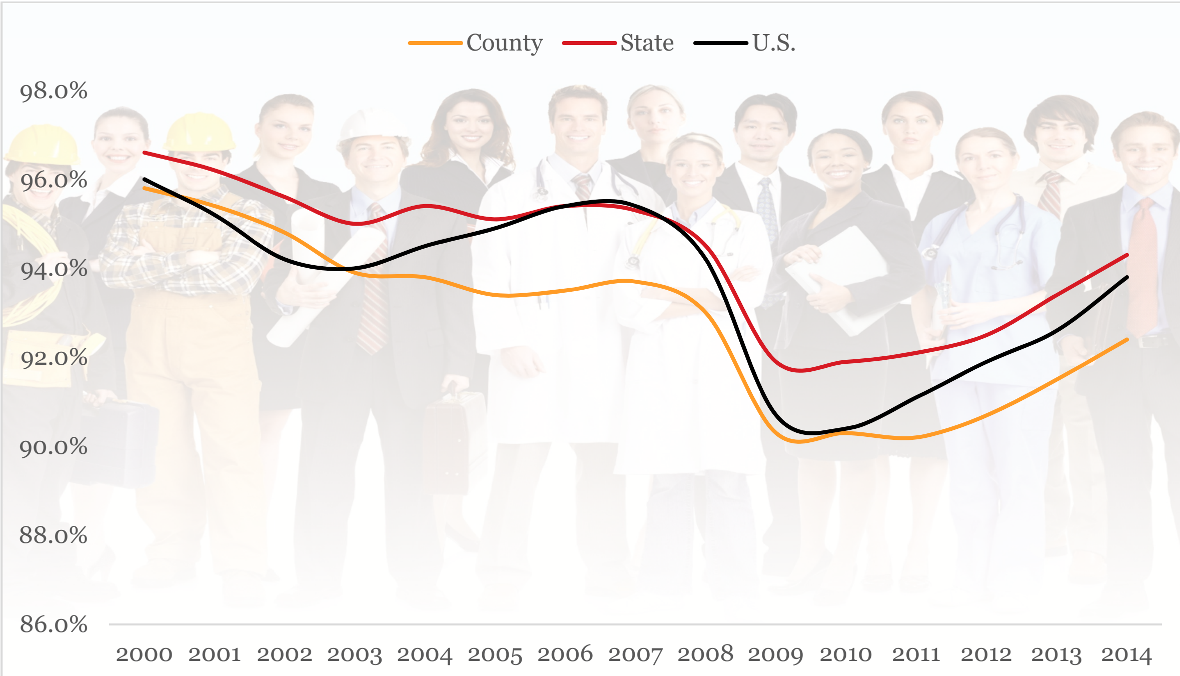



Figure 3.3 | Employment Rate (2000 – 2014) Aroostook County, Maine, U.S.

### 3.6.4 Socioeconomic Conditions Summary

Three elements were examined in the previous sections: population, income, and employment. As presented in Table 3.8 and Figure 3.1, the population in Aroostook County has shown a steady decline over the course of the 55-year period leading up to this year (1960 – 2014). In addition, the County population is projected to continue this slow migration away from the state's northernmost regions through the 20-year planning period. On the other hand, the state, which saw a small but steady increase in population during the same period, is projected to start losing people toward the end of the planning period.

Economically, the County held its own during the period from 2005 through present day and is forecast to continue to outpace both the state and United States over the next 20 years. Table 3-9 and Figure 3-2 illustrates this trend.

In terms of employment, the County has for at least the 15-year period kept a parallel pace with both the state and national employment figures (see Figure 3.3). While the County has lagged behind both Maine and the United States, it has clearly followed the same trend, whether rising or falling in terms of the number of people employed.

# 3.7 Preferred Aviation Forecast for Houlton

The local market (within southern Aroostook County) will likely have similar changes to the national level. As the general aviation market changes in the U.S. and the State of Maine, the service area for Houlton will change accordingly. Thus, changes in the number of aircraft in the general aviation fleet and the number of hours flown are projected to change at a similar rate as the rest of the U.S. In summary, activity at Houlton will change as noted in Table 3-10.

**Table 3.10 | Preferred Forecast Values for Houlton**

| Activity | Median 20 Year Changes | Overall Changes |
|---|---|---|
| **Based Aircraft** | | |
| Single Engine Piston | 0.26% | 1.0% |
| Multi Engine Piston | 0% | |
| Turboprop | 15.0% | |
| Helicopter | 5.0% | |
| **Operations** | | |
| Single Engine Piston | -0.88% | 0.4% |
| Multi Engine Piston | -0.89% | |
| Turboprop | 0.84% | |
| Helicopter | 6.38% | |
| Other (Sport, Experimental) | 6.17% | |
| **Fuel Sales** | | |
| Aviation Gas | -0.1% | 2.3% |
| Jet Fuel | 2.5% | |

# 3.8 Forecast of General Aviation Activity at Houlton

This section melds the previous sections together, providing a general forecast of aviation activity at the Houlton International Airport. The original FAA TAF data, existing activity at Houlton (based aircraft, operations, and fuel sales), local socioeconomic conditions and the FAA Aerospace Forecasts are brought together to form the forecasts for the airport.

## 3.8.1 General Aviation Defined

There are a variety of aviation activities that comprise the broad definition of general aviation. General aviation activities include all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations.

General aviation represents the largest percentage of civil aircraft in the United States and accounts for most operations handled by towered and non-towered airports, as well as the majority of certified pilots. Its activities include flight training, sightseeing, aerial photography, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi charter operations. General aviation aircraft encompass a broad range of types, from single-engine piston aircraft to large corporate jets, as well as helicopters, gliders, and amateur-built aircraft.

General aviation operations are divided into the subcategories of local and itinerant operations. Local operations are those arrivals or departures performed by aircraft that remain in the airport traffic pattern, or are within sight of the airport. Local operations are most often associated with training activity and flight instruction, and include touch and go operations.

Itinerant operations are arrivals or departures other than local operations, performed by either based or transient aircraft that do not remain in the airport traffic pattern or within a 20-nautical mile radius.

The forecast of general aviation activity presented in this section consists of based aircraft and operations projections through the 2035 planning horizon. The TAF serves as the baseline forecast for comparison purposes, coupled with a separate market share forecast and econometric forecast that is based on the service area's socioeconomic data and presented as an alternative scenario.

### 3.8.2 Forecast Reliability

Experience demonstrates that forecasts about airport traffic will always differ from actual activity. Comparisons between what traffic level a forecast indicates for a given time period and what actually occurs almost invariably show a significant discrepancy. This is especially true when one considers forecasts 10 to 20 years out, that is, beyond the normal period for the planning of airport facilities. Intermediate and long-term forecasts may differ from what actually occurs by up to 20 percent. Part of this is because of the periodic and natural swings of the economy and the other reason is unknown factors about future world and national events, such as 9/11 or a major hurricane that disrupts fuel supplies. Because of this, we anticipate the possibility that our forecasts could swing by 20 percent. We apply this variation to the individual forecasts presented in the next section.

In applying the 20 percent variation, we project high and low ranges for each of the elements addressed earlier, in particular Table 3-12.

### 3.8.3 General Aviation TAF Adjustments

As noted in Terminal Area Forecasts section, a principle role in developing forecasts for Houlton is to realign the FAA TAF to be more accurate for Houlton. Based on the proposed forecasts for both based aircraft and operations, the TAF realignments are shown in Table 3-11.

Note that the revised forecasts now include air taxi activity, a segment of general aviation that was not originally reported in the FAA TAF. Based aircraft growth is tied to an annual 1.0% increase, and operations growth is based on a 0.4% annual increase.

**Table 3.11 | TAF Realignments**

| Year | Air Taxi | GA | Military | Total Operations |
|---|---|---|---|---|
| TAF* | 0 | 12,000 | 700 | 12,700 |
| 2015 | 200 | 11,800 | 700 | 12,700 |
| 2016 | 191 | 11,858 | 702 | 12,751 |
| 2017 | 192 | 11,906 | 704 | 12,802 |
| 2018 | 193 | 11,953 | 707 | 12,853 |
| 2019 | 193 | 12,001 | 710 | 12,904 |
| 2020 | 194 | 12,049 | 713 | 12,956 |
| 2021 | 196 | 12,097 | 715 | 13,008 |
| 2022 | 196 | 12,146 | 718 | 13,060 |
| 2023 | 197 | 12,194 | 721 | 13,112 |
| 2024 | 198 | 12,243 | 724 | 13,165 |
| 2025 | 198 | 12,292 | 727 | 13,217 |
| 2026 | 199 | 12,341 | 730 | 13,270 |
| 2027 | 199 | 12,391 | 733 | 13,323 |
| 2028 | 200 | 12,440 | 736 | 13,376 |
| 2029 | 201 | 12,490 | 739 | 13,430 |
| 2030 | 202 | 12,540 | 742 | 13,484 |
| 2031 | 203 | 12,590 | 745 | 13,538 |
| 2032 | 204 | 12,640 | 748 | 13,592 |
| 2033 | 204 | 12,691 | 751 | 13,646 |
| 2034 | 205 | 12,742 | 754 | 13,701 |
| 2035 | 206 | 12,793 | 757 | 13,756 |

Source: FAA TAF, Stantec Consulting Services Analysis (2015)

Note: 0.4% annual growth applied to operations and 1.0% applied to based aircraft.

### 3.8.4 Based Aircraft

The number of based aircraft at Houlton is projected to increase at a rate of 1.0% to 4% per year, with a median growth of 2.5%. Table 3-12 presents this data, which shows a growth in aggregate based aircraft of between 5 and 19 aircraft over the next 20 years. The low growth scenario has been selected as the preferred forecasts for a 1.0% annual increase.

**Table 3.12 | Based Aircraft Forecasts**

| Year | Low Growth | Median Growth | High Growth |
|---|---|---|---|
| Today | 24 | 24 | 24 |
| 2016 | 24 | 24 | 25 |
| 2017 | 24 | 25 | 25 |
| 2018 | 25 | 25 | 26 |
| 2019 | 25 | 26 | 27 |
| 2020 | 25 | 26 | 28 |
| 2021 | 25 | 27 | 29 |
| 2022 | 26 | 28 | 30 |
| 2023 | 26 | 28 | 30 |
| 2024 | 26 | 29 | 31 |
| 2025 | 27 | 29 | 32 |
| 2026 | 27 | 30 | 33 |
| 2027 | 27 | 30 | 34 |
| 2028 | 27 | 31 | 35 |
| 2029 | 28 | 32 | 36 |
| 2030 | 28 | 32 | 37 |
| 2031 | 28 | 33 | 39 |
| 2032 | 28 | 34 | 40 |
| 2033 | 29 | 34 | 41 |
| 2034 | 29 | 35 | 42 |
| 2035 | 29 | 36 | 43 |
| **Net Change** | **5** | **12** | **19** |

Source: Stantec Consulting Services Analysis

### 3.8.5 Based Aircraft Fleet Mix

The fleet mix forecast further assesses growth in the number of based aircraft by breaking it out into various aircraft categories. This analysis, which is presented in Table 3-13, uses the FAA Aerospace forecasts discussed earlier, and adjusts the growth rate of individual aircraft categories accordingly. This assessment indicates that the growth rate of turboprop, and helicopters will outpace the piston aircraft as a percentage of total aircraft.

**Table 3.13 | Based Aircraft Fleet Mix**

| Year | SE Piston | ME Piston | TP | Helicopter | Total GA Fleet |
|---|---|---|---|---|---|
| Today | 19 | 4 | 0 | 1 | 24 |
| 2016 | 19 | 4 | 0 | 1 | 24 |
| 2017 | 19 | 4 | 0 | 1 | 24 |
| 2018 | 19 | 4 | 1 | 1 | 25 |
| 2019 | 19 | 4 | 1 | 1 | 25 |
| 2020 | 19 | 4 | 1 | 1 | 25 |
| 2021 | 19 | 4 | 1 | 1 | 25 |
| 2022 | 20 | 4 | 1 | 1 | 26 |
| 2023 | 20 | 4 | 1 | 1 | 26 |
| 2024 | 20 | 4 | 1 | 1 | 26 |
| 2025 | 20 | 4 | 2 | 1 | 27 |
| 2026 | 20 | 4 | 2 | 1 | 27 |
| 2027 | 20 | 4 | 2 | 1 | 27 |
| 2028 | 20 | 4 | 2 | 1 | 27 |
| 2029 | 20 | 4 | 2 | 2 | 28 |
| 2030 | 20 | 4 | 2 | 2 | 28 |
| 2031 | 20 | 4 | 2 | 2 | 28 |
| 2032 | 20 | 4 | 2 | 2 | 28 |
| 2033 | 20 | 4 | 3 | 2 | 29 |
| 2034 | 20 | 4 | 3 | 2 | 29 |
| 2035 | 20 | 4 | 3 | 2 | 29 |
| **Net Change** | **1** | **0** | **3** | **1** | **5** |

### 3.8.6 Operations

The baseline operations for Houlton are 12,700 annual takeoffs and landings (refer to Table 3-14), with projected increases of 0.4% per year (all categories of aircraft). This slight change will result in an increase of approximately 1,056 operations for a total of just under 13,800 operations per year by 2035. While this seems like a small increase, it is consistent with general aviation trends in the United States. As discussed in Section 3.8.2 – Forecast Reliability, this number could vary by as much as 20%, meaning the overall increase could be as low as 845 and as high as 1,270. Table 3-14 provides a breakout of projected changes per year between now and 2035.

