PHASE I CONCLUSIONS AND OBSERVATIONS

NEW ENGLAND REGIONAL AIRPORT SYSTEM PLAN
GENERAL AVIATION

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| INTRODUCTION

BACKGROUND

The New England state aviation officials, in partnership with the Federal Aviation Administration (FAA), conducted a study of the General Aviation (GA) airport system in New England. In the fall of 2006, the FAA New England Region, in concert with the New England Airport Directors and New England State Aviation Directors, completed the New England Regional Airport System Plan (NERASP). That study served as the foundation of a regional strategy for the air carrier airport system to support the needs of air passengers through 2020. The development of that strategy has been instrumental in assisting with the investment and development of the primary commercial airport system in New England.

During preparation of the NERASP, the group highlighted that a similar evaluation of GA would provide state aviation officials with a greater understanding of the role of general aviation in New England, as well as the infrastructure investment and priorities to support that role. Assisted by this information, FAA can make more informed decisions regarding priority capital investments. In addition to having an overall perspective of the New England GA system, a goal of this assessment is to provide each state aviation official with a common understanding of their state airport system in relation to the New England Region as a whole.

Since the initial NERASP study proved that the geographic boundary of the New England region, as well as its cultural identity, can make for an effective planning approach for the air carrier system, why not use it for the GA system as well.

It also became obvious that it was essential to develop a strategic perspective of the New England general aviation airport system because we were faced with:

1. A struggling economy,
2. Rising costs to operate aircraft and airports,
3. Declining operational activity,
4. An aging infrastructure, and
5. Limited state and federal funds to address improvements.

This unique application of airport system planning is similar to a recent FAA general aviation study to develop a nationwide GA perspective called *"General Aviation Airports: A National Asset"* (FAA ASSET Study). The FAA Asset Study provides a new framework of analysis for analyzing the New England GA airports that was incorporated into this study.

PROJECT GOALS

When referring to the New England airport system (excluding heliports and seaplane bases) there are over 360 landing sites. Of these, over 150 are public use airports that are publicly or privately owned, and just over 110 of these airports are eligible to apply to the FAA for Airport Improvement Program

(AIP) grants. The **overall goals** of the "New England Regional Airport System Plan – General Aviation" (NERASP GA) are to:

1. Identify the airport system essential to meet the future GA demand;
2. Establish a "classification system" that provides an accurate assessment of airport roles;
3. Present an overview of the infrastructure cost essential to sustain and improve the system;
4. Create performance standards to monitor the system;
5. Identify the GA airports that are essential to the regional transportation system;
6. Highlight the significance of general aviation in the economic development of New England; and
7. Develop strategies that ensure a sustainable GA airport system.

Based on the original goals of the study, the project team developed a comprehensive framework to produce the data and analysis to address these goals. As is often the case, the resources needed to accomplish such a comprehensive scope were not available. Consequently, and in consultation with the State Aviation Directors, it was determined a phased approach would be taken. The Phase I effort that is reported herein is approximately 25% of the original scope, but was meant to provide an adequate understanding GA activity in New England, and a baseline for the next phase to build upon.

Under this phased approach, GA was reviewed through various independent lenses that do not necessarily follow a traditional system planning approach. Often the result of these independent tasks provided new insights and anecdotal information on the regional airport system. As a result, the findings of Phase I have identified some potential areas where additional analysis may be needed, while other findings simply provide a baseline for GA in the New England Region.

This Phase I document serves as a compilation of the key findings. It provides the context of what was accomplished and it identifies several unique observations and potential areas that should be considered in the next phase of studying the New England Regional Airport System – General Aviation. The subsequent phase is needed to achieve the goal identified above; **"*Develop strategies that ensure a sustainable GA airport system*"**.

| CLASSIFICATION OF GA AIRPORTS IN NEW ENGLAND SYSTEM

This task attempted to focus on a baseline understanding of General Aviation (GA) in New England. To accomplish this, the effort reviewed and assessed the existing GA system focusing on an objective description of the historic function of the airports in providing services to its service area communities and their interaction with other regional and national airports. In terms of a national system their roles have been defined by the FAA National Plan of Integrated Airport Systems (NPIAS). Further, it provides a profile of the New England GA airports in each classification.

In May of 2012, with the release of the FAA ASSET Study, the FAA created five new classifications of general aviation airports included in the National Plan of Integrated Airport Systems (NPIAS): National, Regional, Local, Basic, and Unclassified. Previously, GA airports were classified as either reliever or general aviation airports in the NPIAS. Some airports were not classified (Unclassified) during the ASSET Study because of a lack of information. A supplemental FAA study is underway to assess the Unclassified airports. Beginning with the FY 2013-2017 NPIAS report, future NPIAS reports will incorporate the new GA airport classifications.

The main objective of the NERASP-GA study was to map the various roles under NPIAS and the FAA's ASSET study classifications and incorporate into the results of other Phase I efforts. The intent was to include airport facility needs, the system of airports as it relates to approach access, and air traffic control towers to understand how these airports may affect system performance and safety. Further, this task incorporated the FAA's ASSET study classifications and analyzed the system of airports to understand the common characteristics among these airports beyond the ASSET classifications. The results provide an information baseline, as well as further understanding as to what each of these airports means to the New England Region.

Both the NPIAS and ASSET descriptions are provided below for context. In addition, classification profiles and mapping of the airports by these designations are also provided.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS (NPIAS)

The NPIAS identifies more than 3,300 existing and proposed airports that are significant to national air transportation and thus eligible to receive Federal grants under the Airport Improvement Program (AIP).

The NPIAS includes all commercial service, reliever (high-capacity general aviation airports in metropolitan areas), and select general aviation airports. Communities that do not receive scheduled commercial service or that do not meet the criteria for classification as a commercial service airport may be included in the NPIAS as a general aviation airport if they meet minimum activity thresholds (e.g., at least 10 based aircraft) and are at least 20 miles from the nearest NPIAS airport.

The NPIAS only categorizes GA airports into two classifications: reliever and all others. Reliever airports are designated by the FAA to relieve congestion at commercial service airports and to provide improved general aviation access to the overall community. To be eligible for reliever designation, these airports must have 100 or more based aircraft or 25,000 annual itinerant operations. The remaining airports are commonly referred to as general aviation airports. This airport type is the largest single group of airports in the National airport system.

Within the NPIAS, the New England airport system (excluding heliports and seaplane bases) consists of 368 landing sites. Of these, 156 are public use airports that are publicly or privately owned, and only 110 of these airports are eligible to apply to the FAA for Airport Improvements Program (AIP) grants.

ALL AIRPORTS – COMMERCIAL AND GENERAL AVIATION, NON-NPIAS

To understand the New England GA airports classification, descriptions of the NPIAS categories are provided below. Please note that these numbers are based on the 2012 data year (updates have been made when a specific change was known "PVD to small hub", but the numbers were not updated in all categories).

COMMERCIAL SERVICE AIRPORTS

Commercial service airports are defined as public airports with scheduled passenger service and having 2,500 or more enplaned passengers per year. The 499 commercial service airports are further subdivided into two additional categories which are primary (378) and non-primary (121). The primary airports enplane at least 10,000 passengers annually. The remaining 121 non-primary commercial service airports have between 2,500 and 10,000 annual passenger enplanements. The primary airports are further broken down into four categories: large, medium, small and non-hub airports.

National Total: 499 **New England Total:** 24

Large Hub Airports

Large hub airports are those that account for 1.0% or more of total U.S. passenger enplanements. Generally, these airports focus primarily on air carrier and cargo operations rather than general aviation activity.

National Total: 29 **New England Total:** 1

Medium Hub Airports

Medium hub airports account for at least 0.25% but less than one 1.0% of total U.S. passenger enplanements. Medium hub airports have a mix of aviation activity which includes air carrier operations and a significant number of general aviation operations.

National Total: 36 **New England Total:** 1

Small Hub Airports

Small hub airports account for at least 0.05% but less than 0.25% of total U.S. passenger enplanements. Air carrier activity at small hub airports requires only a fraction of runway capacity which allows these airports to accommodate a more general aviation activity with less congestion.

National Total: 74 **New England Total:** 4

Non-hub Primary Airports

Commercial service airports with at least 10,000 annual enplanements but less than 0.05%of all commercial passenger enplanements are categorized as non-hub primary airports. These airports are typically heavily used by general aviation aircraft.

National Total: 239 **New England Total:** 14

Non-primary Commercial Service Airports

Non-primary commercial service airports which have annual enplanements between 2,500 and 10,000 are categorized as non-primary commercial service airports. These airports have some scheduled air carrier operations but are used primarily by general aviation users.

National Total: 121 **New England Total:** 4

GENERAL AVIATION AIRPORTS

Airports which do not meet the criteria for primary or non-primary airports and do not have scheduled commercial service but do have sufficient aeronautical activity (and at least 10 based aircraft) and are at least 20 miles from the nearest NPIAS airport can be classified as a general aviation airport in the NPIAS. These airports are generally the closest source of air transportation for a large segment of the U.S. population and many activities taking place at these facilities are critical to more rural areas. These activities include use by the military and law enforcement, medical evacuation, flight training, to name a few.

National Total: 2,563 **New England Total:** 110

General Aviation Reliever Airports

In most cases general aviation aircraft and most large commercial aircraft have a variety of differences which make mixing the two in an airport operating environment. Operating characteristics such as takeoff, landing, and approach speeds and maneuverability are just some of the differences that provide many challenges to operating a general aviation aircraft in and among these large commercial jets. It is for these reasons that the FAA has encouraged the development of airports in and around the hub airports to provide general aviation pilots with suitable alternatives for their aviation activities. These airports are designated as reliever airports. Reliever airports must be accessible by the public, have 25,000 itinerant operations or 100 or more based aircraft to carry this status.

National Total: 268 **New England Total:** 11

Other General Aviation NPIAS Airports

The National Plan of Integrated Airport Systems is was developed in part to identify public use airports that are considered significant to the national air transportation system and are therefore eligible to receive grant funding from the FAA Airport Improvement Program. Two of the three categories listed below are groups of airports which are included under the NPIAS program and the third category identifies the group of airports that are not covered.

General Aviation Publicly Owned NPIAS Airports

Airports that meet the criteria under this category meet the standards of both the general aviation airport designation or the reliever airport designation and are owned and managed by local governments which are usually responsible for the development and maintenance of the facilities in accordance with federal standards. These airports are opened to the public.

National Total: 2,509 **New England Total:** 66

General Aviation Privately Owned NPIAS Airports

Airports that meet the criteria under this category meet the standards of both the general aviation airport designation or the reliever airport designation and are owned and managed by private owners who are usually responsible for the development and maintenance of the facilities in accordance with federal standards. These airports are opened to the public.