**Table 3.14 | Operations Forecast**

| Year | Local | Itinerant | Total |
|---|---|---|---|
| Current | 7,000 | 5,700 | 12,700 |
| 2016 | 7,026 | 5,725 | 12,751 |
| 2017 | 7,054 | 5,748 | 12,802 |
| 2018 | 7,082 | 5,771 | 12,853 |
| 2019 | 7,110 | 5,794 | 12,904 |
| 2020 | 7,139 | 5,817 | 12,956 |
| 2021 | 7,167 | 5,841 | 13,008 |
| 2022 | 7,196 | 5,864 | 13,060 |
| 2023 | 7,225 | 5,887 | 13,112 |
| 2024 | 7,254 | 5,911 | 13,165 |
| 2025 | 7,283 | 5,935 | 13,218 |
| 2026 | 7,312 | 5,958 | 13,270 |
| 2027 | 7,341 | 5,982 | 13,323 |
| 2028 | 7,370 | 6,006 | 13,376 |
| 2029 | 7,400 | 6,030 | 13,430 |
| 2030 | 7,430 | 6,054 | 13,484 |
| 2031 | 7,460 | 6,078 | 13,538 |
| 2032 | 7,489 | 6,103 | 13,592 |
| 2033 | 7,519 | 6,127 | 13,646 |
| 2034 | 7,549 | 6,152 | 13,701 |
| 2035 | 7,579 | 6,177 | 13,756 |
| **Net Change** | **579** | **476** | **1,056** |

### 3.8.7 Operations – Fleet Mix

This section further breaks out the operations data into individual aircraft categories (fleet mix). This data is helpful in calculating potential future needs in the size of aircraft parking aprons, hangars, and projected fuel sales (avgas versus jet fuel). Using the individual estimate growth rates for each group (from Table 3-10), we discover that as predicted, the total number of single engine and multi-engine piston aircraft will slowly decrease over the next 20 years, while turboprop, jet, helicopter, and the “other” category, (which includes sport and ultralight aircraft) will increase. Table 3-15 lists the fleet mix estimates for the next 20 years.

**Table 3.15 | Fleet Mix Operations Forecasts**

| Year | SE Piston | ME Piston | TP | Jet | Helicopter | Other | Total |
|---|---|---|---|---|---|---|---|
| Current | 7,000 | 2,600 | 1,000 | 600 | 600 | 900 | 12,700 |
| 2016 | 6,932 | 2,575 | 1,008 | 624 | 625 | 937 | 12,751 |
| 2017 | 6,866 | 2,549 | 1,016 | 649 | 651 | 975 | 12,802 |
| 2018 | 6,799 | 2,524 | 1,024 | 675 | 679 | 1,015 | 12,853 |
| 2019 | 6,734 | 2,500 | 1,032 | 702 | 707 | 1,057 | 12,904 |
| 2020 | 6,669 | 2,475 | 1,040 | 730 | 737 | 1,100 | 12,956 |
| 2021 | 6,604 | 2,451 | 1,048 | 759 | 768 | 1,145 | 13,008 |
| 2022 | 6,541 | 2,427 | 1,056 | 790 | 800 | 1,192 | 13,060 |
| 2023 | 6,478 | 2,403 | 1,064 | 821 | 834 | 1,241 | 13,112 |
| 2024 | 6,415 | 2,379 | 1,072 | 854 | 869 | 1,292 | 13,165 |
| 2025 | 6,353 | 2,356 | 1,081 | 888 | 905 | 1,345 | 13,217 |
| 2026 | 6,292 | 2,333 | 1,089 | 924 | 943 | 1,400 | 13,270 |
| 2027 | 6,231 | 2,310 | 1,098 | 961 | 983 | 1,458 | 13,323 |
| 2028 | 6,171 | 2,288 | 1,106 | 999 | 1,024 | 1,517 | 13,376 |
| 2029 | 6,111 | 2,265 | 1,115 | 1,039 | 1,067 | 1,580 | 13,430 |
| 2030 | 6,052 | 2,243 | 1,124 | 1,081 | 1,112 | 1,644 | 13,484 |
| 2031 | 5,994 | 2,221 | 1,132 | 1,124 | 1,159 | 1,712 | 13,538 |
| 2032 | 5,936 | 2,199 | 1,141 | 1,169 | 1,208 | 1,782 | 13,592 |
| 2033 | 5,879 | 2,178 | 1,150 | 1,215 | 1,258 | 1,855 | 13,646 |
| 2034 | 5,822 | 2,156 | 1,159 | 1,264 | 1,311 | 1,931 | 13,701 |
| 2035 | 5,766 | 2,135 | 1,168 | 1,315 | 1,366 | 2,010 | 13,756 |
| **Net Change** | **-1,234** | **-465** | **168** | **715** | **766** | **1,110** | **1,056** |

Figure 3-4 presents local, itinerant, and total operations graphically for the next 20 years.

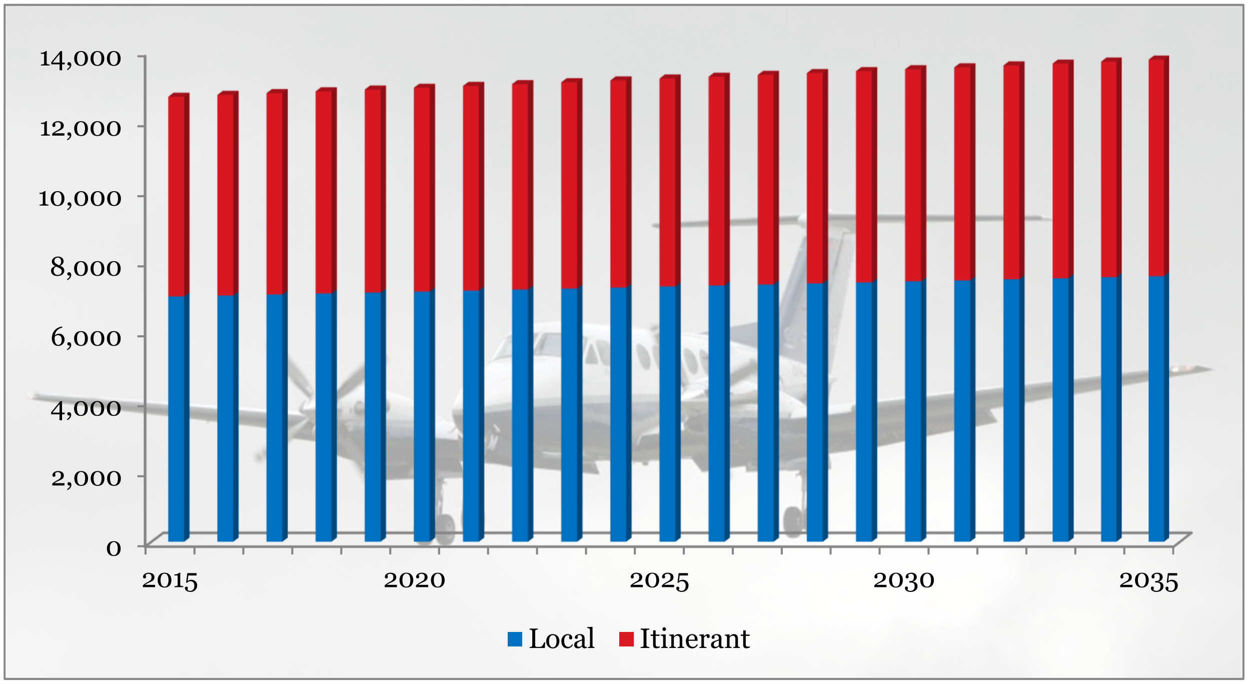



Figure 3.4 | Operations Forecast

## 3.9 FUEL SALES

Fuel sales at Houlton will reflect changes in the number of operations at the airport. As noted in Chapter 2, the airport sold close to 25,000 gallons of fuel during the period July 1, 2014-June 30, 2015, a number management believes is consistent with previous years and one that they are confident will carry through in subsequent years. National forecasts identify that projected sales in avgas will probably decline over the course of the next 20 years (see Table 3-4, Fuel Sales). However, we are not fully convinced that the national projections apply to Houlton because of the aggressive approach the town has taken in promoting sales. It is anticipated that avgas sales will increase by perhaps 1.5% per year for the next 10 years, but then level off and eventually decline. The reason for the turnaround is because of industry and environmental efforts to reduce and eventually eliminate avgas in the market. We believe that by 2025, avgas sales will start to decline. By applying these forecasts to the historic sales at Houlton, we estimate that by the year 2035, the airport will sell an estimated 33,675 gallons of fuel (9,180 in aviation gas and 24,495 in jet fuel). Figure 3-7 breaks the projected sales down by planning years.

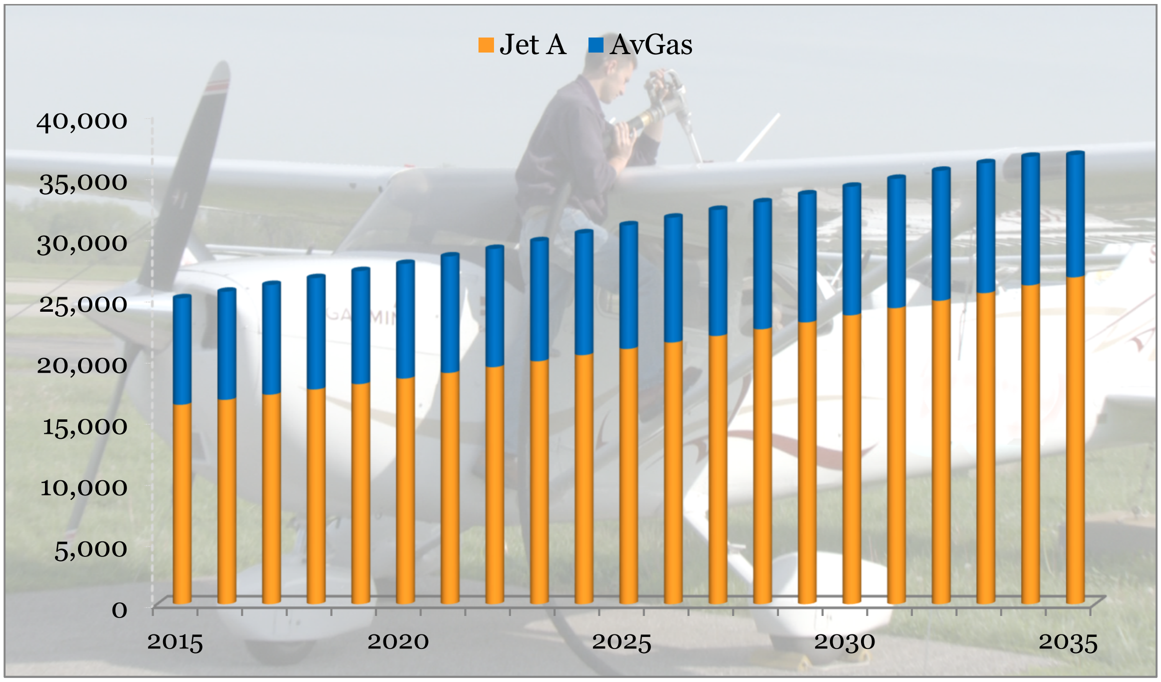



Figure 3.5 | Projected Fuel Sales

## 3.10 Design Aircraft

The existing design aircraft is the Beechcraft King Air 200 (see Design Aircraft, page 2.10). After evaluating the airport and projecting potential changes in based aircraft, operations, and the fleet mix for the next 20 years, we feel the design aircraft will remain the same general type of aircraft, whether the King Air 200 or the newer King Air 350.

## 3.11 Airport Reference Code and Runway Design Codes

The existing Airport Reference Code (ARC) is B-II (refer to Chapter 2, page 2.10) and the Runway Design Codes (RDC) are B-II-5000 for the primary Runway 5-23, and A-I-VIS for the crosswind Runway 1-19. The ARC and RDCs will remain the same throughout the 20-year planning period.

## 3.12 Summary

Houlton International Airport will remain a general aviation airport in support of primarily recreational flying as well as business activity. We've shown that the population, per capita income, and employment levels will remain consistent with changes in both the national and state demographics. Consistent with this, we feel the airport's level of activity will mirror that of the U.S in terms of the number of based aircraft, fleet mix, and operations. These projections are used in subsequent chapters in developing the airport's facility needs as well as alternatives to meet those needs.