National Total: 40 **New England Total:** 9

General Aviation Publicly or Privately Owned Non-NPIAS Airports

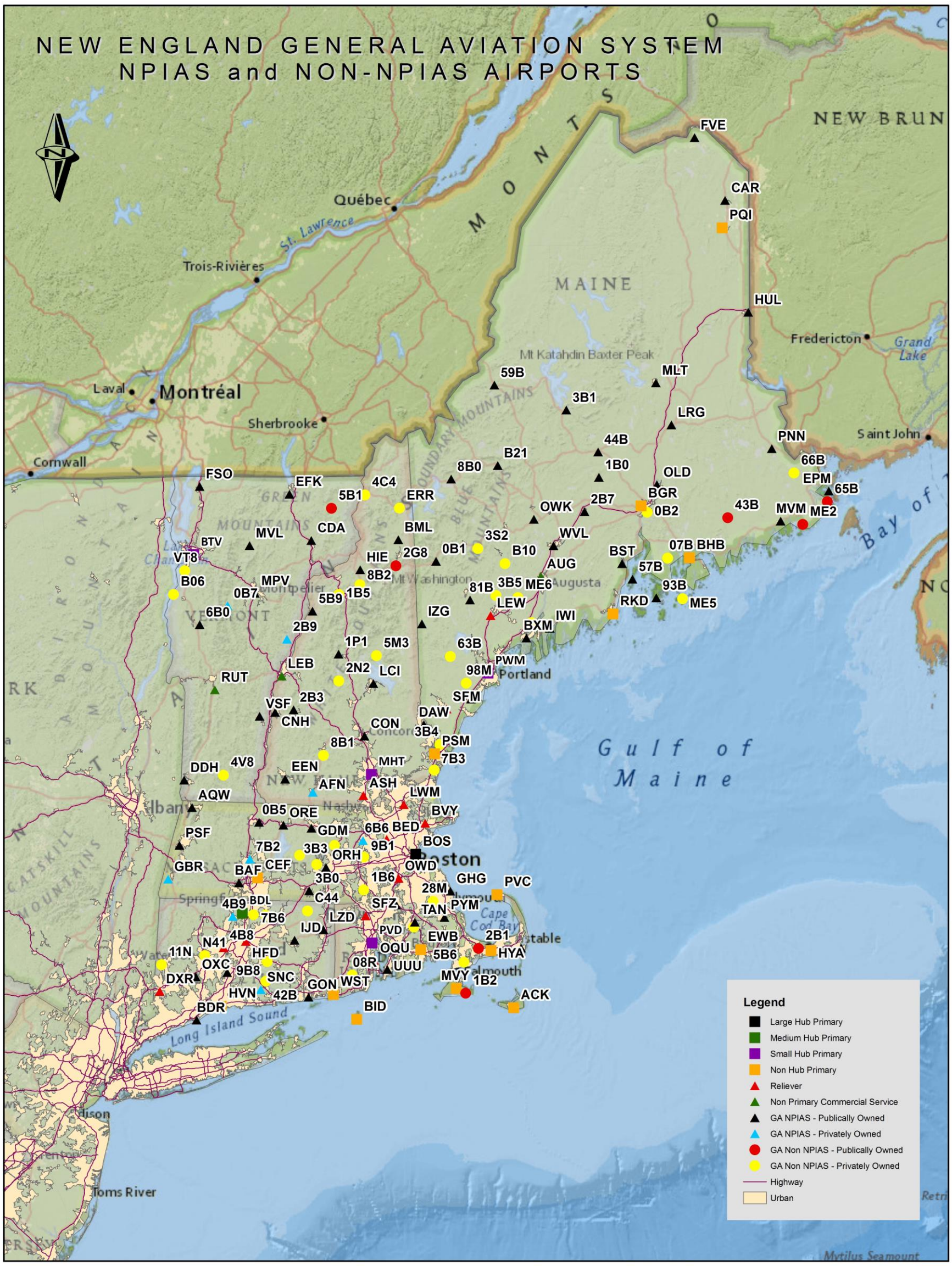
Airports that meet the criteria under this category may meet the standards of both the general aviation airport designations of the previously referenced "General Aviation Publicly Owned NPIAS Airports" and "General Aviation Privately Owned NPIAS Airports" categories. Unlike the two previous categories, these airports are not eligible for FAA airport improvement funding and are not required to be open to the public.

National Total: 18,832 **New England Total:** 46

TABLE 1 / PUBLIC USE AIRPORTS. *All Public Use Airports by Category*

NPIAS CATEGORY	NE	CT	MA	ME	NH	RI	VT
Large Hub - Primary	1	0	1	0	0	0	0
Medium Hub - Primary	1	1	0	0	0	0	0
Small Hub- Primary	4	0	0	1	1	1	1
Non-Hub- Primary	14	1	6	4	1	2	0
Total NPIAS Primary	**20**	**2**	**7**	**5**	**2**	**3**	**1**
Non Primary - Commercial Service	4	0	1	1	1	0	1
GA Reliever	11	3	3	2	1	2	0
GA- NPIAS Publically Owned	66	6	14	27	10	1	8
GA-NPIAS Privately Owned	9	2	4	0	1	0	2
Total NPIAS Non-Primary	**90**	**11**	**22**	**30**	**13**	**3**	**11**
Total NPIAS	**110**	**13**	**29**	**35**	**15**	**6**	**12**
GA Non-NPIAS Privately Owned	39	7	8	12	8	1	3
GA Non-NPIAS Publically Owned	7	0	2	3	1	0	1
Total Non-NIPIAS	**46**	**7**	**10**	**15**	**9**	**1**	**4**
Total Combined	**156**	**20**	**39**	**50**	**24**	**7**	**16**

FIGURE 1 / ALL PUBLIC USE AIRPORTS. *NPIAS and Non-NPIAS*



Appendix C provides a listing of airport identification three-letter codes.

GENERAL AVIATION AIRPORTS: A NATIONAL ASSET (FAA ASSET[1])

General aviation airports are an important part of the national and regional aviation systems and generally provide "on demand" services that scheduled airline service cannot provide and a significant economic role for the communities they serve. These aeronautical services include emergency preparedness and response functions (medical evacuation); law enforcement activities; search and rescue/disaster relief; government agency supported services such as security, customs and border protection, and firefighting activities. In the United States there is a certain portion of the population that live in remote areas where access in and out of these remote areas can only be accomplished by aircraft which makes the airport not only a key transportation hub but a life line for the residents of that community.

In May 2012, the FAA completed the ASSET study that presented a national asset classification system for GA airports which classifies the airports into five (5) distinct classifications. These classifications consist of National, Regional, Local, Basic, and Unclassified. A follow on effort is currently underway by the FAA to study the airports that are considered Unclassified. The following are the descriptions of each classification as determined by the FAA ASSET Study:

NATIONAL AIRPORTS CLASSIFICATION

This classification serves national to global markets with very high levels of activity with many jets and multiengine propeller aircraft averaging about 200 based aircraft, including 30 jets. National Airports support the national and state system by providing communities with access to national and international markets. They accommodate a full range of aviation activity, including large corporate jet and multi-engine aircraft operations, significant charter passenger services, or all-cargo operations. They often work in conjunction with, and in support of, hub airports serving the aviation needs of larger metropolitan areas.

National Total: 84
New England Total: 8 (9.5% of "National" Total)

REGIONAL AIRPORTS CLASSIFICATION

This classification serves regional to national markets with high levels of activity with some jets and some multiengine propeller aircraft averaging about 90 total based aircraft including three (3) jets. Regional airports support regional economies by connecting communities to statewide and interstate markets. These airports accommodate a full range of regional and local business activities, limited scheduled passenger service, or cargo operations. They serve corporate jet and multi-engine aircraft, as well as single-engine propeller aircraft.

National Total: 467
New England Total: 16 (3.4% of "Regional" Total)

LOCAL AIRPORTS CLASSIFICATION

This classification serves local to regional markets with some multiengine propeller aircraft averaging about 33 based propeller driven aircraft and no jets. Local airports supplement communities by providing access to primarily intrastate and some interstate markets. These airports accommodate small businesses, flight training, emergency service, charter passenger service, cargo operations, and personal flying activities. They typically accommodate smaller general aviation aircraft, mostly single-engine propeller and some multi-engine aircraft.

National Total: 1,236
New England Total: 44 (3.5% of "Local" Total)

[1] General Aviation Airports: A National Asset - http://www.faa.gov/airports/planning_capacity/ga_study/

BASIC AIRPORTS CLASSIFICATION

This classification often serves critical aeronautical functions within local and regional markets with moderate to low levels of activity with an average of about 10 propeller driven aircraft and no jets. Basic airports support general aviation activities such as emergency service, charter or critical passenger service, cargo operations, flight training, and personal flying. These airports typically accommodate mostly single-engine propeller aircraft. They may be located in, and provide service to, remote areas of the United States with limited or no surface transportation options, and therefore may be critical to the transportation of goods required for local day-to-day life.

National Total: 668

New England Total: 8 (1.2% of "Basic" Total)

UNCLASSIFIED AIRPORTS CLASSIFICATION

Of the 2,952 general aviation airports studied by the Federal Aviation Administration, and as outlined in the May 2012 Report titled "General Aviation: A National Asset", the FAA could not establish a clearly defined category of the remaining 497 airports as they have different types of activity and characteristics and could not be readily be described as a clear group or category.

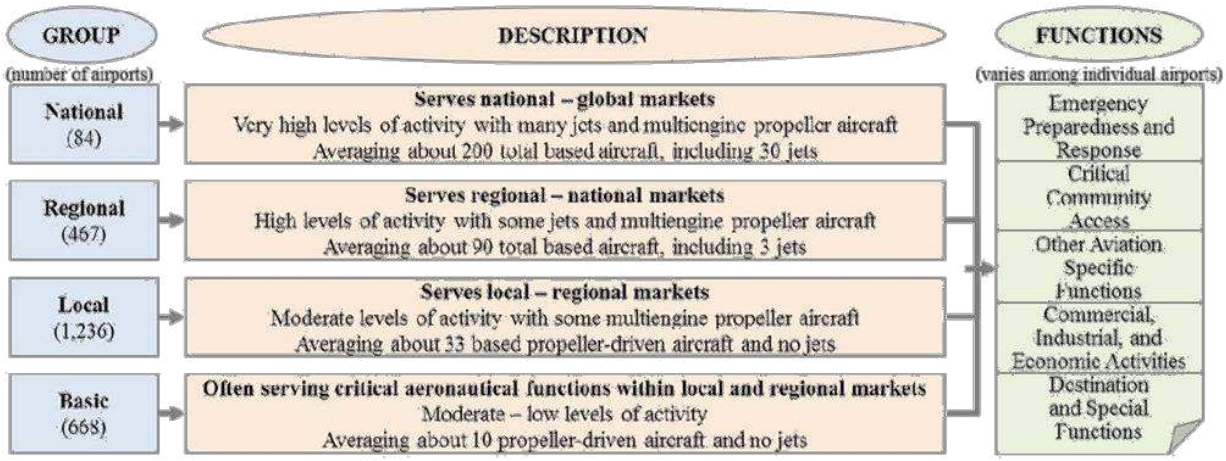
National Total: 497

New England Total: 16 (3.2% of "Unclassified" Total)

TABLE 2 / ASSET CLASSIFICATION AIRPORTS. *All Airports by Classification*

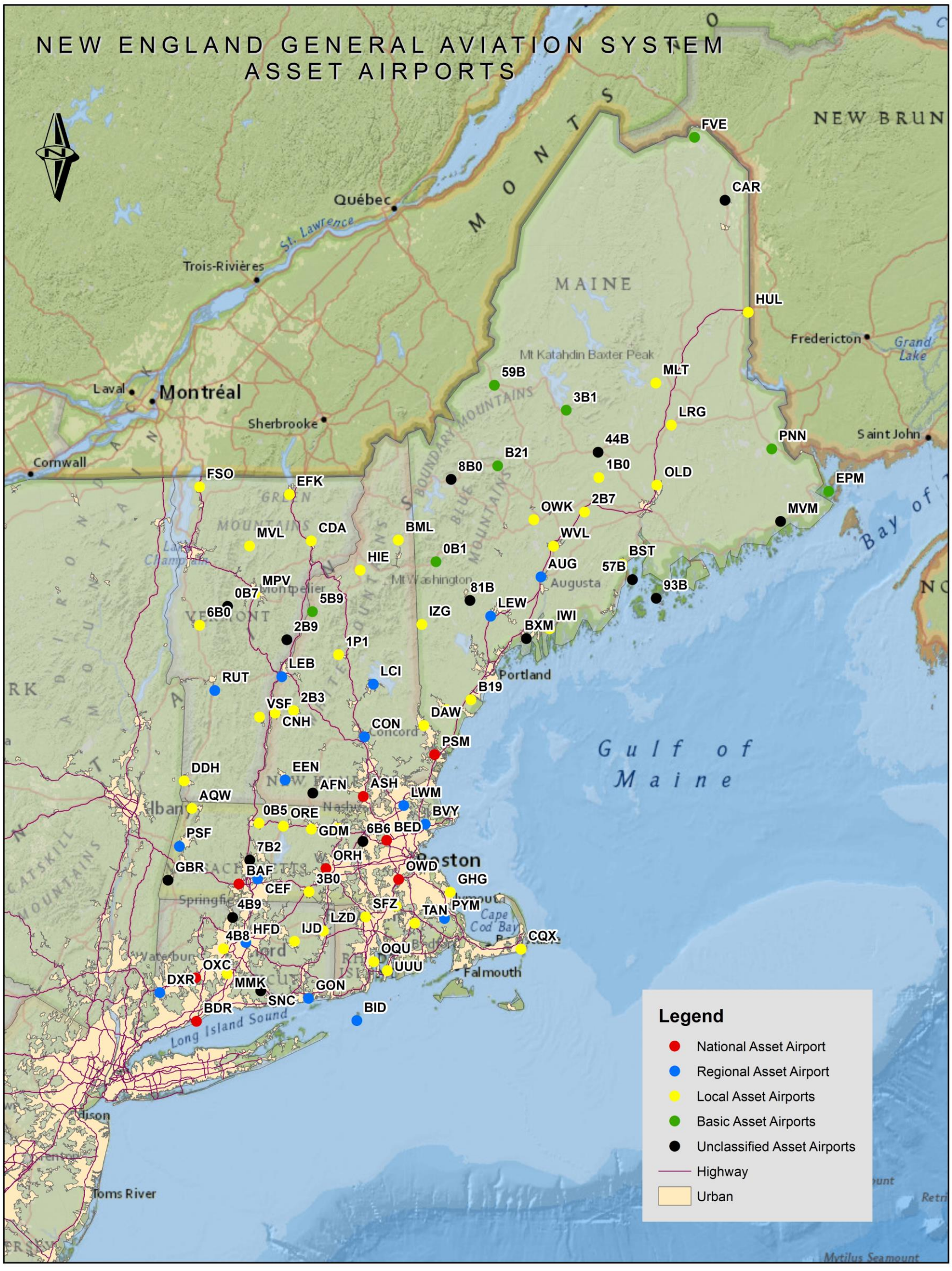
ASSET CATEGORY	NE	CT	MA	ME	NH	RI	VT
National	8	2	4	0	2	0	0
Regional	16	3	5	2	4	1	1
Local	44	4	10	13	6	3	8
Basic	8	0	0	7	1	0	0
Unclassified	16	2	3	8	1	0	2
Total Asset Categories	**92**	**11**	**22**	**30**	**14**	**4**	**11**

TABLE 2A / ASSET CLASSIFICATION. *Classification by Descriptions and Functions*



Source: http://www.faa.gov/airports/planning_capacity/ga_study/

FIGURE 2 / FAA ASSET AIRPORTS. *By ASSET Classifications*



Appendix C provides a listing of airport identification three-letter codes.

FAA ASSET STUDY PROFILES OF NEW ENGLAND GENERAL AVIATION AIRPORTS

To develop an in-depth understanding of the nature and characteristics of general aviation airports in New England, profiles with data relevant to the operation were collected for each airport. This data included records from the air traffic control towers, runway length; approaches (type and minimum); fuel and other services; weather reporting; instrument flight rules (IFR) activity; and the future runway and taxiway pavement costs. These profiles in conjunction with the FAA ASSET classification were used to further understand airports in New England. The results of the analysis yielded data for the following airport characteristics:

- Runway Length Ranges by Classification
- Airports with Non-paved Runways
- Runway Airport Reference Code (ARC), not available for all airports
- IFR Departures Range (2011)
- Average IFR Departures (2011)
- Best Available Approach by Type
- Approach Minimum Range
- On-Airport Weather Reporting
- Air Traffic Control Tower
- Aircraft Rescue & Fire Fighting (ARFF)
- Fuel Availability
- Jet Fuel Availability

It is important to note that aircraft activity is measured by aircraft operational counts; a takeoff or a landing. Within these aircraft operation counts, activity is measured under visual flight rules (VFR) or instrument flight rules (IFR). VFR activity is that conducted in good weather conditions and IFR is that conducted in poor weather conditions, or when a flight plan is filed. Most commercial, scheduled, and charter aircraft operators file IFR flight plans even in good weather conditions.

The challenge at GA airports becomes accurate operational counts of VFR activity. Airports with air traffic control towers have accurate operational data because an air traffic controller logs each VFR or IFR operation. At a non-control tower airport the data is based on estimates by airport management. Because of the uncertain nature of these estimates, Phase I of this study focused on analyzing IFR activity at New England GA airports because it gives a better picture of the importance of aviation and the “connectivity” factor among airports as well as its link to economic development. The study team still recognizes the need to further analyze all levels of GA aircraft activity.

Each data set was then separated by the FAA ASSET classification system which breaks the airports into the five classifications previously described. The following section contains the New England profiles for each FAA ASSET classification.

FIGURE 3 / "NATIONAL" ASSET AIRPORTS. *National Classification*

Appendix C provides a listing of airport identification three-letter codes.

PROFILE OF GA AIRPORTS IN "NATIONAL" AIRPORT CLASSIFICATION

According to the FAA ASSET classification, National airports support the national and state system by providing communities with access to national and international markets. They accommodate a full range of aviation activity, including large corporate jet and multi-engine aircraft operations, significant charter passenger services, or all-cargo operations. They often work in conjunction with, and in support of, hub airports serving the aviation needs of larger metropolitan areas.

New England's National airports serve business aviation users by providing quick and convenient access to many of the region's metropolitan areas. As alternatives to nearby large and medium hub airports for general aviation users, they provide capacity relief for busier commercial service airports in New England and the New York metropolitan area. The National airports serve a range of flight activity from high end business jets to light piston-powered aircraft. National airport users fly to and from destinations across the U.S. and as far away as Abu Dhabi. By providing convenient and flexible transportation for businesses, National airports play an important role in facilitating economic development for the region.

LOCATIONS WITHIN NEW ENGLAND

The New England region has eight National airports, representing about 10% of the national airports across the U.S. Four of the region's National airports are located in Massachusetts, two are in Connecticut and two are in New Hampshire. All of the National airports serve metropolitan areas which is the likely reason there are none in northern New England. Hanscom Field, Norwood Memorial, Nashua Boire and Portsmouth International fall within the region's largest metropolitan area, the Boston-Cambridge-Quincy, MA-NH MSA. Six of the eight National airports are within a one hour drive of a large hub commercial service airport and two are within an hour drive to a medium hub[2]. Given their locations in urban areas and in close proximity to large commercial service airports, the National airports play an important role in serving the diverse aviation needs of the region's large metro areas and providing relief to busier commercial service airports.

NATIONAL AIRPORTS PROFILE

Total Number Of Airports: 8

LONGEST RUNWAY LENGTH
9,000 feet[1] - 6 are greater than 5,000 feet

BASED AIRCRAFT (2012)
1,671 Avg. All: 209 Avg. Jets: 25

RUNWAY AIRPORT REFERENCE CODE (ARC)
B (1); C (5); D (2)

RUNWAY RECONSTRUCTION COST RANGE
Number of Airports: 8
Partial Depth: $155,020,000
Full Depth: $196,980,000

IFR DEPARTURE RANGE (2011)
2,790 to 22,025 Average: 5,905

WHERE ILS IS BEST APPROACH AVAILABLE
Number of Airports: 7 (88%)

WHERE RNAV/GPS IS BEST APPROACH AVAILABLE
Number of Airports: 1 (12%)

APPROACH MINIMUM RANGE
200- ½ to 300 - ¾

ON AIRPORT WEATHER REPORTING
Number of Airports: 8 (100%)

AIR TRAFFIC CONTROL TOWER
Number of Airports: 8 (100%)

ON-SITE AIRCRAFT RESCUE AND FIRE FIGHTING
Number of Airports: 5 (63%)

FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 8 (100%)

JET FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 8 (100%)

[1]Excludes National – Portsmouth (11,321)

[2] Hanscom Field, Portsmouth International, Norwood, Nashua Boire and Worcester are within a one hour drive of Boston Logan International; Bridgeport/Sikorsky is approximately one hour from New York La Guardia; and Waterbury-Oxford and Barnes Municipal are within one hour of Hartford/Bradley International.

IFR FLIGHT ACTIVITY – NATIONAL AIRPORTS

New England's National airports account for 53% of the general aviation IFR departures within the region's GA system, and 28% of the region's total general aviation IFR activity. Hanscom Field, which had more than 22,000 IFR departures in 2011, is the most active of the National airports, and accounts for nearly 46% of the activity at the region's National airports. Portsmouth International and Bridgeport Igor - Sikorsky each account for 10-11% of the IFR activity at the National airports. Total aircraft operations at the National airports, including flights flown without flight plans and pilot training activity, averages 67,000, based on the FAA's Air Traffic Activity System (ATADS). Hanscom Field is the busiest airfield in terms of total activity at more than 160,000 annual aircraft operations. At the National airports, IFR flights are estimated to represent approximately 18% of total flight operations.

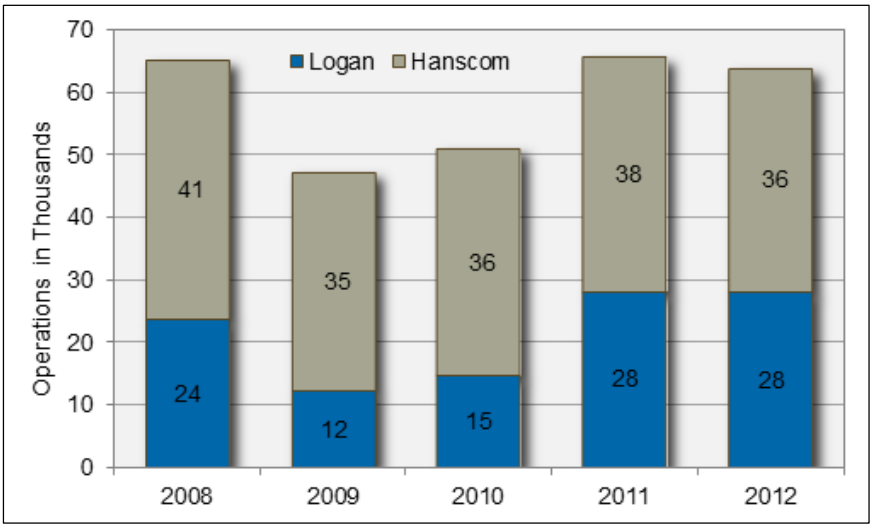
TABLE 3 / IFR ACTIVITY. *New England's National GA Airports*

NATIONAL AIRPORTS	CODE	STATE	2011 IFR DEPARTURES	PERCENT OF TOTAL
Bedford-Hanscom	BED	MA	22,025	46.6%
Portsmouth Intl at Pease	PSM	NH	5,050	10.7%
Bridgeport Igor I Sikorsky Memorial	BDR	CT	4,891	10.4%
Norwood Memorial	OWD	MA	4,103	8.7%
Waterbury-Oxford	OXC	CT	3,895	8.2%
Barnes Municipal	BAF	MA	2,945	6.2%
Nashua-Boire Field	ASH	NH	2,790	5.9%
Worcester	ORH	MA	1,539	3.3%
Total National Airports			**47,238**	**100.0%**

Source: FAA TFMSC Data and ICF SH&E Analysis

Bedford-Hanscom Field is owned and operated by the Massachusetts Port Authority. It is a reliever to Boston Logan Airport for business aviation activity. Over the past five years Hanscom has handled 27% to 186% more business aviation departures than Logan Airport. This reflects on the effectiveness of Hanscom's role as a GA Reliever airport to Logan.