Table 3.16 is a summary of the findings in this chapter.

| **Table 3.16 \| Summary** | | | | |
|---|---|---|---|---|
| **Elements** | **Existing (2015)** | **Short Term (2016 – 2020)** | **Medium Term (2021 – 2025)** | **Long Term (2026 – 2035)** |
| **Design Aircraft** | **King Air 200** | **King Air 200** | **King Air 200** | **King Air 200** |
| **Airport Reference Code (ARC)** | **B-II** | **B-II** | **B-II** | **B-II** |
| **Runway 5-23 Design Code (RDC)** | **B-II-5000** | **B-II-5000** | **B-II-5000** | **B-II-5000** |
| **Runway 1-19 Design Code (RDC)** | **A-I-VIS** | **A-I-VIS** | **A-I-VIS** | **A-I-VIS** |
| **Based Aircraft Fleet Mix** | | | | |
| Single Engine Piston | 19 | 19 | 20 | 20 |
| Multi Engine Piston | 4 | 4 | 4 | 4 |
| Turboprop | 0 | 1 | 2 | 3 |
| Helicopter | 1 | 1 | 1 | 2 |
| **Total Based Aircraft** | **24** | **25** | **27** | **29** |
| **Operations (per year)** | | | | |
| Local | 7,000 | 7,139 | 7,283 | 7,579 |
| Itinerant | 5,700 | 5,817 | 5,935 | 6,177 |
| **Total** | **12,700** | **12,956** | **13,218** | **13,756** |
| **OPBA** | **529** | **518** | **489** | **474** |
| **Aviation Fuel Sales (gallons/year)** | | | | |
| Jet Fuel | 16,300 | 17,825 | 19,560 | 24,495 |
| Avgas | 8,700 | 9,110 | 9,455 | 9,180 |
| **Total** | **25,000** | **26,935** | **29,015** | **33,675** |

# 4.0 FACILITY REQUIREMENTS

## 4.1 INTRODUCTION

This chapter investigates the ability of the airport to meet current demand and then determines what facilities would be required to meet future needs as established in the Forecasts.

The analysis of facility requirements is based on more than capacity and demand; making sure the airport meets FAA design and safety standards and considering new services for airport users are also considered.

The potential need for an increase in airside and landside capacity is determined by comparing the capacity of the existing facilities to forecasted demand. Where demand exceeds capacity, additional facilities will be recommended. Conversely, if capacity exceeds demand, alternate methods of using this excess capacity will be suggested. The timeframe for assessing facility needs usually involves three forecast periods: short (0-5 years); intermediate (6-10 years); and long-term (years 11-20).

## 4.2 RUNWAY REQUIREMENTS

In this section, dimensional criteria such as length, width, and pavement design strength are evaluated for the existing runways at Houlton.

### 4.2.1 Design Aircraft

As discussed in Chapter 2, FAA guidance on dimensional standards is based on the ARC and RDC. This is true for both existing and future classifications. As also noted in Chapter 2, the design aircraft for Houlton is the Beech King Air 200 for Runway 5-23 and the Cessna 172 Skyhawk for Runway 1-19. Based on these aircraft, the ARC for Runway 5-23 is B-II and the ARC for Runway 1-19 is A-I.

### 4.2.2 Runway Width Analysis

Different criteria determine the required runway width and length. Width is determined by the ARC and by the approach visibility minimums. The higher the ARC and the lower the visibility, the wider the runway should be. Based on the current ARC, the required runway width is 75' for Runway 5-23 and 60' for Runway 1-19. The width for Runway 5-23 was reconstructed in 2009 at 100', as at that time it was determined a 100' wide runway was necessary.

### 4.2.3 Runway Length Analysis

Many factors determine the required length of a runway, the most notable of which is the design aircraft: how much runway it requires for takeoff and landing. Generally, larger, faster aircraft require more runway pavement to operate safely.

As noted in Chapter 2, Runway 5-23 is approximately 5,015' long and Runway 1-19 is approximately 2,700' long. Runway length is determined using specific aircraft performance data for the types of aircraft currently based at the airport as well for those aircraft that use the airport. This analysis takes into consideration the airport elevation, mean high summer temperature, and runway gradient. As design aircraft, the Beech King Air 200 and the Cessna 172 Skyhawk are included in this analysis. Table 4-1 identifies specific runway lengths required for the various aircraft that are likely to use the airport.

**Table 4.1 | Runway Length Requirements**

| Aircraft | ARC | MGTOW (pounds) | Takeoff Runway Length (feet) | Landing Runway Length (feet) |
|---|---|---|---|---|
| Beech King Air 200 | B-II | 12,500 | 2,969 | 3,269 |
| Cessna 172 | A-I | 2,300 | 1,415 | 1,302 |
| Cessna 310 | A-I | 5,500 | 1,935 | 2,080 |
| Cessna 525 Citationjet (CJ-1) | B-I | 10,400 | 3,917 | 3,421 |
| Cessna Citation II | B-II | 13,300 | 3,432 | 2,621 |
| Cessna 650 Citation III/IV | C-II | 21,000 | 5,867 | 3,331 |
| Dassault Falcon 2000 | B-II | 35,800 | 5,969 | 5,946 |
| Dassault Falcon 50 | B-II | 39,900 | 5,574 | 3,353 |
| Grumman Gulfstream III | C-II | 68,700 | 5,828 | 3,725 |
| Learjet 55 | C-I | 21,000 | 5,642 | 3,566 |
| Piper PA-24 | A-I | 3,200 | 1,640 | 1,415 |
| Piper PA-30 | A-I | 3,725 | 1,133 | 1,978 |

Source: Stantec Analysis

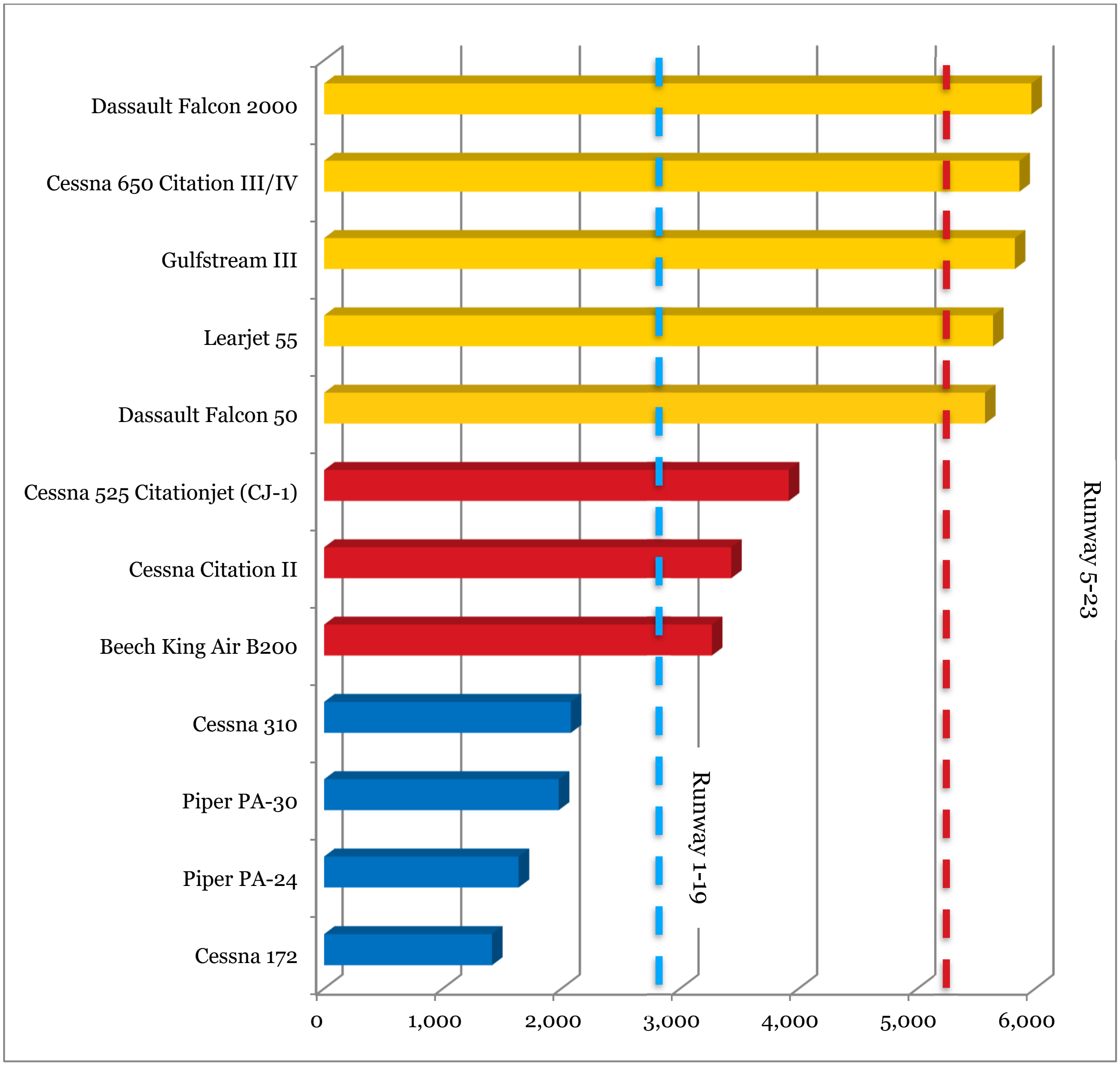



Figure 4.1 | Runway Length Requirements

As shown in Figure 4.1, most of the aircraft that currently use the airport can use the primary runway at its current length. Therefore, the length of Runway 5-23 is considered to be adequate throughout the 20-year planning period.

Runway 1-19 serves as the crosswind runway at the airport. The optimum runway length for a crosswind runway is 80% of the primary runway, which would be approximately 4,000 feet. At 2,700 feet, Runway 1-19 is 1,300 feet shorter - only 54% of the length of the primary runway.

Only the smaller single-engine piston aircraft can use Runway 1-19 at its existing length. This represents 33% of the aircraft shown in Figure 4.1. Runway 1-19 was reopened in 2009 as a temporary runway during the reconstruction of Runway 5-23 after being rendered inactive in 1994. The runway has remained open.

A review of Advisory Circular 150/5325-4B, Runway Requirements for Airport Design, Figure 2.1 identifies a runway length of 3,650' is needed based on an average maximum temperature of the hottest day of the month (July) as 77.6° and 500' field elevation.

Selected trees were field surveyed using triangulation and the treetop data was input into a spreadsheet for use in completing an obstruction analysis for all four runway ends. Results of the obstruction analysis indicated vegetative obstructions within the approach surfaces for all four runway ends.

Wind data was obtained for periods of particular significance including seasonal variations[16] as referenced in the Design Manual, AC 150/5300-13, Appendix 2, Paragraph A2-5. The following summarizes the wind data collected. Ideally, a runway should be aligned with the prevailing wind direction to minimize crosswinds for aircraft landing and taking off. The most desirable runway orientation is the one that has the largest wind coverage and minimum crosswind components. Wind coverage is the percentage of time crosswind components are below an acceptable velocity. The recommended wind coverage for a runway is 95 percent, meaning that the runway is usable 95% of the time. As shown in Table 2.10, Wind Coverage, Runway 5-23 does not meet the 95% percent required wind coverage with 94.6% under all weather conditions and 94.3% under IFR conditions. Wind coverage for Runway 1-19 is 94.98% under all weather conditions and 94% under IFR conditions. The combined wind coverage is 97.80% under all weather conditions and 96.9% under IFR conditions. In addition, according to information from pilots using the airport and wind data collected in the 2002 Airport Master Plan Update, Runway 1-19 is the favored runway due to wind conditions. Additional runway length of 1,300 feet extending the runway beyond the intersection of Runway 5-23 is justified based on the wind coverage and the aircraft that use the airport; however, 750 feet is the maximum amount of runway length that can be regained to the Runway 1 threshold without creating ground obstructions to the federally protected surfaces. Wind data was examined to better understand the prevailing winds and the coverage provided to the crosswind runway. The following graphics are depictions of the prevailing winds at KHUL.[17]

[16] FAA AC 150/5300-13A, Airport Design, Appendix 2, Paragraph A2-5.
[17] http://www.aviador.es/Statistics/Wind/KHUL-9

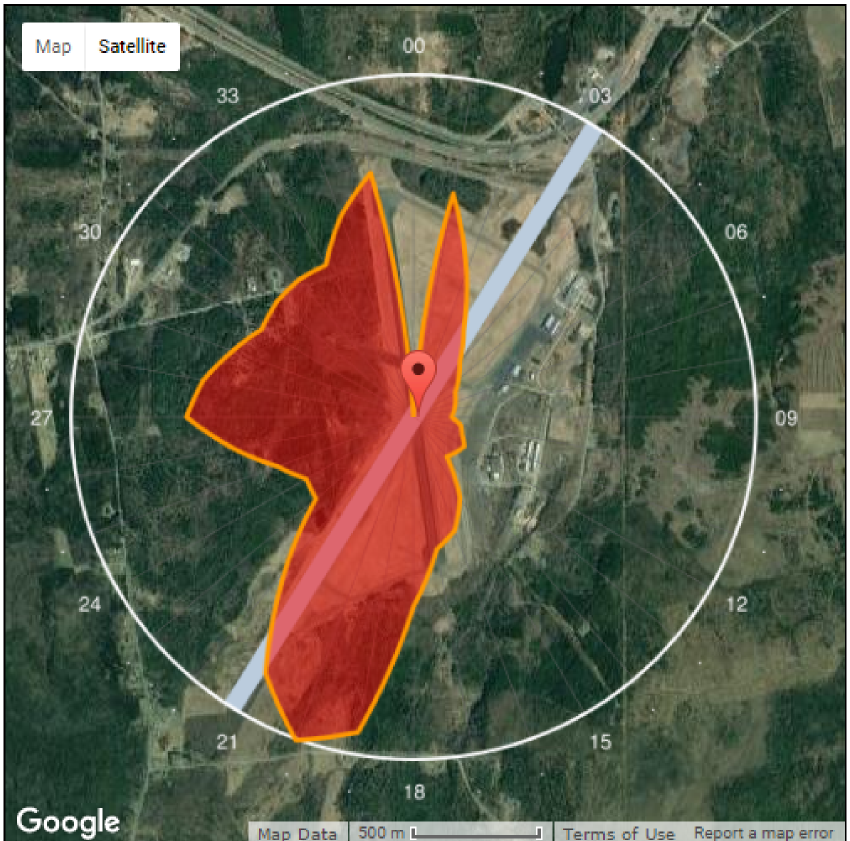



Figure 4.2 | Prevailing Winds (June – May, 2011 - 2017)

Source: http://www.aviador.es/

The wind overlay shows how the runways fit the prevailing winds. The wind profiles correspond to METAR data taken from June 2011-May 2017. The first overlay depicts all wind data taken from this time period. The prevailing wind coverage overlay covers Runway 1-19 almost in its entirety. Historical wind data indicates there is a strong and consistent pattern of prevailing winds at KHUL, with winds blowing most often from the north, northwest and southwest during many months of the year, but primarily in the summer months (Figure 4-2), making Runway 1-19 the justified crosswind runway for pilots to use.