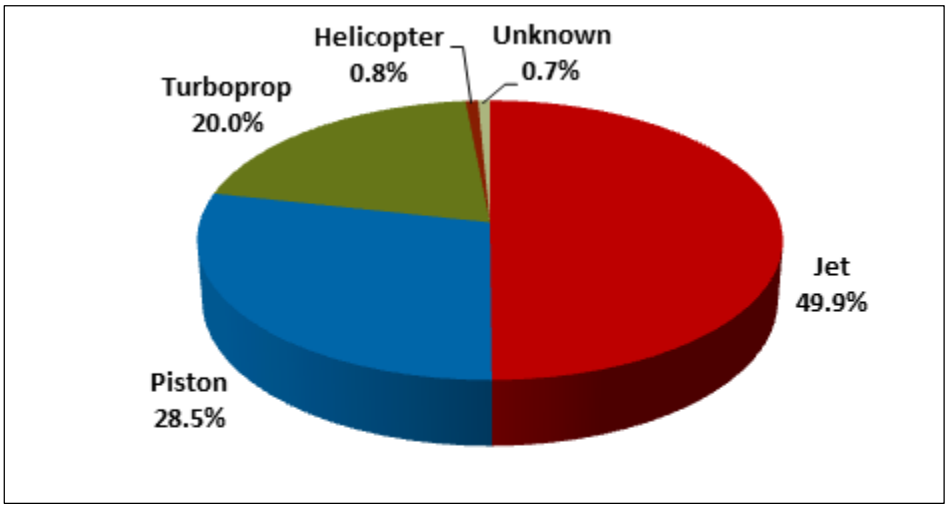
FIGURE 4 / ANNUAL BUSINESS AVIATION OPERATIONS. *Boston Logan Airport and Hanscom Field*



As a result of not having commercial service at the time of the FAA ASSET study, two of the National airports have scheduled commercial airline services. Portsmouth International is served by Allegiant Airlines with two weekly flights to Orlando-Sanford International (started October 25, 2013). Worcester Regional Airport receives daily nonstop service from JetBlue to Orlando International and Fort Lauderdale-Hollywood airports in Florida (started November 7, 2013).

The region's National GA airports have a high share of IFR departures performed with jet aircraft, indicating their importance in serving the needs of business aviation users. In 2011, jets accounted for half of the IFR departures at the National airports. This is similar to the region's Primary airports, where jets also accounted for half of all general aviation IFR departures. The National GA airports also accommodate a significant number of IFR departures by lighter piston-powered aircraft. In 2011, piston aircraft accounted for almost 29% of the IFR departures that occurred at the National airports.

FIGURE 5 / IFR DEPARTURES BY AIRCRAFT CATEGORY. *National Airports*



Source: FAA TFMSC Data and ICF SH&E Analysis.

The National airports also accommodate more than a quarter (27%) of the region's flight activity by fractional aircraft operators[3]. Although more than half (56%) of the fractional jet flying occurs at the region's Primary airports, National airports are also frequented by fractional jet flyers.

[3] This is based on fractional operators in the New England region with at least 100 identified annual IFR departures: Executive Jet; Plane Sense; Citation Shares; Bombardier Business Jet Solutions; and Flight Options.

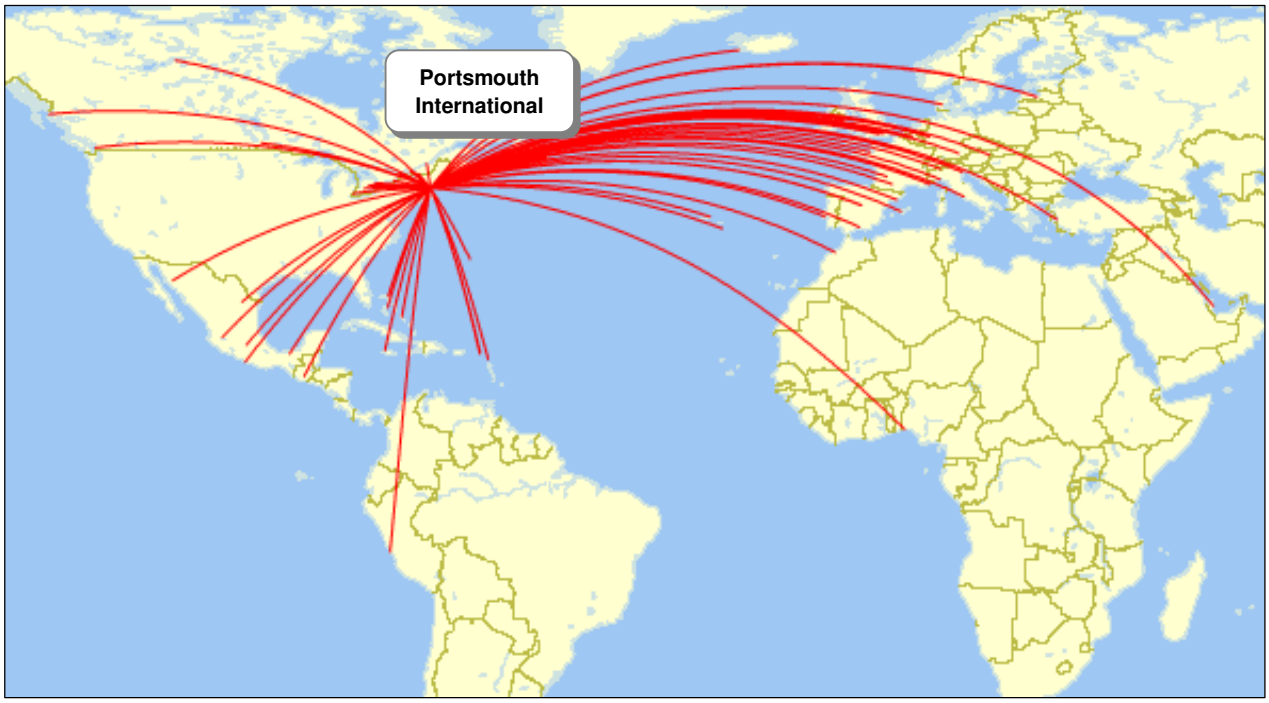
SYSTEM ACTIVITY AND INTERACTIONS – NATIONAL AIRPORTS

New England's National airports play a significant role in connecting the New England region to other destinations across the U.S. and the globe. More than 60% of the IFR flights (approximately 29,000 departures) from the National airports are to other U.S. markets outside the six New England states. The top destinations from the National airports are concentrated in the FAA's Eastern region[4], primarily in the New York metropolitan area, and include Teterboro (NJ), Westchester County (NY), Morristown (NJ), Farmingdale (NY) and Washington Dulles (VA). This area accounts for two-thirds of flying to other domestic destinations outside of New England, but National airports provide access to all regions of the country.

The National airports also play a role in providing intra-regional connectivity. Approximately 35% of IFR departures (approximately 14,000) are to New England destinations, including other National airports. Top intra-regional destinations include the Island markets (Nantucket and Martha's Vineyard), and other National airports (Hanscom, Portsmouth and Nashua).

The National airports also serve aircraft departing to international destinations, both near and far, providing business aviation users with the flexibility to reach global markets. Approximately 5% of the IFR departures from the National airports (approximately 2,200 departures) are to foreign points. Canada is the top region for international flights departing from the National airports (61%) followed by the Caribbean/Bermuda (19%) and Europe (17%). For example, in 2011, there were 292 IFR departures from Portsmouth International Airport to destinations throughout the world.

FIGURE 6 / INTERNATIONAL IFR DEPARTURES. *Portsmouth International at Pease*



Source: FAA TFMSC Data and ICF SH&E Analysis.

[4] FAA's Eastern region includes Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia.

A USER PERSPECTIVE – NATIONAL AIRPORTS

In a survey of business aviation users, the location and convenience of the region's GA airports was cited as the top strength of the region's GA airport system. The region's National airports, which are located in centers of commerce, play an important role in creating economic development opportunities for the New England region. Not only are the National airports conveniently located in the Region's metropolitan areas, but they also have the facilities to accommodate corporate aircraft, providing local businesses with the ability to use general aviation as a business tool. General aviation provides businesses with numerous benefits including:

- Flexibility to fly on their own timetable and not be tied to commercial airline services
- Quick access to multiple locations in a single day
- Access to locations not easily reached with commercial airline services
- Time savings so employees can be more productive
- Quick response to customer needs

Yankee Pacific, LLC, based in Rye, New Hampshire, invests in aviation-related businesses and provides business development and management services to aviation companies. Their investment portfolio includes aviation businesses that are located in areas not well served by commercial airlines. Yankee Pacific's company-owned airplane, based at Portsmouth International Airport at Pease, is a critical business tool for reaching customer and company locations on short notice and with minimal down time.

In one instance, on a Friday evening a client in Wichita called for a meeting at 2:00 pm the following Monday. The meeting not only required executives from New Hampshire, but also required an engineer from Tulsa. The company's plane was able to depart from Pease International Tradeport at 7:00 am on Monday and make a stop in Tulsa to pick-up the engineer and arrive in Wichita in time for the scheduled meeting. The meeting was a success due in part to the company's ability to be responsive on short-notice. Using scheduled commercial airline services and automobiles to transport all of the company representatives to the meeting would have required multiple days of travel and wasted down time, but was accomplished in a single day with private business aviation.

FIGURE 7 / "REGIONAL" ASSET AIRPORTS. *Regional Classification*

Appendix C provides a listing of airport identification three-letter codes.

PROFILE OF GA AIRPORTS IN "REGIONAL" AIRPORT CLASSIFICATION

Regional airports support regional economies by connecting communities to statewide and interstate markets. These airports are located in metropolitan areas and they accommodate a full range of regional and local business activities, limited scheduled passenger service, or cargo operations. Regional airports serve corporate jet and multi-engine aircraft, as well as single-engine propeller aircraft.

The regional general aviation airports serve some of New England's largest metropolitan areas as well as smaller micropolitan[5] areas in Northern New England. They provide efficient air access that supports local commerce and strengthens the regional economy. Several of the Regional airports function as Reliever airports by diverting general aviation activity away from nearby, commercial service airports and others accommodate corporate shuttle services between company or customer locations. Like their national airport counterparts, the Regional airports handle a variety of aircraft types from pistons to long-range business jets and they provide intra- and inter-regional connectivity for business aviation users.

LOCATIONS WITHIN NEW ENGLAND

The New England general aviation airport system has 16 Regional airports. Each state has at least one Regional airport, with Massachusetts having the most (5). Based on the criteria established in the ASSET study for Regional airports, all are located in a metropolitan or micropolitan area. Three Massachusetts airports, Beverly, Lawrence and Plymouth, fall within the region's largest metro area, the Boston-Cambridge-Quincy, MA-NH MSA. Several of the airports, such as Dillant-Hopkins in Keene, NH and Auburn/Lewiston Municipal in Maine, serve more remote and less populated areas in Northern New England that are nonetheless important regional centers of commerce.

REGIONAL AIRPORTS PROFILE

Total Number Of Airports: 16

LONGEST RUNWAY LENGTH
6,201 feet[1] - 12 are greater than 5,000 feet

BASED AIRCRAFT (2012)
1,511 Avg. All: 94 Avg. Jets: 2

RUNWAY AIRPORT REFERENCE CODE (ARC)
A (1); B (8); C (6); D (1)

RUNWAY RECONSTRUCTION COST RANGE
Number of Airports: 16
Partial Depth: $153,240,000
Full Depth: $190,700,000

IFR DEPARTURE RANGE (2011)
595 to 4,910 Average: 1,804

WHERE ILS IS BEST APPROACH AVAILABLE
Number of Airports: 10 (63%)

WHERE RNAV/GPS IS BEST APPROACH AVAILABLE
Number of Airports: 5 (31%)

WHERE VOR IS BEST APPROACH AVAILABLE
Number of Airports: 1 (6%)

APPROACH MINIMUM RANGE
200 - ½ to 1,000 - 1 ¼

ON AIRPORT WEATHER REPORTING
Number of Airports: 16 (100%)

AIR TRAFFIC CONTROL TOWER
Number of Airports: 7 (44%)

ON-SITE AIRCRAFT RESCUE AND FIRE FIGHTING
Number of Airports: 4 (25%)

FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 15 (94%)

JET FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 15 (94%)

[1]Excludes Regional – Westover (11,597)

[5] A micropolitan area is defined by the U.S. Office of Management and Budget as one or more adjacent counties or county equivalents that have at least one urban core area of at least 10,000 population but less than 50,000, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties.

IFR FLIGHT ACTIVITY – REGIONAL AIRPORTS

In 2011, New England's Regional airports handled nearly 29,000 general aviation IFR departures, approximately one-third of the IFR flight activity in the New England general aviation airport system and 17% of the region's total general aviation IFR departures. Hartford Brainard accommodated 4,900 general aviation IFR departures (17% of the Regional airport total), making it the busiest of the Regional airports for this type of activity. Groton-New London accounted for 12% (3,500 departures) and Lebanon accounted for nearly 10% (2,800). Considering all types of aircraft activity, including VFR and local operations, the Regional airports, on average, handle approximately 50,000 aircraft operations annually. For the Regional airports, IFR flight activity represents approximately 7% of total aircraft operations.

TABLE 4 / IFR ACTIVITY. *New England's Regional GA Airports*

REGIONAL AIRPORTS	CODE	STATE	2011 IFR DEPARTURES	PERCENT OF TOTAL
Hartford Brainard	HFD	CT	4,910	17.0%
Groton-New London	GON	CT	3,529	12.2%
Lebanon Municipal	LEB	NH	2,829	9.8%
Danbury Municipal	DXR	CT	2,393	8.3%
Beverly Municipal	BVY	MA	2,209	7.7%
Laconia Municipal	LCI	NH	1,617	5.6%
Lawrence Municipal	LWM	MA	1,563	5.4%
Pittsfield Municipal	PSF	MA	1,522	5.3%
Dillant-Hopkins	EEN	NH	1,224	4.2%
Block Island State	BID	RI	1,191	4.1%
Rutland-Southern Vermont Regional	RUT	VT	1,155	4.0%
Auburn Lewiston Municipal	LEW	ME	1,126	3.9%
Plymouth Municipal	PYM	MA	1,123	3.9%
Augusta State	AUG	ME	963	3.3%
Concord Municipal	CON	NH	910	3.2%
Springfield/Chicopee Westover	CEF	MA	595	2.1%
Total Regional Airports			**28,859**	**100.0%**

Source: FAA TFMSC Data and ICF SH&E Analysis.

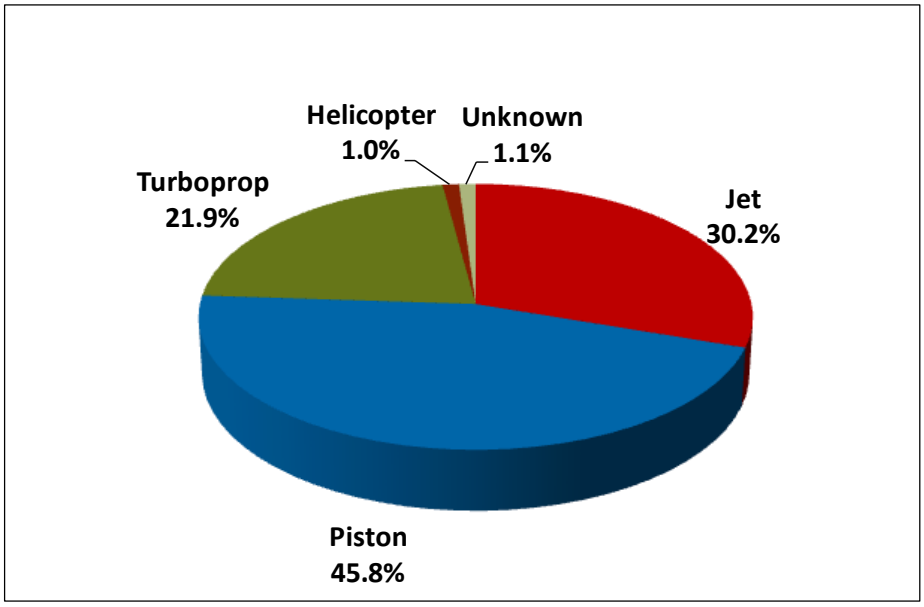
Several of the Regional airports function as reliever airports by accommodating operations that would be incompatible with activity at nearby larger airports or by serving as alternatives to nearby commercial service airports. The reliever airports in the Regional class are: Hartford-Brainard, Danbury, Beverly, Lawrence and Auburn. As an example, Hartford-Brainard Airport, which serves as a general aviation reliever to Hartford-Bradley International, handled 63,500 total aircraft operations in 2011, more than three times the number of general aviation operations at Bradley (18,800).

Three of the Regional airports receive scheduled commercial airline services under the US DOT Essential Air Service program (Augusta, Lebanon and Rutland). Block Island also receives regularly scheduled shuttle services to and from Westerly Rhode Island.

Like the National airports, a wide variety of general aviation aircraft operate at the Regional airports. However, at the Regional airports IFR departures are most commonly performed by piston aircraft.

Piston aircraft accounted for 46% of the IFR departures at the Regional airport in 2011. Jets account for 30% of all IFR departures at the Regional airports.

FIGURE 8 / IFR DEPARTURES BY AIRCRAFT CATEGORY. *Regional Airports*



Source: FAA TFMSC Data and ICF SH&E Analysis.

Major fractional operators transport customers to New England's Regional airports. In 2011, approximately 12% of activity by major fractional aircraft operators in New England occurred at the Regional airports[6].

SYSTEM ACTIVITY AND INTERACTIONS – REGIONAL AIRPORTS

New England's Regional airports help to connect businesses to other U.S. destinations. More than half (58% or approximately 29,000) of the general aviation IFR departures in 2011 were flown to other U.S. airports outside of New England. The FAA's Eastern region[7] is the predominant destination accounting for 78% of all inter-regional flights, but aircraft bound for other U.S. points fly as far as the West Coast and Alaska. The top destinations for inter-regional flights include Westchester County (NY), Teterboro (NJ), Farmingdale Republic (NY), Islip (NY), and Washington Dulles (VA).

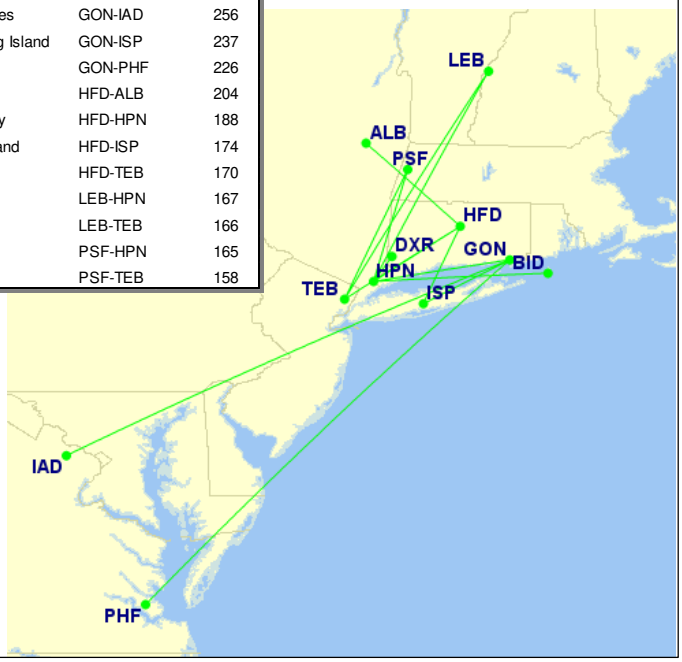
Several of the Regional airports support IFR flights to destinations outside the region along the East Coast, as shown in Figure 9. The routes illustrated are indicative of the various types of IFR activity that occur at the Regional airports. Many of these flights segments are under 100 miles and the Danbury-Westchester County great circle distance is just 24 miles. These short-haul flights may represent positioning flights, where aircraft are stored at one airport with available facilities, but frequently fly to nearby airports to pick-up passengers. Other longer distance routes, such as Groton-New London to Newport News or Lebanon-Teterboro, may be flown as corporate shuttles to client or other company locations.

[6] This is based on fractional operators in the New England region with at least 100 identified annual IFR departures: Executive Jet; Plane Sense; Citation Shares; Bombardier Business Jet Solutions; and Flight Options.

[7] FAA's Eastern region includes Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia.

FIGURE 9 / FREQUENT INTER-REGIONAL FLIGHT SEGMENTS FLOWN. *Regional Airports*

Route		2011 IFR Depts.
Block Island - Westchester County	BID-HPN	385
Danbury - Westchester County	DXR-HPN	324
Groton New London - Westchester County	GON-HPN	319
Groton-New London - Washington Dulles	GON-IAD	256
Groton-New London - MacArthur Long Island	GON-ISP	237
Groton-New London - Newport News	GON-PHF	226
Hartford-Brainard - Albany	HFD-ALB	204
Hartford-Brainard - Westchester County	HFD-HPN	188
Hartford-Brainard - MacArthur Long Island	HFD-ISP	174
Hartford-Brainard - Teterboro	HFD-TEB	170
Lebanon - Westchester County	LEB-HPN	167
Lebanon - Teterboro	LEB-TEB	166
Pittsfield - Westchester County	PSF-HPN	165
Pittsfield - Teterboro	PSF-TEB	158



Source: FAA TFMSC Data and ICF SH&E Analysis.

The Regional airports also provide intra-regional connectivity for general aviation users. Approximately 40%, or nearly 12,000, of the IFR departures from the Regional airports are bound for other New England destinations. The most frequently flown to New England destinations are Manchester, Nantucket, Hanscom, Boston Logan and Martha's Vineyard.

Compared to the National airports, there are fewer flights from the Regional airports to international destinations. In 2011, less than 2% of IFR departures (500 flights) were to foreign destinations. While 8 out of 10 international flights were to points in Canada, Regional airport flights flew to destinations as far as Europe and South America.

A USER PERSPECTIVE – REGIONAL AIRPORTS

The Regional airports function similarly to National airports and contribute to economic development in New England in multiple ways. Local companies rely on the aviation facilities and services at the Regional airports for quick and convenient access to business destinations, company offices and client locations within and outside the region.

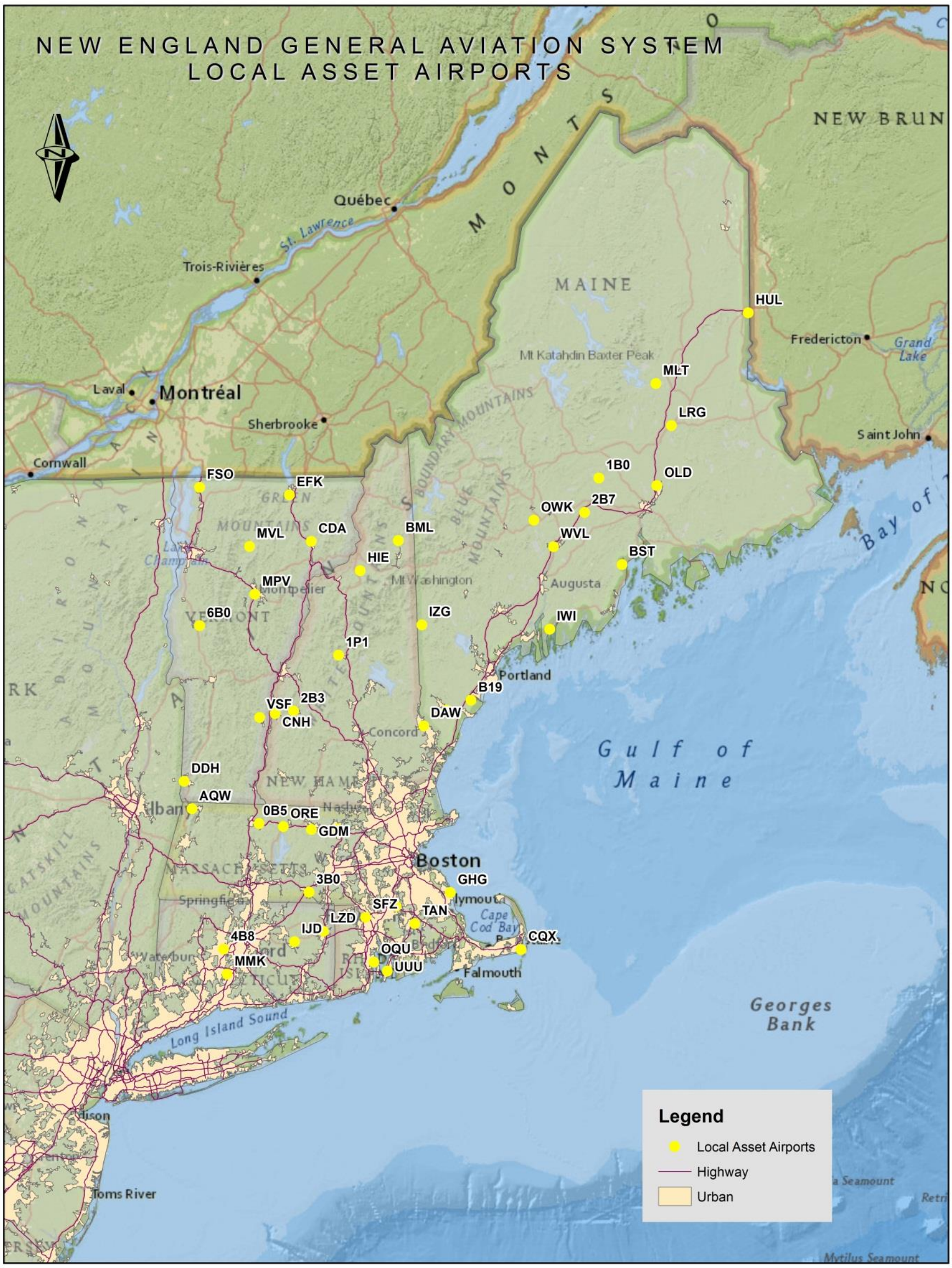
The Regional airports also serve the needs of businesses that may not be based in New England, but require quick and convenient access to client locations or new business opportunities in the region. These companies contribute to the New England economy each time they fly into a Regional airport and spend money for services at the airport and spend money in the community at area hotels, restaurants or retail establishments. For example, a New York state construction contractor relies on private general aviation transportation to reach customer job sites in New England and frequently flies into Regional

airports like Hartford-Brainard. Business aviation allows the company's project managers and engineers to reach job sites quickly without wasting time at commercial airports or traveling long distances on congested roadways.