The summer months include METAR data from 2011-2016, for the months of April-October. The coverage map very clearly shows strong winds from the north and south. Runway 1-19 is not clearly visible, meaning that for nearly all summer months, winds favor the crosswind runway, particularly for the Runway 1 approach.

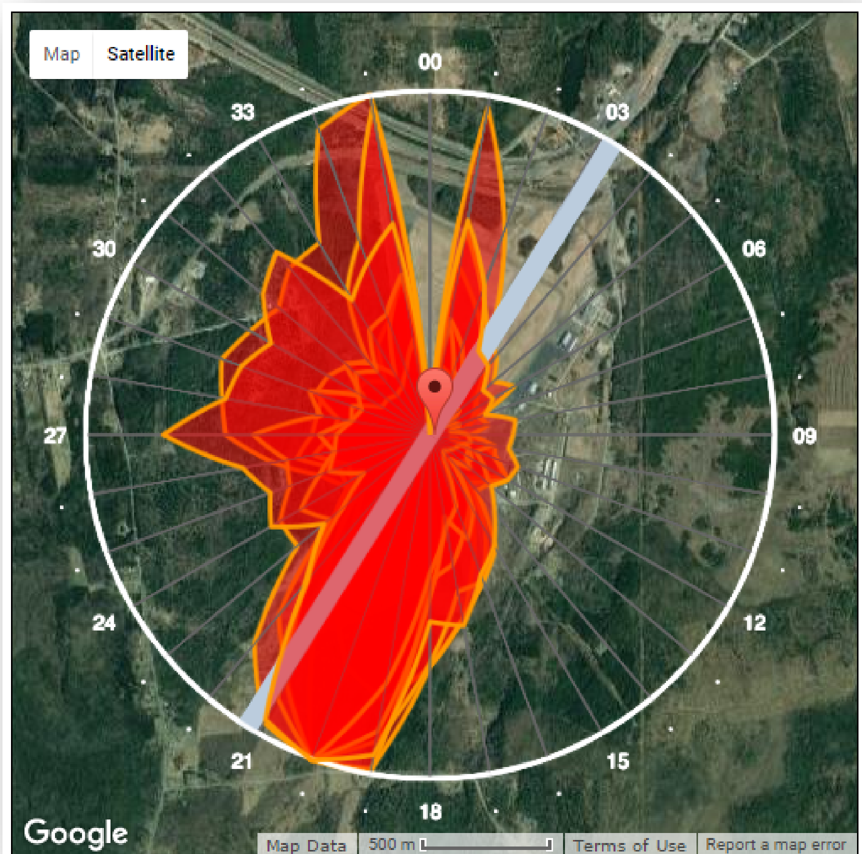



Figure 4.3 | Prevailing Winds (April – October, 2011 - 2017)

Source: [http://www.aviador.es/](http://www.aviador.es/)

The winter months include METAR data from 2011-2017, for the months of November-March shown in Figure 4-3. The coverage maps indicate that westerly and northwesterly winds are prominent during this time of year. Again, the Runway 1-19 is not visible under the coverage map, which displays how the Runway 1 approach would be favorable for pilots in these conditions as well.

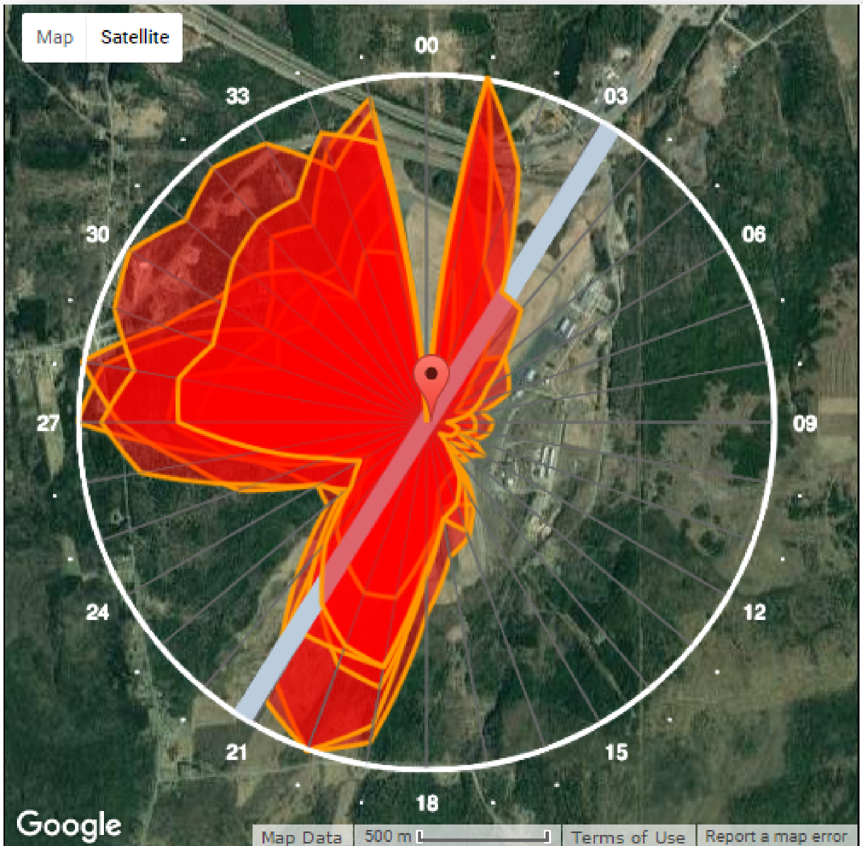



Figure 4.4 | Prevailing Winds (November – March, 2011 - 2017)

Source: [http://www.aviador.es/](http://www.aviador.es/)

In conclusion, the runway length analysis and wind data justify the airport regaining up to 750' in length of the crosswind Runway 1-19. Seasonal traffic variation and the fact that the airport is situated in an isolated/remote area further underscore the need for adjustments to the critical design aircraft threshold of at least 500 annual itinerant operations as stated in AC 150/5325-4B, Runway Requirements for Airport Design, 102(a)(8).

It was ultimately determined by the FAA that Runway 1-19 would remain at its existing length of 2,700 feet and the additional 750 feet to Runway 1 be reserved on the ALP as potential future aviation development.

## 4.3 TAXIWAY REQUIREMENTS

As discussed in Chapter Two, the three taxiways at the airport are all approximately 50 feet wide. The design requirements are based on the taxiway design group criteria (TDG) for the aircraft that use the airport. The Beech King Air 200 has a TDG of 2 and the Cessna 172 has a TDG of 1, which allows 35 feet and 25 feet, respectively. This will require further design evaluation at the time the taxiways are reconstructed in order to determine whether a wider than needed taxiway would be eligible for federal and state funding. Current standards require a 240-foot separation for Runway 5-23 and a 225-foot separation for Runway 1-19 from runway centerline to taxiway centerline.

It is recommended that Taxiways 'A' and 'B' be relocated closer to the runway so the required separation from runway centerline to taxiway centerline is fulfilled, rather than exceeded as it currently exists. The existing taxiway condition warrants significant rehabilitation, to the point of possible reconstruction. Reconstructing such that minimum separation standards are utilized will result in lower maintenance costs, less impervious surface for the airport (better for the environment), less fuel utilized by taxiing aircraft and additional area for aviation related development in the future.  This will allow for lower maintenance costs as there will be less pavement in the proposed location and less fuel used by taxiing aircraft.  In addition, this will also allow additional area for hangar development in the future.

## 4.4 VISUAL NAVIGATION AIDS

As identified in Chapter 2, Table 2.9, Airport Navigation Aids, all existing visual navigation aids at the airport are in good condition. The airport may want to consider installing runway lights and runway end identifier lights (REILs) to Runway 1-19 at the time the runway is reconstructed, which is included in the intermediate term in this AMPU.

The runway and taxiway directional signs at the airport are in good condition, as they were replaced in 2009 when Runway 5-23 was reconstructed. No improvements to signage at the airport are recommended throughout the planning period.

## 4.5 LANDSIDE CAPACITY AND REQUIREMENTS

This section addresses landside capacity and recommended changes to meet future demand. Landside facilities include parking aprons and hangars, terminal building space, automobile parking, and miscellaneous storage and facilities.

### 4.5.1 Aircraft Storage

Before aircraft storage requirements can be addressed, a future assumption must be made concerning the ratio of aircraft stored in hangars to those parked on tiedowns.  The current mix is 100% in hangars. Typically, general aviation airports have 80% parked in hangars and 20% tied down on apron areas. Due to the more severe winter weather in Houlton, it would be expected that the ratio of aircraft stored in hangars would be higher than other general aviation airports in Maine. However, it is anticipated that the mix will change slightly throughout the planning period, with 90% parked in hangars and 10% parked on apron areas.

### *Apron and Tie-downs*

As identified in Chapter 2, the airport has an apron area that can accommodate approximately 13 aircraft, with nine marked tie-down spaces. The tie-down area on the general aviation apron is approximately 5,400 square yards and the cargo apron is approximately 3,970 square yards, for total apron space of 9,370 square yards. Tables 4-2, 4-3, and 4-4 present standard calculations used to determine the itinerant, based, and total apron space that would be needed based on the forecasts.

**Table 4.2 | Itinerant Aircraft Apron Space**

| Parameter | Year | | | |
|---|---|---|---|---|
| | 2015 (Existing) | 2020 | 2025 | 2035 |
| Total Annual Itinerant Operations | 5,700 | 5,817 | 5,935 | 6,177 |
| Busiest Month Operations (20% Annual) | 1,140 | 1,163 | 1,187 | 1,235 |
| Average Day Busy Month Operations (1/30) | 38 | 38.78 | 39.57 | 41.18 |
| Busiest Day 110% Average Day | 41.8 | 42.66 | 43.52 | 45.3 |
| Itinerant Aircraft Parking Demand (1/2 busiest day) | 21 | 21 | 22 | 23 |
| Square Yards per Aircraft | 360 | 360 | 360 | 360 |
| Planned Apron Square Yards (rounded) | 7,560 | 7,560 | 7,920 | 8,280 |

Source: Stantec analysis

**Table 4.3 | Based Aircraft Apron Space**

| Parameter | Year | | | |
|---|---|---|---|---|
| | 2015 (Existing) | 2020 | 2025 | 2035 |
| Based Aircraft | 24 | 25 | 27 | 29 |
| Percent Aircraft Parked on Aprons | 0% | 10% | 10% | 10% |
| Based Aircraft on Apron Space | 0 | 2.5 | 2.7 | 2.9 |

| Table 4.3 \| Based Aircraft Apron Space | | | | |
|---|---|---|---|---|
| Parameter | Year | | | |
| | 2015 (Existing) | 2020 | 2025 | 2035 |
| Square Yards Per Aircraft | 300 | 300 | 300 | 300 |
| Planned Apron Square Yards (rounded) | 0 | 750 | 810 | 870 |

Source: Stantec analysis

| Table 4.4 \| Total Aircraft Apron Space (square yards) | | | | |
|---|---|---|---|---|
| Parameter | Year | | | |
| | 2015 (Existing) | 2020 | 2025 | 2035 |
| Itinerant Aircraft Space | 7,560 | 7,560 | 7,920 | 8,280 |
| Based Aircraft Space | 0 | 750 | 810 | 870 |
| Total Space Required | 7,560 | 8,310 | 8,730 | 9,150 |
| Existing Space | 9,370 | 9,370 | 9,370 | 9,370 |
| Surplus (Deficit) | 1,810 | 1,060 | 640 | 220 |

Source: Stantec analysis

In conclusion, no additional apron space is needed throughout the 20-year planning period.

### *Hangars*

The airport currently has three hangars, with the Town-owned hangar able to accommodate 20-24 aircraft depending on the aircraft size. The base year data indicates that 19 aircraft are parked in hangars, which is 100% of the total based aircraft. As noted earlier, it is assumed that this ratio will change slightly with 90% parked in hangars and 10% parked on the apron. Existing hangar space used to determine hangar requirements throughout the planning period is limited to 24 spaces available in the Town-owned hangar.