The Connecticut regional airports, in particular the ones that border the metropolitan New York area, contribute to the region's economic development in yet another way. Some New York based companies store and maintain their aircraft at New England facilities, which may be more attractive than a local facility because of lower operating costs and greater hangar availability. This represents a direct injection of money from outside the region into the New England economy, helping to support aviation jobs in New England.

Lagonia Law, located in New York State, specializes in aviation, real estate, business and family law and bases two aircraft at Danbury Municipal. As an aviation law firm it uses general aviation aircraft to be responsive to client needs and travel to client locations on short notice. More than 80% of the trips made by the lawyers at Lagonia Law are to destinations in southern New England. This type of business benefits the region, not only when it flies into a New England airport and spends money in the region, but also by choosing to store and maintain its aircraft at a New England airport.

FIGURE 10 / "LOCAL" ASSET AIRPORTS. *Local Classification*



Appendix C provides a listing of airport identification three-letter codes.

PROFILE OF GA AIRPORTS IN "LOCAL" AIRPORT CLASSIFICATION

Local airports provide communities access to primarily intrastate markets and some interstate markets. Local airports are typically located close to large populations but are not necessarily located in metropolitan or micropolitan areas. These airports accommodate small businesses, recreational flying, aerial services, flight training, emergency service and medical transport, charter passenger service, some cargo operations and personal flying activities. Local airports typically accommodate smaller general aviation aircraft, mostly single-engine propeller and some multi-engine aircraft.

The majority of the general aviation airports in New England fall within the local category. The local airports in New England are a diverse group of airports and the mainstay of the region's GA airport system. The local airports provide essential aviation services for business aviation and personal flying needs and they contribute to commerce and economic development in the region's non-metro communities.

LOCATIONS WITHIN NEW ENGLAND

More than half of the airports in the New England general aviation airport system are classified as local airports. New England's 44 local airports are spread throughout the six-state region.

LOCAL AIRPORTS PROFILE

Total Number Of Airports: 44

LONGEST RUNWAY LENGTH
7,504 feet - 9 are greater than 5,000 feet

BASED AIRCRAFT (2012)
1,920 Avg. All: 44 Avg. Jets: 0.2

RUNWAY AIRPORT REFERENCE CODE (ARC)[1]
A (5); B (35); C (1); D (2)

RUNWAY RECONSTRUCTION COST RANGE
Number of Airports: 44
Partial Depth: $189,390,000
Full Depth: $237,770,000

IFR DEPARTURE RANGE (2011)
0 to 1,333 Average: 236

WHERE ILS IS BEST APPROACH AVAILABLE
Number of Airports: 4 (9%)

WHERE RNAV/GPS IS BEST APPROACH AVAILABLE
Number of Airports: 33 (75%)

WHERE VOR IS BEST APPROACH AVAILABLE
Number of Airports: 2 (5%)

NO APPROACHES AVAILABLE
Number of Airports: 5 (11%)

APPROACH MINIMUM RANGE
200 - ¾ to 1,300 - 1 ¼

ON AIRPORT WEATHER REPORTING
Number of Airports: 32 (72%)

AIR TRAFFIC CONTROL TOWER
Number of Airports: 1 (2%)

ON-SITE AIRCRAFT RESCUE AND FIRE FIGHTING
Number of Airports: 0 (0%)

FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 40 (91%)

JET FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 22 (50%)

[1]ARC not available for all airports

IFR FLIGHT ACTIVITY – LOCAL AIRPORTS

New England's Local airports collectively handled more than 10,000 general aviation IFR departures in 2011. The Local airports accounted for 12% of the general aviation IFR flight activity within the region's GA airport system and 6% of the region's total general aviation IFR departures. The busiest Local airport in terms of IFR activity is Quonset State Airport in Rhode Island, which handled approximately 1,300 IFR departures in 2011. The top 10 airports accommodated 60% of the total IFR departures at New England's Local airports, while several airports accommodated less than 100 IFR departures. IFR flight activity represents only a small portion (approximately 2%) of the overall flight activity at the Regional airports. Although IFR flight activity is low at the Local airports compared to National and Regional airports, the Local airports perform essential functions and accommodate a significant amount of operations under visual flight rules (VFR). The average number of annual arriving and departing aircraft handled at Local airports in New England is 20,000. This includes all types of aircraft operations including local and itinerant and operations conducted under IFR conditions. In 2011, New England's Local airports collectively handled an estimated 880,000 VFR flights (arriving and departing aircraft including touch-and-go training operations).

TABLE 5 / IFR ACTIVITY. *New England's Local GA Airports*

Local Airports	Code	State	2011 IFR Depts	Percent of Total	Local Airports	Code	State	2011 IFR Depts	Percent of Total
Quonset State	OQU	RI	1,333	12.8%	Berlin Regional	BML	NH	126	1.2%
North Central State	SFZ	RI	824	7.9%	Mount Washington Regional	HIE	NH	119	1.1%
Newport State	UUU	RI	821	7.9%	Houlton International	HUL	ME	112	1.1%
Sanford Regional	SFM	ME	591	5.7%	Newport State	EFK	VT	105	1.0%
Edward F Knapp State	MPV	VT	577	5.6%	Taunton Municipal-King Field	TAN	MA	100	1.0%
Waterville Robert Lafleur	WVL	ME	547	5.3%	Orange Municipal	ORE	MA	99	1.0%
Fitchburg Municipal	FIT	MA	459	4.4%	Turners Falls	0B5	MA	95	0.9%
Chatham Municipal	CQX	MA	396	3.8%	Middlebury State	6B0	VT	76	0.7%
Meriden Markham Municipal	MMK	CT	376	3.6%	Southbridge Municipal	3B0	MA	75	0.7%
Morrisville-Stowe State	MVL	VT	368	3.5%	Dewitt Field/Old Town Muni.	OLD	ME	73	0.7%
William Morse State	DDH	VT	358	3.5%	Millinocket Municipal	MLT	ME	69	0.7%
Robertson Field	4B8	CT	349	3.4%	Franklin County State	FSO	VT	65	0.6%
Belfast Municipal	BST	ME	295	2.8%	Claremont Municipal	CNH	NH	42	0.4%
Wiscasset	IWI	ME	265	2.6%	Parlin Field	2B3	NH	28	0.3%
Windham	IJD	CT	258	2.5%	Gardner Municipal	GDM	MA	24	0.2%
Mansfield Municipal	1B9	MA	238	2.3%	ME Airport of Norridgewock	OWK	ME	23	0.2%
Harriman-and-West	AQW	MA	218	2.1%	Plymouth Municipal	1P1	NH	17	0.2%
Eastern Slopes Regional	IZG	ME	196	1.9%	Dexter Regional	1B0	ME	13	0.1%
Pittsfield Municipal	2B7	ME	196	1.9%	Lincoln Regional	LRG	ME	10	0.1%
Springfield Hartness State	VSF	VT	165	1.6%	Caledonia County[1]	CDA	VT	0	0.0%
Biddeford Municipal	B19	ME	138	1.3%	Danielson[1]	LZD	CT	0	0.0%
Skyhaven	DAW	NH	136	1.3%	Marshfield/George Harlow Field[1]	GHG	MA	0	0.0%
					Total Local Airports			**10,375**	**100.0%**

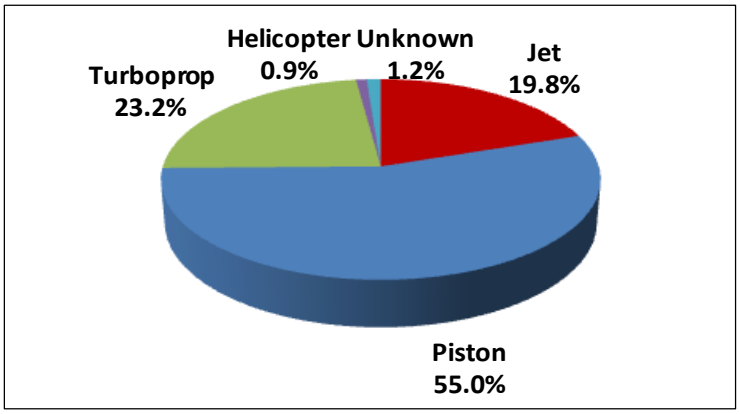
[1] *Note IFR flight data not available.* *Source: FAA TFMSC Data and ICF SH&E Analysis.*

There are four Relievers among the Local airports: Robertson Field (CT), Sanford Regional (ME), Quonset State (RI) and North Central State (RI). These airports accommodate general aviation activity that would

be incompatible with commercial flight activity at larger commercial service airports. For example, Sanford Regional Airport absorbs some general aviation activity that might otherwise use Portland International Jetport. In 2011, Sanford handled approximately 79,000 total general aviation operations compared to 21,000 general aviation flights at Portland.

A diverse range of aircraft types utilize the Local airports, but the majority of IFR departures (55%) are conducted by piston aircraft. Jet and turboprop aircraft account for 20% and 23% of IFR departures, respectively.

FIGURE 11 / IFR DEPARTURES BY AIRCRAFT CATEGORY. *Local Airports*

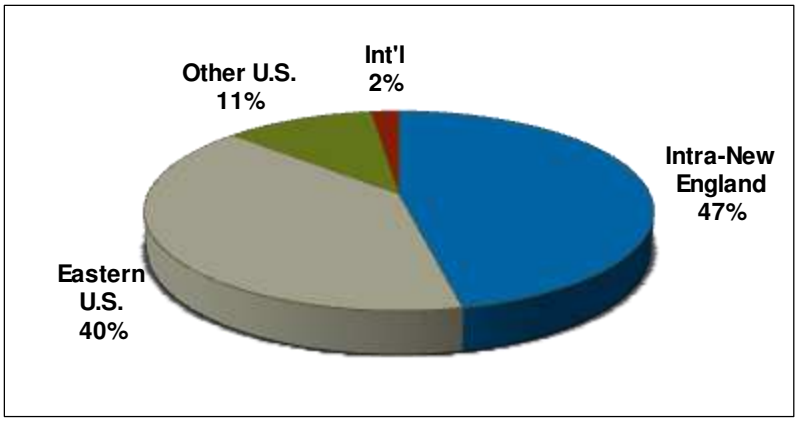


Source: FAA TFMSC Data and ICF SH&E Analysis.

SYSTEM ACTIVITY AND INTERACTIONS – LOCAL AIRPORTS

New England's Local airports link the communities they serve to destinations primarily in the northeastern U.S. Destinations in New England and the Eastern U.S. account for 87% of all IFR departures from the region's Local airports. IFR flying to domestic destinations outside the northeast accounts for just 11% of total IFR flight departures. The minimal international flights from the Local airports are mostly bound for short haul markets in eastern Canada. One exception is Quonset State which has the facilities and runway length to accommodate some flights to Western Europe and the Caribbean.

FIGURE 12 / IFR DEPARTURES BY DESTINATION REGION. *Local Airports*



Source: FAA TFMSC Data and ICF SH&E Analysis.

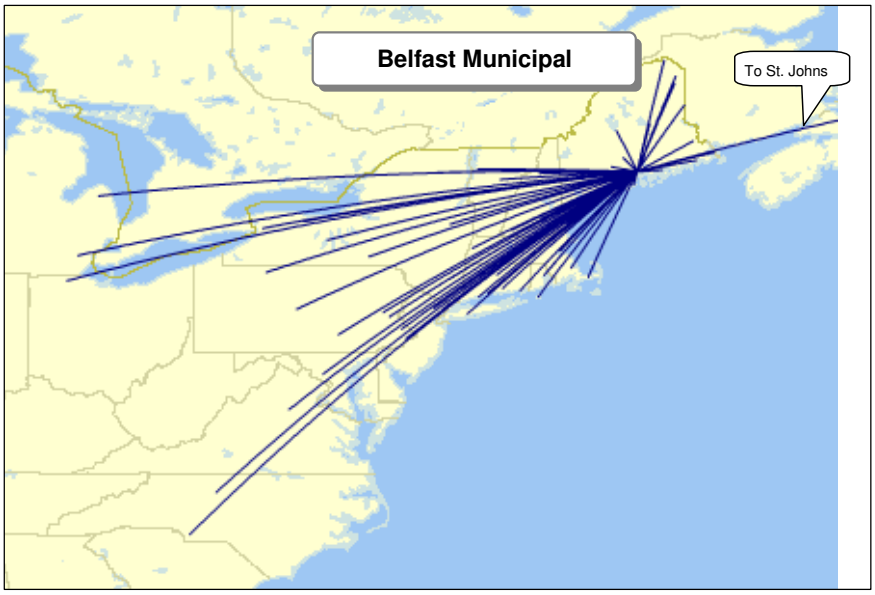
ECONOMIC DEVELOPMENT – LOCAL AIRPORTS

New England's Local airports contribute to commerce and economic development in the communities they serve in many ways. In many non-metro communities, Local airports are vital air transportation links for businesses, from small privately-owned companies to large corporations. These businesses create local jobs and contribute to gross regional product.

In coastal Maine, customers of boat building businesses often rely on the convenience of business aviation to travel to Maine to view their boats that may be undergoing a restoration or to take delivery of a new boat. According to state's boat builders, easy access in and out of the Coastal Maine area is important to their customers and ultimately to their business success.

Athena Health, headquartered in Watertown, MA, is a national company that provides cloud-based services for electronic health records, medical practice management and care coordination to medical groups and health systems. The publicly-traded company earned $422 million in revenue in 2012 and employs more than 2,600 people. Athena Health has operation sites in Belfast, Maine; Alpharetta, Georgia; Rome, Georgia; Birmingham, Alabama; Chennai, India; Austin, Texas; Ewing, New Jersey; Durham, North Carolina; and San Mateo, California. Athena Health relies heavily on business aviation to transport employees and clients from across the U.S. to two of its facilities in Maine via the Belfast Municipal Airport. More than 400 people are employed at the Belfast operations center located in a portion of the former complex that housed credit card giant MBNA which closed its Maine operations in 2005. Athena Health's Belfast facility could employ up to 600 persons over the next few years if the company's growth plans are realized. Operations at the Belfast facility include processing claims for clients, posting remittances, doing follow-up work to track health payments and providing customer support. Athena Health also owns and operates an education and conference facility in Northport, Maine, located 15 minutes from the Belfast office complex. The Northport facility which is used to train both employees and customers employs about 50 people.

FIGURE 13 / IFR FLIGHT SEGMENTS FLOWN. *Belfast Municipal Airport*



Source: FAA TFMSC Data and ICF SH&E Analysis.

A USER PERSPECTIVE – LOCAL AIRPORTS

Arundel Machine, located in southern Maine, is one of New England's leading manufacturers of precision machined components. Arundel Machine employs 79 people and serves customers in the Aerospace, Defense, Medical, Semiconductor, Oil & Gas and Optics/Security industries. The company President, Marcel Bertrand, is a pilot who bases an aircraft at Biddeford Municipal Airport and uses it to give his business a competitive edge. Approximately 90% of Arundel's customers are in New England and the remainder is in the NY/Great Lakes region. Access to business aviation allows Arundel Machine Tool to deliver high quality service along with their high quality products. They can quickly travel to customer sites on short notice to conduct business or deliver critical parts. Business aviation also allows the company to operate from two locations. Arundel Machine Tool has grown from a small operation that started in a basement in 1985 to a 30,000 square foot state-of-the-art facility that can be expanded to 60,000 square feet as the business grows.

A construction services company with headquarters and multiple regional offices in New England and other states utilizes business aviation to respond to customer needs and increase employee productivity and quality of life while growing their business. The company, which has more than $400 million in annual sales and over 4,000 employees companywide, bases its corporate aircraft at one of New England's Local airports. Business aviation gives the company the ability to visit multiple jobsites or customers in a single day. On some days they have been able to visit more than four states in one day. It also allows them to respond to customers' emergency needs, by sending company employees, tools or parts to a jobsite in a matter of hours rather than days if relying on commercial air service. Employees can not only accomplish more using business aviation, they can eliminate overnight travel and spend more time with their families. The company also flies potential customers to New England so they can tour the company's various fabrication facilities.

FIGURE 14 / "BASIC" ASSET AIRPORTS. *Basic Classification*

Appendix C provides a listing of airport identification three-letter codes.

PROFILE OF GA AIRPORTS IN "BASIC" AIRPORT CLASSIFICATION

Basic airports support general aviation activities such as emergency service, charter or critical passenger service, cargo operations, flight training, and personal flying. These airports typically accommodate mostly single-engine propeller aircraft. They may be located in, and provide service to, remote areas of the United States with limited or no surface transportation options, and therefore may be critical to the transportation of goods required for local day-to-day life.

New England's Basic airports, although largely unused by business aviation users, play an important role in supporting access and the quality of life in northern New England's rural communities. Basic airports enable the delivery of critical safety and emergency services to the region's remote populations. These airports often support life flights to transport critically ill or injured persons to hospital and trauma centers not easily reached by surface modes. The Basic airports also fulfill safety needs by supporting aerial firefighting services, search and rescue missions and environmental patrols.

LOCATIONS WITHIN NEW ENGLAND

There are eight Basic airports located in northern New England. Seven of the eight are in Maine and one is in New Hampshire. Like their counterparts across the U.S., New England's Basic airports serve small remote communities by providing access to critical safety and emergency services. Some of the region's Basic airports, such as Bethel Regional and Sugarloaf Regional, are located in ski-resort areas and also help to support regional tourism.

BASIC AIRPORTS PROFILE

Total Number Of Airports: 8

LONGEST RUNWAY LENGTH
4,600 feet - 5 are greater than 3,200 feet

BASED AIRCRAFT (2012)
63 Avg. All: 8 Avg. Jets: 0

RUNWAY AIRPORT REFERENCE CODE (ARC)
A (4); B (4)

RUNWAY RECONSTRUCTION COST RANGE
Number of Airports: 8
Partial Depth: $20,230,000
Full Depth: $24,960,000

IFR DEPARTURE RANGE (2011)
5 to 110 Average: 41

WHERE RNAV/GPS IS BEST APPROACH AVAILABLE
Number of Airports: 40 (50%)

WHERE NDB IS BEST APPROACH AVAILABLE
Number of Airports: 1 (12%)

NO APPROACHES AVAILABLE
Number of Airports: 3 (38%)

APPROACH MINIMUM RANGE
300-1 to 1,200 - 1 ¼

ON AIRPORT WEATHER REPORTING
Number of Airports: 6 (75%)

AIR TRAFFIC CONTROL TOWER
Number of Airports: 0 (0%)

ON-SITE AIRCRAFT RESCUE AND FIRE FIGHTING
Number of Airports: 0 (0%)

FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 7 (88%)

JET FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 3 (38%)

IFR FLIGHT ACTIVITY – BASIC AIRPORTS

IFR flight activity at the Basic airports is limited. In 2011, there were 325 IFR flights for the combined eight Basic airports. Though the level of IFR flights is minimal, each of the Basic airports handled IFR flights. The most active Basic airport for IFR activity is Greenville Municipal, which accommodated 110 IFR departures, approximately one-third of total IFR departures at the Basic airports.

In terms of total aircraft activity, including VFR flights and arrivals as well as departures, the Basic airports handle approximately 3,700 aircraft operations, on average. The most active Basic airports are Sugarloaf Regional and Greenville Municipal, with reported activity of 6,000 ad 5,800 annual operations, respectively.

TABLE 6 / IFR ACTIVITY. *New England's Basic GA Airports*

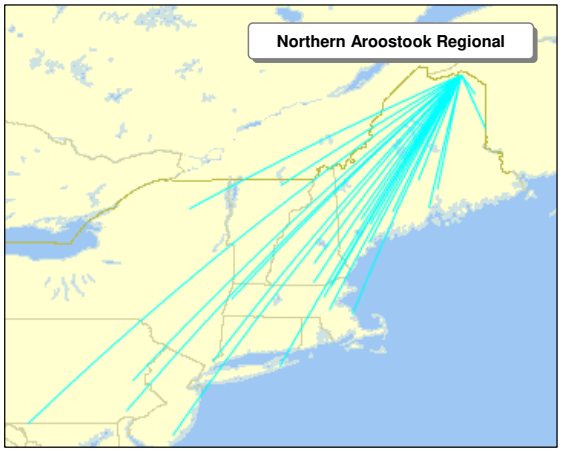
BASIC AIRPORTS	CODE	STATE	2011 IFR DEPARTURES	TOTAL OPERATIONS [1]
Sugarloaf Regional	B21	ME	5	6,000
Greenville Municipal	3B1	ME	110	5,800
Dean Memorial	5B9	NH	5	4,750
Bethel Regional	0B1	ME	56	4,500
Newton Field	59B	ME	8	3,500
Princeton Municipal	PNN	ME	23	2,252
Northern Aroostook Regional	FVE	ME	63	1,400
Eastport Municipal	EPM	ME	55	1,200
Total Basic Airports			**325**	**29,402**

[1] Total airport operations are based on estimates from the FAA Terminal Area Forecasts and information reported on Airport Master Records (FAA Form 5010).

Source: FAA TFMSC Data, Terminal Area Forecast and Form 5010s, and ICF SH&E Analysis.