As identified in Table 4.5, four additional hangar spaces are projected to be needed by the end of the planning period. It is recommended that any unused space beyond these four needed spaces be reserved for additional hangar development as hangar land leases are a primary revenue source for general aviation airports.

**Table 4.5 | Hangar Space Requirements**

| Parameter | Year | | | |
|---|---|---|---|---|
| | 2015 (Existing) | 2020 | 2025 | 2035 |
| Based Aircraft | 24 | 25 | 27 | 29 |
| Percent Aircraft in Hangars | 100% | 95% | 95% | 95% |
| Based Aircraft Hangar Needs | 24 | 24 | 26 | 28 |
| Existing Hangar Space | 24 | 24 | 24 | 24 |
| Surplus (Deficit) | 0 | 0 | (2) | (4) |

Source: Stantec analysis

### 4.5.2 Automobile Parking Requirements

Automobile parking space is based on peak hour demands, using an industry guideline of 1.3 parking spaces per peak hour pilot/passenger and airport employees. The airport currently has 10 automobile parking spaces. As identified in Table 4.6, Automobile Parking Requirements, the airport will need up to 19 additional spaces during the planning period.

**Table 4.6 | Automobile Parking Requirements**

| Parameter | Year | | | |
|---|---|---|---|---|
| | 2015 (Existing) | 2020 | 2025 | 2035 |
| Itinerant Aircraft Parking Demand | 21 | 21 | 22 | 23 |
| Parking Space Per Peak Hour Demand | 1.3 | 1.3 | 1.3 | 1.3 |
| Number of Parking Spaces | 27 | 27 | 29 | 30 |
| Existing Spaces | 10 | 10 | 10 | 10 |
| Surplus (Deficit) | (17) | (17) | (19) | (20) |

Source: Stantec analysis

## 4.6 MISCELLANEOUS FACILITY REQUIREMENTS

### 4.6.1 Fuel Storage and Sales

The airport has a 15,000-gallon Jet-A tank and a 10,000 gallon 100 LL tank. Sales for Jet-A fuel are forecasted to increase from 16,300 to 24,495 gallons and sales for 100 LL are forecasted to increase from 8,700 to 9,180 gallons throughout the 20-year planning period. Based on this, the existing tanks are adequate to service the forecasted activity at the airport.

### 4.6.2 Snow Removal Equipment and Facilities

The airport currently has a rotary plow, sweeper attachment, and 3,000 ton/hour snow blower unit. The airport recently acquired a carrier vehicle, displacement plow, and hopper under a FY 2017 grant. The snow blower is aging and will need to be replaced. Snow removal calculations will need to be completed at the time of the funding request in order to determine actual equipment eligible for funding. Eligibility criteria will be in accordance with the latest version of FAA Advisory Circular *(AC) 150/5220-20 Airport Snow and Ice Control Equipment and, AC 150/5200-30C, Airport Winter and Safety Operations.*

### 4.6.3 Terminal Building Requirements

The terminal building is approximately 4,000 square feet and is considered of adequate size and location to meet future airport needs. Improvements to the building are needed to meet American with Disabilities Act (ADA) standards.

## 4.7 Facility Requirements Summary

Table 4.7 summarizes the facility requirements needed in the short, intermediate, and long terms. Projects should be implemented as demand warrants and projects can be moved from one planning period to another as needed.

**Table 4.7| Facility Requirements Summary**

| Feature | Timeframe | | | |
|---|---|---|---|---|
| | 2015 (Existing) | 2020 (Short Term) | 2025 (Intermediate Term) | 2035 (Long Term) |
| Runway dimensions:<br>Runway 5-23<br>Runway 1-19 | 5,015'x100'<br>2,700'x60' | 5,015'x100'<br>2,700'x60' | 5,015'x100'<br>2,700'x60' | 5,015'x100'<br>2,700'x60' |
| Taxiways | None | None | Realign parallel taxiway – 240' Runway 5-23 and 225' Runway 1-19 centerline to taxiway centerline | None |
| Apron requirements (square yards) | None | None | None | None |
| Lighting:<br>Runway 1-19 | None | None | MIRLS | None |
| REILs | None | Runway 1-19 | None | None |

| Table 4.7\| Facility Requirements Summary | | | | |
|---|---|---|---|---|
| Feature | Timeframe | | | |
| | 2015 (Existing) | 2020 (Short Term) | 2025 (Intermediate Term) | 2035 (Long Term) |
| Hangar Requirements | None | None | 2 | 4 |
| Automobile Parking | 17 | 17 | 19 | 20 |
| Fuel Facilities | None | None | None | None |
| Terminal Building | None | None | None | None |

Source: Stantec analysis

# 5.0 ALTERNATIVES ANALYSIS

## 5.1 INTRODUCTION

The purpose of this Section is to identify and evaluate reasonable development alternatives for Houlton International Airport that meet the demand levels outlined in Section 4 and are also constructible, minimize environmental impacts, and are financially feasible. The underlying objective is to meet the identified needs for both capacity and safety requirements for the entire airfield operation and infrastructure. This Section reviews airport land available for future development and evaluates realistic airport layouts that incorporate the recommended facilities identified in Section 4.

## 5.2 ASSUMPTIONS

It is important to address several key assumptions and project needs that were developed in earlier parts of this study before any alternatives can be analyzed. These assumptions are part of the foundation upon which the alternatives are developed.

- The airport will remain a general aviation airport during the entire 20-year planning period.
- The existing types of aircraft using the airport are not expected to change significantly throughout the planning period and the existing mix of operations is forecasted to remain primarily single engine aircraft.
- Available runway length for the crosswind runway does not meet the needs of the majority of critical aircraft and should be further evaluated as part of the upcoming obstruction analysis project to determine if 750 feet of runway can be regained.
- The ARC of B-II for Runway 5-23 and ARC of A-I for Runway 1-19 will remain the same throughout the 20-year planning period.

## 5.3 DEVELOPMENT ALTERNATIVE ANALYSIS

This subsection identifies alternatives for locating the recommended facility improvements throughout the long term. Improvements identified throughout the 20-year planning period in Section 4 include the following:

- Identify space for at least 4 additional hangars
- Expand automobile parking to accommodate 20 additional spaces
- Relocate Taxiways ‘A’ and ‘B’ closer to runway to meet separation standards.

- Install MIRLS to Runway 1-19
- Install REILS to Runway 1-19

## 5.3.1 Alternatives Analysis - Landside

This section analyzes landside alternatives, primarily options for adding additional hangar development. The following sections discuss three alternatives for accommodating proposed landside development at the airport throughout the 20-year planning period.

The following landside alternatives would be categorically excluded from an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) per paragraphs 5-6.4.e and 5-6.4.f of the FAA's Order 1050.1F. For each of the landside alternatives discussed, an amendment to the airport's existing Site Location of Development permit will be required from the Maine Department of Environmental Protection (MDEP) to address the construction of new impervious surfaces (hangars and pavement) at the airport. No wetlands would be impacted by the landside alternatives discussed, and no impacts to threatened species are anticipated from the pavement or hangar construction in previously developed areas.

The existing fence will need to be relocated in order to accommodate hangar development in the following landside alternatives.

### 5.3.1.1 Terminal Area Development Alternative 1

This alternative includes space for four 55 x 200 foot nested T-hangars accommodating 6 aircraft in each unit. Approximately 163,000 square feet of pavement will be needed for aircraft taxiing from the hangars to the runway. This proposed development is estimated to cost $5,200,000 for constructing the required pavement and four T-hangars.

An approximate 9,000 square foot automobile parking lot accommodating 15 automobiles is recommended for the parking for the proposed hangar development. This parking lot includes two handicap spaces to meet ADA requirements. The estimated cost for constructing the automobile parking lot is $100,000.

Figure 5-1 identifies the improvements for Terminal Area Development Alternative 1.

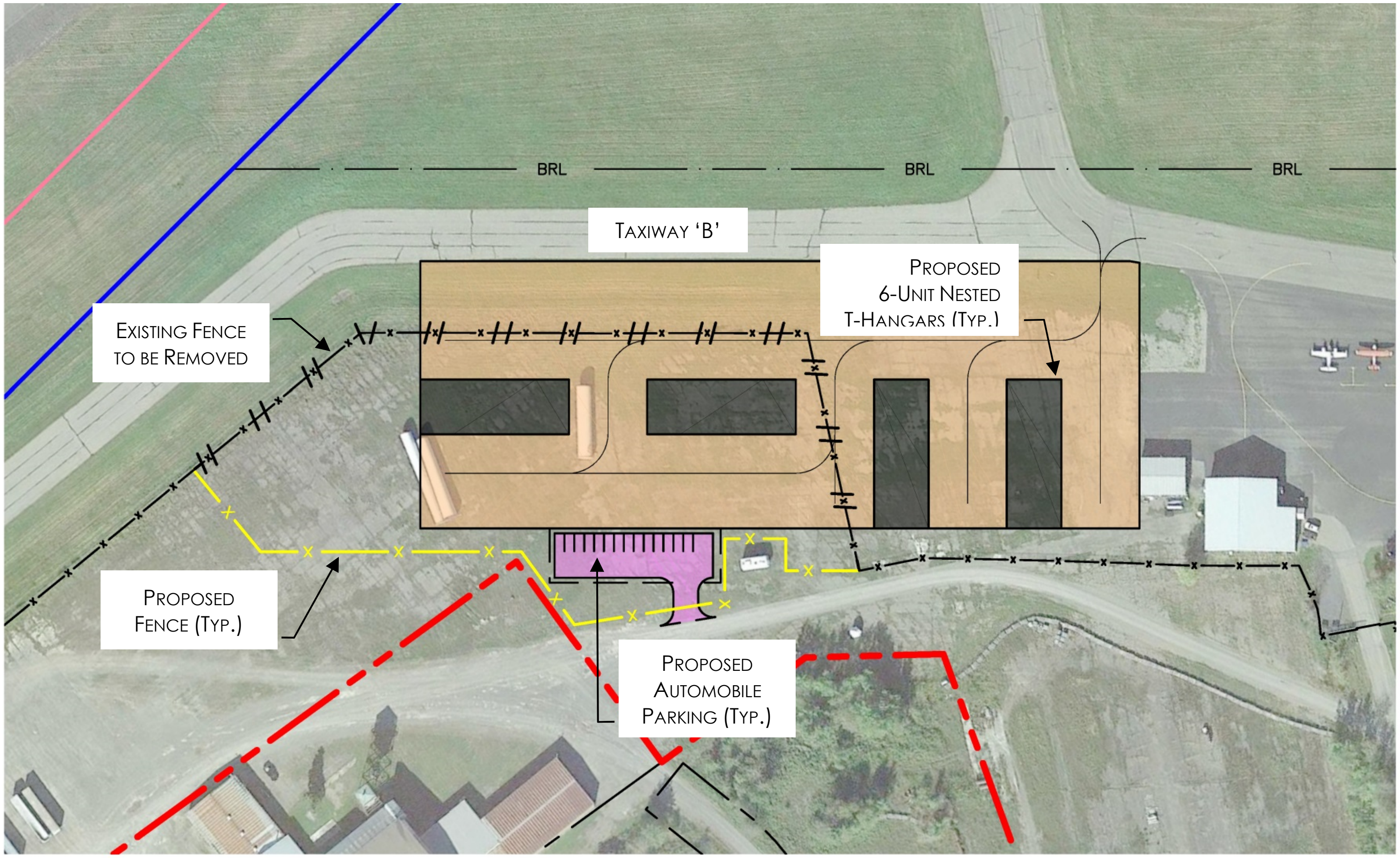



Figure 5.1 | Terminal Area Development Alternative 1

### 5.3.1.2 Terminal Area Development Alternative 2

This alternative includes space for four 55 x 200 foot nested T-hangars accommodating eight aircraft in each unit and three 50 x 50 foot conventional hangars. These hangars are identified within the area of the existing Taxiway 'A' and will not be able to be constructed until after the taxiway has been relocated. The estimated cost for constructing the four T-hangars and conventional hangars is $8,125,000, including 261,000 square feet of pavement that will be required. The conventional hangars are estimated to cost $375,000 each and the T-hangars are estimated to cost $850,000 each.

This alternative does not identify a specific area for additional apron development; however, space to the north of the proposed hangar development has been reserved for future development as demand justifies.

Approximately 25,000 square feet for two automobile parking lots is identified in this alternative. These areas will accommodate approximately 26 and 12 automobiles, respectively. Both automobile parking lots include two handicap spaces to meet ADA requirements. The estimated cost for constructing both automobile parking lots is $280,000.

Figure 5-2 identifies the proposed arrangement for Terminal Area Development Alternative 2.

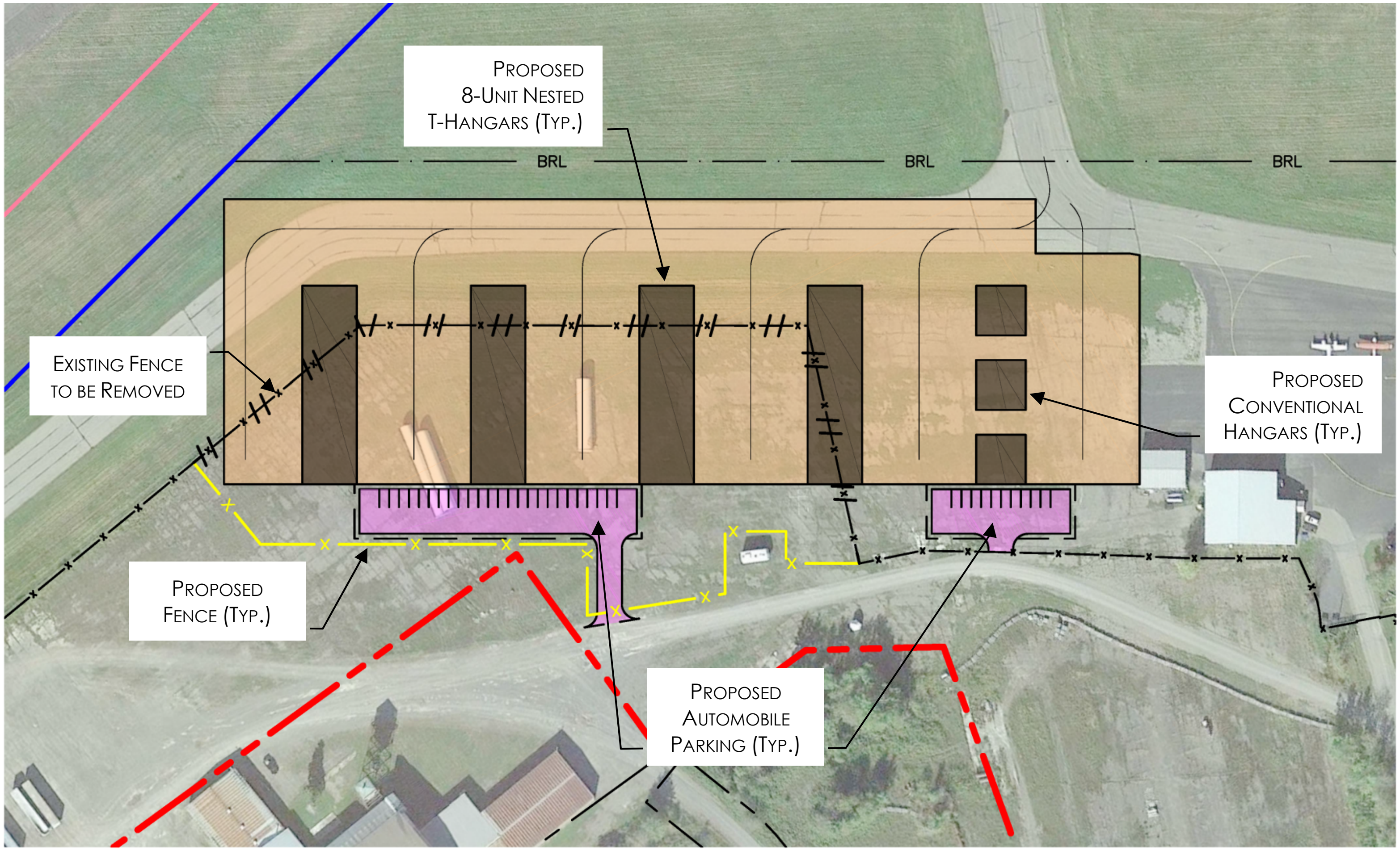



Figure 5.2 | Terminal Area Development Alternative 2

### 5.3.1.3 Terminal Area Development Alternative 3

This alternative includes space for three 55 x 200 foot nested T-hangars accommodating 8 aircraft in each unit and three 50 x 50 foot conventional hangars. These hangars are identified within the area of the existing Taxiway 'A' and will not be able to be constructed until after the taxiway has been relocated. The area to the north of the proposed hangar development is reserved for further apron/hangar development if demand warrants it in the future. Construction of the T-hangars and conventional hangars is estimated to cost $7,725,000, including 236,000 square feet of pavement that will be needed.

This alternative includes an approximate 32,000 square foot apron area located adjacent to the existing apron, which is estimated to cost $450,000.

There are two automobile parking areas identified adjacent to the proposed hangar development to accommodate parking for the hangar owners, totaling approximately 25,000 square feet. These parking lots will accommodate 26 and 12 vehicles, respectively. Both automobile parking lots will include two spaces for handicap parking to meet ADA requirements. Construction of the two automobile parking lots is estimated to cost $280,000.

Figure 5.3 identifies the proposed configuration for Terminal Area Development Alternative 3.

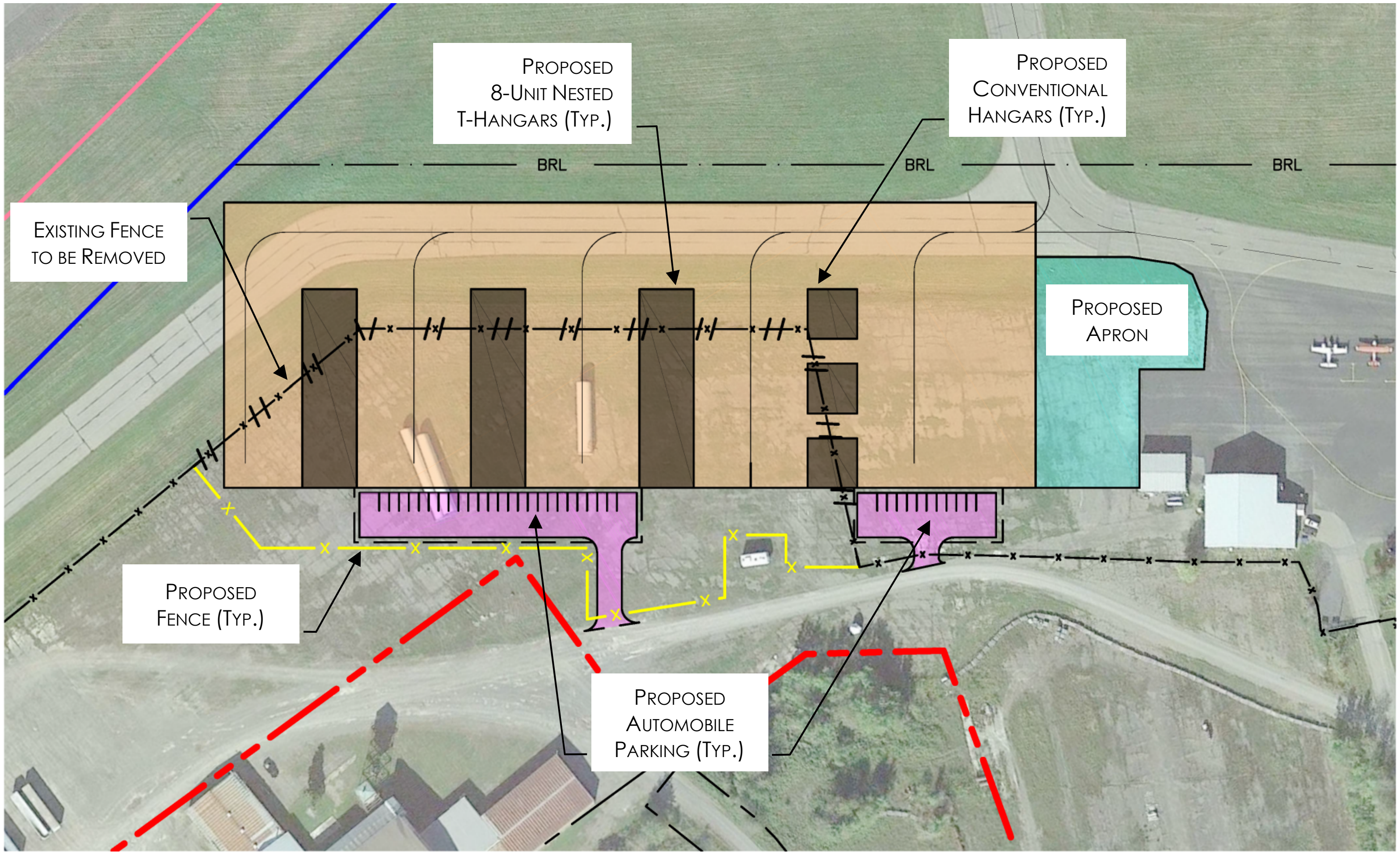



Figure 5.3 | Terminal Area Development Alternative 3

### 5.3.2 Alternatives Analysis – Airside

This section analyzes airside alternatives, primarily options for the crosswind runway and taxiway. The following sections discuss two alternatives for accommodating proposed airside development at the airport throughout the 20-year planning period.

Avigation easement and land acquisition will require an environmental assessment under NEPA per FAA Order 1050.1F. For both airside alternatives discussed, an amendment to the airport's existing Site Location of Development permit will be required from the MDEP to address the construction of new impervious surfaces (pavement) at the airport. No wetlands would be impacted by the airside alternatives discussed, and no impacts to threatened species are anticipated from the pavement construction in previously developed areas.

#### 5.3.2.1 Airside Development Alternative 1

This alternative includes moving Taxiway 'A' closer to the runway to meet current separation standards of 240 feet from runway centerline to taxiway centerline. This alternative includes keeping Runway 1-19 at 2,700 feet in length.

The taxiway is in poor condition and needs to be reconstructed in the short term. Relocating the taxiway would save on future maintenance costs as it would be less pavement to maintain, which in turn would be better for the environment with less fuel being used for taxiing aircraft.

The abandoned section of Runway 1-19 and the abandoned taxiway could be converted back to a grassed area, which would provide credit for mitigation under the Site Location of Development permit for the development of Taxiway 'A' and any hangar construction. This would be determined as part of the design and permitting of Runway 1-19 and taxiway relocation projects. The taxiway relocation is estimated to cost $3,500,000.

It also is anticipated that tree clearing will be required within the protected approach surfaces. As aerial photogrammetry was not collected as part of this AMPU, the extent of the tree clearing cannot be determined. It is recommended that within the short term, the airport complete a full obstruction analysis of all four runway ends with new aerial photogrammetry. A ground survey has shown that there are vegetative obstructions that will need further study as part of a separate obstruction analysis.

The additional costs for acquiring avigation easements to remove vegetative obstructions will need to be included in the Capital Improvement Program for the airport after the obstruction analysis. The obstruction analysis and environmental assessment for acquiring avigation easements is estimated at $275,000.

Figure 5-4 identifies the airside improvements in Airside Development Alternative 1.

#### 5.3.2.2 Airside Development Alternative 2

This alternative includes moving Taxiway 'A' closer to the runway to meet current separation standards of 240 feet from runway centerline to taxiway centerline. This allows for additional hangar development in a configuration more suited to easier taxi access. The taxiway is estimated to cost $3,100,000.

It is recommended in this alternative that Runway 1 be extended 2,275 feet to the original runway threshold in order to accommodate aircraft using Runway 1-19, as discussed in Chapter Four.

Tree clearing in this alternative is likely to be significant and avigation easements will be needed due to the approach surface beginning 2,275 feet beyond the existing threshold. In addition, ground obstructions exist to the federally protected surfaces that would need to be mitigated under this alternative.

Figure 5-5 identifies the airside improvements in Airside Development Alternative 2.

#### 5.3.2.3 Airside Development Alternative 3

This alternative also includes moving Taxiway 'A' closer towards the runway to meet current separation standards. As discussed previously, the taxiway is estimated to cost $2,800,000.

It is recommended that 750 feet of runway be reallocated to the Runway 1 threshold. This is the maximum amount of runway length that can be regained while avoiding ground obstructions, based on ground contour data provided by MaineDOT. This will need to be confirmed during the upcoming obstruction analysis as well as determining the extent of tree clearing that would be needed to add the 750 feet of runway length. The estimated cost for engineering and construction for regaining the 750 feet is $600,000. This does not include the costs for acquiring avigation easements, preparing an environmental assessment, and removing obstructions.

Figure 5-6 identifies the airside improvements in Airside Development Alternative 3.

### 5.3.3 Development Alternative Summary

Terminal Area Development Alternative 3 includes adequate space to accommodate the required hangar spaces throughout the long term in a mix between corporate conventional hangars and T-hangars as well as additional apron space that may be needed throughout the planning period. Terminal Area Development Alternatives 1 and 2 do not identify additional apron space as the facility requirements did not identify any additional apron space. Terminal Area Development Alternatives 1 also does not identify corporate hangar space and there is only enough space for 6-unit hangars as opposed to 8-unit T-hangars in the other two alternatives due to the taxiway being shown in its existing location.

All three airside alternatives recommend moving the taxiway closer to the runway to meet current separation standards. The advantage to relocating the taxiway is additional airport land that can be utilized for hangar development, which based on the facility requirements prepared in Chapter Four is the greatest need at the airport throughout the planning period.

As discussed previously, an additional 750' can be regained to the Runway 1 threshold without creating ground obstructions to the federally protected surfaces; however, the FAA has determined this is not eligible for AIP funding at this time. Therefore, Development Alternative 1 has been determined to be the preferred airside alternative. The area is reserved for future aviation development if conditions at the airport change and the additional runway length is justified.

It is recommended that Landside Development Alternative 3 and Airside Development Alternative 1 be considered the preferred alternatives.

**Table 5.1 | Alternative Development Summary**

| Alternative | Estimated Cost | Environmental Impacts |
|---|---|---|
| *Landside Development Alternative 1* | | Amendment to Site Location of Development permit needed for new impervious surface. |
| Four nested 6-unit T-hangars (buildings) | $3,000,000 | |
| Pavement for T-hangars | $2,200,000 | |
| Automobile parking lot | $100,000 | |
| *Landside Development Alternative 2* | | Amendment to Site Location of Development permit needed for new impervious surface. |
| Four nested 8-unit T-hangars (buildings) | $3,400,000 | |
| Three conventional hangars (buildings) | $1,125,000 | |
| Pavement for T-hangars and conventional hangars | $3,600,000 | |
| Automobile parking lot | $280,000 | |
| *Landside Development Alternative 3* | | Amendment to Site Location of Development permit needed for new impervious surface. |
| Three nested 8-unit T-hangars (buildings) | $3,400,000 | |
| Three conventional hangars (buildings) | $1,125,000 | |
| Pavement for T-hangars and conventional hangars | $3,200,000 | |
| Apron | $450,000 | |
| Automobile parking lot | $280,000 | |
| *Airside Development Alternative 1* | | Environmental assessment will be required for acquiring avigation easements for obstruction removal.<br>Amendment to Site Location of Development permit needed for new impervious surface. |
| Relocate taxiway | $3,500,000 | |
| Obstruction analysis and EA | $275,000 | |
| Acquire avigation easements | Unknown | |
| Obstruction removal | Unknown | |

| | | |
|---|---|---|
| *Airside Development Alternative 2*<br>Relocate taxiway<br>Obstruction analysis and EA<br>Acquire avigation easements<br>Obstruction removal | <br>$3,100,000<br>$275,000<br>Unknown<br>Unknown | Environmental assessment will be required for acquiring avigation easements for obstruction removal.<br>Amendment to Site Location of Development permit needed for new impervious surface. |
| *Airside Development Alternative 3*<br>Relocate taxiway<br>Obstruction analysis and EA<br>Acquire avigation easements<br>Obstruction removal | <br>$2,800,000<br>$275,000<br>Unknown<br>Unknown | Environmental assessment will be required for acquiring avigation easements for obstruction removal.<br>Amendment to Site Location of Development permit needed for new impervious surface. |

Source: Stantec analysis

# 6.0 AIRPORT LAYOUT PLAN

## 6.1 INTRODUCTION

The Airport Layout Plan (ALP) is a drawing used to depict current and future airport facilities graphically. The term Airport Layout Plan refers to a single drawing or a set of drawings.

A complete ALP drawing set was produced in conformance with FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans, including Changes 1 and 2 and FAA Standard Operating Procedure (SOP) 2.00, Standard Procedures for FAA Review and Approval of Airport Layout Plans (ALPs). A total of 9 drawings constitutes the full ALP set. The original set of ALP drawings was produced at 24" x 36" with an 11x17" copy included in Appendix C.

The ALP has been prepared in accordance with generally accepted planning practices and with FAA guidance.

- FAA Advisory Circular 150/5300-13A, Airport Design
- FAA Advisory Circular 150/5070-6B, Airport Master Plans
- Federal Aviation Regulations, Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace

The basis of the ALP is the existing airport layout, revised to illustrate the proposed new facilities and design standards. These facilities are based on the preferred alternative in Chapter 5. The ALP serves as the official plan detailing the Town's proposed development for the Airport and is signed by the Town, FAA, and MaineDOT. To be eligible for future federal grant funding, projects must be shown on the ALP. Narrative descriptions of each drawing in the ALP are provided in the following sections.

A current FAA approved ALP is a prerequisite for issuance of a grant for airport development.

## 6.2 ALP DRAWING SET

The HUL ALP set includes the following drawings:

### 6.2.1 Cover Sheet

The cover sheet binds the ALP Drawing Set and includes the following information.

- Airport name and location
- AIP Number
- Location, County, and Vicinity Map
- Name of the Airport Sponsor
- Preparer Information
- Sheet Index

- Date Prepared

### 6.2.2 Data Tables Plan

The Data Sheet contains primary airport and runway data tables. Tables note the existing and proposed conditions.

### 6.2.3 Existing Facilities Plan

The Existing Facilities Plan is provided as both a reference document to identify existing facilities (including the runway, taxiway, buildings, aprons, and other structures) and a presentation document to determine a starting point for this study.

This sheet is prepared at a scale of 1 inch = 400 feet.

### 6.2.4 Ultimate Airport Layout Plan

The Airport Layout Plan is the graphical presentation of the recommended airport improvement projects for Houlton International Airport. The ALP is a pictorial representation and summarization of the efforts made in this planning process. The previous chapters supply the basis for the Airport's future airport layout as shown in the drawing set.

The proposed projects identified throughout the 20-year planning period, as selected by the Town in consultation with the PAC, were the basis for determining the proposed improvements at the Airport. The timing of development depends on when it is needed and can be funded. The ALP includes, but is not limited to, the following items:

- Relocation of Taxiway 'A' to meet current separation standards
- Addition of three 55 x 200 foot nested T-hangars accommodating approximately eight aircraft in each unit
- Addition of three 50 x 50 foot conventional hangars
- Addition of approximately 32,000 square foot aircraft parking apron
- Addition of approximately 25,000 square feet automobile parking areas

All recommended airport improvements shown on this Plan are representative and may be modified as necessary to meet the needs of the community and airport users or the future design requirements of the FAA or MaineDOT.

This sheet is prepared at a scale of 1" = 400'.

### 6.2.5 Terminal Plan

The Terminal Plan focuses on the aviation service facilities by providing a larger view sheet concentrating on the airport's terminal area.

This sheet is prepared at a scale of 1" = 100'.

### 6.2.6 Runway Plan and Profile Sheets

The Runway Plan and Profile sheets are large-scale plan views of inner portions of approaches for each runway. Each drawing shows the Part 77 approach surface to the approximate limit of the RPZ area. For this project, two sheets, one for each runway, were prepared as noted below. Each drawing shows both runway ends in a split drawing. Each uses an aerial photo for the base map and are made at a scale of Horizontal 1" = 200'; Vertical 1" = 20'.

(*Note:* Obstruction data is not included on the runway plan and profile sheets, as aerial photogrammetric data was not obtained as part of this project. It is recommended that these sheets be modified as part of the upcoming obstruction analysis project.)

#### 6.2.6.1 Runway 5-23 Plan and Profile

Runway 5 is a non-precision runway with one mile visibility minimums. The FAR Part 77 approach surface has an inner width of 500 feet, an outer width of 3,500 feet, and a length of 10,000 feet. The slope is 34:1. The RPZ has an inner width of 500 feet, an outer width of 1,000 feet, and a length of 1,700 feet. The RPZ covers an area of 13.77 acres.

Runway 23 is a visual runway, with no instrument approach procedure. The Part 77 approach surface has an inner width of 500 feet, an outer width of 1,500 feet, and a length of 5,000 feet. The slope is 20:1 for the entire 5,000-foot-long surface. The RPZ is the same size as Runway 5, with an inner width of 500 feet, an outer width of 1,000 feet, and a length of 1,700 feet. The RPZ covers an area of 13.77 acres.

#### 6.2.6.2 Runway 1-19 Plan & Profile

Runway 1-19 is a visual runway, with no instrument approach procedure to either end. The size of the RPZ is the same on both ends, with an inner width of 500 feet, an outer width of 1,000 feet, and a length of 1,700 feet. The RPZ covers an area of 13.77 acres.

Runways 1 and 19 have a Part 77 approach surface with an inner width of 250 feet, an outer width of 1,250 feet, and a length of 5,000 feet. The slope is 20:1 for the entire 5,000-foot-long surface.

### 6.2.7 Airport Airspace Plan

The Airport Airspace drawing is a plan view of all FAR Part 77 surfaces, based on ultimate runway lengths. This drawing uses a scale of 1" = 1,500', with a USGS topographic map as the base. Ground obstructions are based on the ground contours from the USGS map. Tree obstructions are not shown on this plan as tree-top data was not collected as part of this project. This drawing should be updated as part of the upcoming obstruction analysis project.

The Part 77 approach surface dimensions used in this drawing are as follows:

- Primary surface width is 500' for Runway 5-23 and 250' for Runway 1-19.

- Approach surface size and slope is as noted in paragraph 6.2.6.

- Transitional surfaces extend outward and upward at a 7:1 slope from the sides of the primary and approach surfaces, which project through and extend beyond the limits of the conical surface for 5,000 feet.

- A horizontal surface is a horizontal plane 150 feet above the established airport elevation (489 feet), the perimeter of which is constructed by swinging arcs of 5,000 feet for all runway ends.

- The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.

### 6.2.8 Airport Land Use Plan

The Land Use Plan depicts existing on and off-airport land use. This plan includes all land uses on and around the airport (low-density residential, transitional residential – business district, highway business district, and rural residence and farming district).

The scale is 1' = 400', with an aerial photo as the base map.

### 6.2.9 Airport Property Map - Exhibit A

The Exhibit 'A" property map is a snapshot of the inventory of parcels that make up dedicated airport property and easements as recognized by the FAA. The Exhibit 'A' indicates how the owner acquired the land or easement, the funding source for the land or easement and whether the land was Federal surplus land or Government Property previously conveyed to the airport. The exhibit must also indicate other detached parcels owned by the Airport Sponsor that are dedicated to airport purposes.

Note: This map was not prepared nor was it updated as part of this project. It is included for reference purposes only.

# 7.0 IMPLEMENTATION PLAN

The analyses completed in the preceding chapters evaluated development needs at Houlton International Airport over the next 20 years based on forecast activity and operational efficiency. The next step is to apply fundamental economic, financial, and management rationale to each development project so that the feasibility of each element in the plan can be assessed. The presentation of the capital improvement program (CIP) has been organized into three sections. The short term identifies those projects needed at the airport to satisfy existing demand and to correct any safety deficiencies. The intermediate and long terms identify projects needed to satisfy forecasted future demand levels and act as a "catch-all" for those projects that could not be funded in the short term or whose demand was not realized. It is not recommended that facilities in the intermediate and long terms be designed or constructed until the anticipated demand level develops.

Intermediate- and long-term demands may not occur exactly as the schedule indicates, which may impact the development timetable. Although each period has a designated length, projects identified for one period may overlap with another as demand and funding warrant. It is important to note that this list is dynamic in nature, meaning the order in which projects appear may change for many reasons, including a change in airport demand and funding availability.

The following discussion represents the priority of projects at this time, broken down into the short, intermediate, and long terms.

## 7.1 SHORT TERM

An obstruction analysis is needed in the short term to determine existing vegetative penetrations to the federally protected surfaces and potential avigation easements that may be required. This project also will include analyzing additional obstructions associated with potentially regaining 750 feet of length to Runway 1-19. Estimated costs for this project are $150,000.

Avigation easements may need to be acquired in the short term depending on the results of the obstruction analysis. An environmental assessment will be required if avigation easements need to be acquired. Costs included in Table 7.1 for acquiring avigation easements will need to be revised once the obstruction analysis has been completed and the quantity of avigation easements needed has been determined.

Obstructions to the federally protected surfaces will be removed as determined during the obstruction analysis. Costs for removing these obstructions will need to be revised once the obstruction analysis has been completed.

Relocating the taxiway in the short term to meet existing separation standards as discussed previously is recommended. This will allow space for additional hangars. Estimated project costs for relocating the taxiway are $3,500,000.

## 7.2 INTERMEDIATE TERM

Runway 1-19 is scheduled to be reconstructed in the intermediate term. The project is estimated to cost $3,000,000. It is recommended that REILs be installed at the time the runway is reconstructed.

## 7.3 LONG TERM

Hangar development will need to occur consistent with demand. Based on the results of the facility requirements, it is anticipated that additional hangars will be needed in the long term; however, demand may justify additional hangar development within the short or intermediate terms as well. Costs are estimated at $3,400,000 for construction of three T-hangars, $1,125,000 for construction of three conventional hangars, and $3,200,000 for construction of the pavement needed for the T-hangars and conventional hangars. These costs will be incurred as justified by demand.

An additional 32,000 square feet of apron is identified as needed in the long term and is estimated to cost $450,000.

Additional automobile parking may be needed in the long term to accommodate the additional hangars. This project is estimated to cost $280,000 for 25,000 square feet of automobile parking.

Runway 5-23 may also need to be rehabilitated in the long term for an estimated cost of $3,000,000.

## 7.4 COST ESTIMATES

Project cost estimates developed herein are based on construction costs of airport-development projects that were recommended in Chapter 4 and further refined in Chapter 5. In addition to construction costs, financial consideration was given to engineering and design, as well as construction items and contingencies not specifically enumerated.

After total project cost estimates were calculated, the respective amounts funded by federal, state, and local or private enterprises were determined based on federal funding-eligibility criteria. Under current legislation, the FAA funds 90 percent of eligible costs through its AIP; the remaining 10 percent is currently divided equally between the MaineDOT and the airport sponsor.

Table 7.1 identifies construction cost estimates based on current dollar values. It should be noted that these costs undoubtedly will rise in the future and will need to be refined once the projects are scheduled in the CIP for the airport.

# 7.5 FINANCIAL SUMMARY

Expenses for the airport include items such as grass cutting and snow removal; revenue includes the lease for the FBO, leases for land for hangars, fuel, and miscellaneous items. Although the airport is not currently a self-sustaining department within the town, it is considered a valuable resource to the community. As with any airport, one of its goals is to generate sufficient revenue to offset expenses. Accordingly, a plan to maximize revenue should be set in place.

The CIP presented in this chapter is intended as a road map of airport improvements to help guide the town of Houlton, the Airport, the FAA, and MaineDOT. The plan as presented will accommodate increases in forecast demand at Houlton International Airport over the next 20 years and beyond. The sequence of projects may change due to the availability of funds or changing priorities. Nonetheless, this is a meant to be a comprehensive list of capital projects the airport should consider in the next 20 years.

To implement the recommendations in this plan, it is key to recognize that planning is a continuous process and does not end with approval of this document. The airport should implement measures that allow them to track various demand indicators, such as based aircraft, hangar demand, and operations.

The actual need for facilities is best established by airport activity levels rather than a specified date. For example, projections have been made as to when additional hangars may be needed at the airport. The timeframe in which the development is necessary may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate development. Although every effort has been made in this planning process to conservatively estimate when facility development may be necessary, aviation demand will dictate the actual timing of facility improvements.

In summary, the planning process requires the Town to consistently monitor the progress of Houlton International Airport regarding aircraft operations and based aircraft. Analysis of aviation demand is critical to the timing and need for new facilities.

# Appendix A TERMS AND ABBREVIATIONS

The following terms and abbreviations are used in this report and may be of some benefit to the reader in understanding the distinctive field of aviation and airports.

| *Term – Abbreviation* | Definition |
|---|---|
| *Above Mean Sea Level (MSL)* | Refers to the elevation (on the ground) or altitude (in the air) of any object, relative to the average sea level datum. |
| *Advisory Circular (AC)* | Guidelines published by the FAA that provide information for the public and industry. In some cases, they outline acceptable means of compliance with Federal Aviation Regulations (FARs). In other cases, they provide general information. |
| *Air Taxi Operation* | Aircraft operations by aircraft other than those classified as an air carrier operation. |
| *Air Traffic* | Air traffic means aircraft operating in the air or on an airport surface, exclusive of loading aprons and parking areas. |
| *Aircraft Approach Category* | A grouping of aircraft based on the approach speed of the design aircraft. |
| *Airplane Design Group (ADG)* | A grouping of airplanes based on wingspan or tail height of the design aircraft. |
| *Airport Elevation* | The highest point on an airport's usable runway expressed in feet above mean sea level (MSL). |
| *Airport Improvement Program (AIP)* | The Airport Improvement Program is a United States federal grant program that provides funds to airports to help improve safety and efficiency. The program was established under the Airport and Airway Improvement Act of 1982. |
| *Airport Layout Plan* | An airport layout plan is a scaled drawing of existing and proposed land and facilities necessary for the operation and development of an airport. The FAA-approved ALP, to the extent practicable, should conform to the FAA airport design standards existing at the time of its approval. |
| *Airport Reference Code (ARC)* | The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. The ARC has two components relating to the airport design aircraft. The first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is the airplane design group and relates to airplane wingspan or tail height (physical characteristics), whichever is the most restrictive. |
| *Airport Reference Point (ARP)* | The latitude and longitude of the approximate center of the airport. |

| *Term – Abbreviation* | Definition |
|---|---|
| *Airside* | The aircraft operational side of an airport, including runways, taxiways, aircraft aprons, and their supporting infrastructure. |
| *Apron* | The apron or ramp is the area where aircraft are parked, unloaded, or loaded, refueled, or boarded. |
| *Area Navigation (RNAV)* | Area navigation (RNAV) is a method of navigation that permits aircraft operations on any desired flight path. |
| *Automated Weather Observation System (AWOS)* | Automated weather reporting systems consisting of various sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast weather data. |
| *Avigation Easement* | An easement that needs to be acquired on individual properties located off-airport property in order to remove obstructions within the protected imaginary surfaces. |
| *Based Aircraft* | An aircraft that is based at a given facility for a majority of the year. |
| *Building Restriction Line (BRL)* | A line that identifies suitable building area locations on airports. |
| *Circling Approach* | A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight in landing from an instrument approach is not possible or is not desirable. |
| *Code of Federal Regulations (CFR)* | The Code of Federal Regulations (CFR) is the codification of the general and permanent rules and regulations (sometimes called administrative law) published in the Federal Register by the executive departments and agencies of the Federal Government of the United States. The CFR is published by the Office of the Federal Register, an agency of the National Archives and Records Administration. |
| *Common Traffic Advisory Frequency (CTAF)* | Common Traffic Advisory Frequency (CTAF), is the name given to the VHF radio frequency used for air-to-air communication at U.S., non-towered airports. Pilots use the common frequency to coordinate their arrivals and departures safely, giving position reports and acknowledging other aircraft in the airfield traffic pattern. |
| *Compatible Land Use* | The compatibility of existing and planned land uses near an airport is usually associated with the extent of potential aircraft-noise impacts from the airport, as well as safety concerns with the land under airport imaginary surfaces. Most land uses occurring adjacent to and within the bounds of airport property involve aviation and commercial activities and are considered compatible with airport operations. Rural residential, agricultural, and industrial (landfill) development comprise the principal land uses adjacent to airport property. Rural residential and agricultural land uses are typically regarded as compatible with standard general aviation operations. |

| Term – Abbreviation | Definition |
|---|---|
| *Displaced Threshold* | A threshold that is located at a point on the runway other than the designated beginning of the runway. |
| *Enplanement* | When a passenger boards an aircraft at an airport. Industry standards typically identify enplanements as the measure of activity at an airport. |
| *FAR Part 77* | Part 77, Objects Affecting Navigable Airspace establishes standards for determining obstructions in navigable airspace; sets forth the requirements for notice to the Administrator of certain proposed construction or alteration; provides for aeronautical studies of obstructions to air navigation to determine their effect on the safe and efficient use of airspace; provides for public hearings on the hazardous effect of proposed construction or alteration on air navigation; and provides for establishing antenna farm areas. |
| *Federal Aviation Regulation (FAR)* | The FAR are published in Chapter 1 of Title 14 of the CFR. |
| *Final Approach* | Part of an instrument approach procedure in which alignment and descent for landing are accomplished. |
| *Fixed Base Operator (FBO)* | In the aviation industry, a fixed base operator is a service center at an airport that may be a private enterprise or may be a department of the municipality that the airport serves. At a minimum, most FBOs offer aircraft fuel and parking, along with access to washrooms and telephones. Some FBOs offer additional aircraft services such as hangar storage, maintenance, aircraft charter or rental, flight training, deicing, and ground services such as towing and baggage handling. FBOs may also offer services not directly related to the aircraft, such as rental cars, lounges, and hotel reservations. |
| *Fixed by Function Navigation Aid* | An air navigation aid (NAVAID) that must be positioned in a particular location in order to provide an essential benefit for civil aviation is termed fixed by function. An example is a runway light, which must by its nature by located along the edge of the runway. |
| *Fixed Wing Aircraft* | A fixed-wing aircraft is a heavier-than-air craft whose lift is generated not by wing motion relative to the aircraft, but by forward motion through the air. The term is used to distinguish from rotary-wing aircraft (rotorcraft), where the movement of the wing surfaces relative to the aircraft generates lift. |
| *Fleet Mix* | Breakout of aircraft categories (single engine, multiengine, etc.). |

| *Term – Abbreviation* | Definition |
|---|---|
| *Frangible Navigation Aid* | A navigational aid (NAVAID) that retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft. The term NAVAID includes electrical and visual air navigational aids, lights, signs, and associated supporting equipment. |
| *General Aviation* | General aviation refers to all flights other than military and scheduled airline flights, both private and commercial. General aviation flights range from gliders and powered parachutes to large, non-scheduled cargo jet flights. As a result, the majority of the world's air traffic falls into this category. |
| *Global Positioning System (GPS)* | Navigation system that uses satellite rather than ground-based transmitters for location information. |
| *Instrument Approach Procedure (IAP)* | A series of predetermined maneuvers for the orderly transfer of an aircraft under IFR from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. |
| *Instrument Flight Rules (IFR)* | Rules and regulations established by the Federal Aviation Administration to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. |
| *Instrument Meteorological Conditions (IMC)* | Meteorological conditions such as visibility, distance from clouds, and ceiling less than the minimums specified for visual meteorological conditions that require operations to be conducted under IFR. |
| *Itinerant Operation* | Operations not classified as “local” operations.  See local operation. |
| *Landside* | The part of the airport exclusive of aircraft operating areas (runways, taxiways, aircraft aprons/ramps).   Landside includes the terminal building, hangars, other buildings and structures not on the airport’s airside, automobile parking areas, access roads, etc. |
| *Local Operation* | Aircraft operations remaining in the local traffic pattern, including military and civil operations. These include simulated instrument approaches at the airport, and operations to or from the airport and a practice area within a 20-mile radius of the tower. |
| *Mean Sea Level (MSL)* | The height of the sea surface midway between its average high and low water positions |
| *Minimum Altitude* | An altitude depicted on an instrument approach chart with the altitude value underscored. Aircraft are required to maintain altitude at or above the depicted value. |

| Term – Abbreviation | Definition |
|---|---|
| *Minimum descent altitude (MDA)* | The lowest altitude (in feet MSL) to which descent is authorized on final approach, or during circle-to-land maneuvering in execution of a non-precision approach. |
| *Missed Approach Point* | A point prescribed in each instrument approach at which a missed approach procedure shall be executed if the required visual reference has not been established. |
| *Modification to Standards* | Means any change to FAA design standards other than dimensional standards for runway safety areas. Unique local conditions may require modifications to airport design standards for a specific airport. |
| *Movement Area* | The maneuvering area or movement area is the part of the airport used by aircraft for landing and takeoff that does not include the airport apron or ramp. The remainder of the airport is considered the non-movement area. |
| *National Plan of Integrated Airport Systems (NPIAS)* | The National Plan of Integrated Airport Systems (NPIAS) is an inventory of U.S. aviation infrastructure assets. It is developed and maintained by the Federal Aviation Administration (FAA). Its purposes are to identify all the airports in the U.S. that are considered significant components of the national aviation infrastructure network; to qualify the current state of development, technology, and repair at each of these airports; and to estimate the funding needed to bring each airport up to current standards of design, technology, and capacity. Airports in the NPIAS are eligible for Federal grants from the Airport Improvement Program. |
| *Non-precision Approach* | Non-precision approach procedure means a standard instrument approach procedure in which no electronic glide slope is provided. |
| *Object Free Area (OFA)* | An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that should be located in the OFA for air navigation or aircraft ground maneuvering purposes. |
| *Obstacle Clearance Surface (OCS)* | An inclined obstacle evaluation surface associated with a glidepath (glideslope). |
| *Piston Aircraft* | An aircraft powered by one or more piston engines (regardless of fuel type). |
| *Precision Approach Path Indicator (PAPI)* | The precision approach path indicator (PAPI) uses light units installed in a single row of either two or four light units. These systems have an effective visual range of about five miles during the day and up to 20 miles at night. |

| ***Term – Abbreviation*** | **Definition** |
|---|---|
| *Rotating Beacon* | A rotating beacon is a light system used to assist pilots in finding an airport, particularly those flying in IMC or VFR at night. Additionally, the rotating beacon provides information about the type of airport using a particular set of color filters. Beacons for civil land airports emit a white and green light that appears as a flash. |
| *Runway End Identifier Lights (REILs)* | A pair of synchronized flashing lights, located laterally on each side of the runway threshold, providing rapid and positive identification of the approach end of a runway. |
| *Runway Protection Zone (RPZ)* | An area off the runway end to enhance the protection of people and property on the ground. |
| *Runway Safety Area (RSA)* | A runway safety area (RSA) is defined as "the surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." |
| *Taxilane* | The portion of the aircraft parking area used for access between taxiways and aircraft parking positions. |
| *Taxiway* | A taxiway is a path on an airport connecting runways with aprons, hangars, terminals and other facilities. They mostly have hard surface such as asphalt or concrete, although smaller airports sometimes use gravel or grass. |
| *Taxiway Safety Area* | A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway. |
| *Terminal Area Forecasts (TAF)* | The official forecast of aviation activity at FAA facilities. These forecasts are prepared to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public. |
| *Threshold* | The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced. |
| *Visual Approach* | An approach based on the pilot's perception of the correct alignment with the runway centerline and glideslope with no reference to navigational equipment. |
| *Visual Descent Point (VDP)* | A defined point on the final approach course of a non-precision straight-in approach procedure, from which normal descent from the MDA to the runway touchdown point may be commenced, provided the runway environment is clearly visible to the pilot. |

| Term – Abbreviation | Definition |
|---|---|
| *Visual Flight Rules (VFR)* | Flight rules adopted by the FAA governing aircraft flight using visual references. VFR operations specify the amount of ceiling and the visibility the pilot must have to operate according to these rules. When the weather conditions are such that the pilot cannot operate according to VFR, he or she must use instrument flight rules (IFR). |
| *Visual Meteorological Conditions (VMC)* | Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling that meet or exceed the minimums specified for VFR. |
| *Visual Runway* | A runway without an existing or planned straight-in instrument approach procedure. |

# Appendix B WILDLIFE HAZARD ASSESSMENT SITE VISIT REPORT

# Appendix C ALP SET