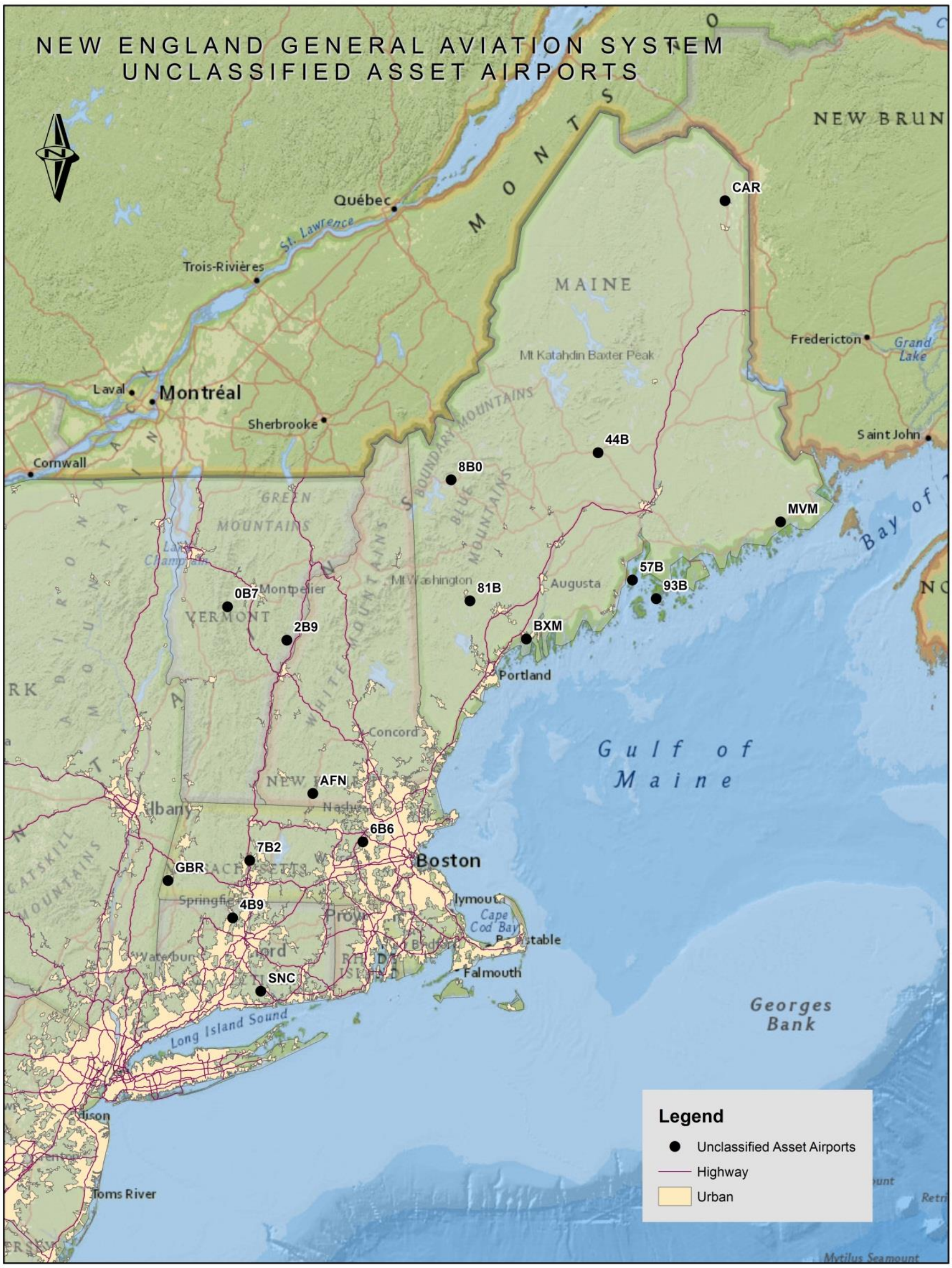
Most of the activity that occurs at Basic airports consists of flights with piston aircraft and without an IFR flight plan. However, IFR flights from Northern Aroostook Regional gives an indication of the types of destinations covered by flying from a Basic airport. General aviation IFR flights from the airport are mostly bound for destinations in Maine or in nearby states with some flights reaching Pennsylvania.

FIGURE 15 / IFR FLIGHT SEGMENTS FLOWN. *Belfast Municipal Airport*



Source: FAA TFMSC Data and ICF SH&E Analysis.

FIGURE 16 / "UNCLASSIFIED" ASSET Airports. *Unclassified Classification*



Appendix C provides a listing of airport identification three-letter codes.

NEW ENGLAND GA AIRPORTS IN "UNCLASSIFIED" AIRPORT CLASSIFICATION

In the ASSET study, the FAA was unable to classify 497 of the nation's general aviation airports because they accommodate different types of activity and have characteristics that are difficult to describe. The FAA is currently conducting a follow up study specifically addressing the unclassified airports.

Sixteen of New England's 92 (or 17% of the national total) general aviation airports in the NPIAS are currently unclassified. The unclassified airports are spread across the region in all states except Rhode Island. Half of the unclassified airports are located in Maine.

LOCATIONS WITHIN NEW ENGLAND

The unclassified airports are a diverse set of general aviation facilities. While the unclassified airports span the region, some are located in metropolitan areas with multiple GA airports and others are in remote areas. For example, Minuteman Airfield in Stow, MA is 15 miles from Hanscom Field and part of the Boston MSA and Caribou Municipal is located in Northern Maine's Aroostook County.

IFR FLIGHT ACTIVITY – UNCLASSIFIED AIRPORTS

Collectively, the Unclassified airports have more IFR flight activity than the Basic airports. In 2011, the sixteen Unclassified airports in New England accommodated more than 1,500 IFR departures. IFR flight activity varies widely across the Unclassified airports from none at Post Mills (VT) to 312 at Northampton (MA). This indicates that some of these unclassified airports likely belong in some of the other classifications. The results of FAA's additional study should help to clarify this point.

In terms of total aircraft activity, including VFR operations and arriving and departing flights, several of the Unclassified airports are very active. The busiest of the Unclassified airports, based on available information, is Minute Man Air Field (MA) with more than 48,000 total operations (245 IFR departures). Other yet to be classified airports with significant levels of aircraft activity includes Walter J. Koladza/Great Barringotn (MA) with 41,500 operations (211 IFR departures), Oxford County Regional (ME) with 34,000 operations (71 IFR departures), and Northampton (MA) with 30,156 operations (312 IFR departures). Some of the Unclassified airports show minimal activity. At least one airport, Brunswick

UNCLASSFIED AIRPORTS PROFILE

Total Number Of Airports: 16

LONGEST RUNWAY LENGTH
4,010 feet - 11 are greater than 2,400 feet

RUNWAY AIRPORT REFERENCE CODE (ARC)
A (8); B (4)

RUNWAY RECONSTRUCTION COST RANGE
Number of Airports: 16
Partial Depth: $51,010,000
Full Depth: $63,580,000

AVERAGE IFR DEPARTURE RANGES (2011)
0 to 312

AVERAGE IFR DEPARTURES (2011)
96

WHERE RNAV/GPS IS BEST APPROACH AVAILABLE
Number of Airports: 9 (56%)

NO APPROACHES AVAILABLE
Number of Airports: 7 (44%)

APPROACH MINIMUM RANGE
500-1 to 900-1

ON AIRPORT WEATHER REPORTING
Number of Airports: 5 (31%)

AIR TRAFFIC CONTROL TOWER
Number of Airports: 0 (0%)

ON-SITE AIRCRAFT RESCUE AND FIRE FIGHTING
Number of Airports: 0 (0%)

FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 10 (63%)

JET FUEL AVAILABILITY AT AIRPORTS
Number of Airports: 4 (25%)

Executive (ME), which transitioned from a military airfield to a civilian air field in April 2011, had no available record of operations in 2011.

TABLE 7 / UNCLASSIFIED AIRPORTS. *By State.*

UNCLASSIFIED AIRPORTS	CODE	STATE	2011 IFR DEPARTURES	TOTAL OPERATIONS \1
Northampton	7B2	MA	312	30,156
Minute Man Air Field	6B6	MA	245	48,085
Chester	SNC	CT	241	15,827
Walter J. Koladza	GBR	MA	211	41,500 \2
Caribou Municipal	CAR	ME	124	4,101
Islesboro	57B	ME	75	1,144
Oxford County Regional	81B	ME	71	34,070
Simsbury	4B9	CT	64	12,775
Jaffrey-Silver Range	AFN	NH	63	7,200
Steven A. Bean Municipal	8B0	ME	55	12,050
Machias Valley	MVM	ME	50	1,666
Stonington Municipal	93B	ME	10	850
Warren-Sugarbush	0B7	VT	8	16,000
Brunswick Executive	BXM	ME	5	n/a
Charles Chase Memorial Field	44B	ME	2	700
Post Mills	2B9	VT	0	4,330
Total Unclassified Airports			**1,536**	**230,454**

\1 Total airport operations are based on estimates from the FAA Terminal Area Forecasts and information reported on Airport Master Records (FAA Form 5010). \2 Conflicting data was found for GBR with one source reporting 128,500 annual operations. Source: FAA TFMSC Data and ICF SH&E Analysis.

PHASE I REGIONAL OBSERVATIONS

The following are regional observations as result of the profiling and common characteristics of the New England GA system under the FAA ASSET Classifications. These findings were based on numerous discussions with the Project Management Team along the course of the Phase I effort.

- **Airport Classification Characteristics**
  - During the course of this study, the FAA released the ASSET Study with new classifications for GA airports. These new classifications were utilized to create a "New England Profile" corresponding to the new ASSET classifications.
  - With the baseline data developed for the profiles it is possible to develop parameters and performance measures that were an objective of the NERASP-GA study.
  - The guidance will assist officials to make effective decisions on the use of the annual federal and state airport funding.
  - The FAA ASSET classifications system identified 497 airports nationally that were "Unclassified". Sixteen (16) of these were New England airports. The FAA is conducting more work to appropriately classify these airports.

- The NERASP-GA analysis identified another issue; airports in the New England system that were potentially "misclassified" airports. Not an inclusive list, but the following airports are the ones discussed or brought up during the course of this Phase I effort include:

  - Hartford-Brainard Airport (HFD) in Connecticut, classified as a Regional but serves the system more like a National. HFD would rank third (3rd) in IFR departures under the list of National airports;

  - Quonset State Airport (OQU) in Rhode Island, classified as a Local, but serves the system more like a Regional. OQU would rank ninth (9th) in IFR departures under the list of Regional airports, and has facilities to accommodate some flights to western Europe and the Caribbean; and

  - Block Island State Airport (BID) in Rhode Island, classified as a regional, but serves the system more like a non-hub primary similar to Westerly State Airport (WST), Martha's Vineyard Airport (MVY), and Nantucket Memorial Airport (ACK).

  Currently, the FAA does not have an official policy to appeal the classification of an airport.

- **Diversity of General Aviation in New England**

  - The Phase I effort proved that GA touches all aspects of airports; from the types of airports to the services provided by aviation. The Phase I effort identified GA airports as the core of the study, but it was clear that many aspects of GA activity crossed over to commercial service airports.

  - The inaccuracies of visual flight rule (VFR) aircraft activity data at non-towered GA airports continues to plague efforts to analyze data. Basically the reliability in conducting analysis is limited and therefore, this study primarily focused on IFR activity and the business/corporate users.

  - Potential methodologies to extrapolate GA aircraft operation counts from airports with control towers were considered. It was determined they still would not provide an accurate estimate given the unique characteristics of GA airports.

  - GA activity like flight training and maintenance, as well as fully understanding the importance of the remote GA airports in New England was limited in Phase I. Phase II should further explore these activities and it should obtain GA activity levels at all New England NPIAS airports, not just GA airports.

  - The New England states should share in the development of an aircraft operational counting program that would yield more accurate estimates of aircraft operation counts.

- **Impact of Potential Air Traffic Control Tower (ATCT) Closures**

  - The issue of ATCT closures is a moving target that could significantly impact GA activity at both commercial service and GA airports alike. Figure 17 identifies the locations of airports with control towers in New England.

  - The sequestration issue pushed FAA to identify ATCT's that would potentially close. In New England there are 27 ATCT's and 12 were proposed for closure under a proposal.

  - The impact from GA users that require air traffic control tower services will actually push some level of GA activity to the airports that retained their ATCT. These are likely the busier GA and commercial service airports in New England. This push will significantly impact the capacity of these airports.

  - While the FAA proposals to close control towers were never implemented, understanding scenarios of control tower closures in New England will play an important role in making informed decisions for the state aviation directors. Those identified in the course of project dialogue include relocation of based aircraft; transfer of itinerant aircraft operations; environmental and airspace factors; aircraft parking and storage capacities; change an airports design aircraft and airport reference code; among others. Phase II should consider a more detailed review of these potential impacts.

- **The Importance of General Aviation in New England**

  - The level of GA activity from based aircraft and operations varies by State and often varies within a State itself. Phase I efforts have resulted in identifying some GA airports in New England to be international gateways, while others provide remote emergency access.

  - The distribution of airports based on the application of the ASSET classifications makes sense from a geographical standpoint. It is within each of these classifications where more analysis will yield specific benefits to each classification:

    - The National Airports are generally focused around New England's metropolitan areas of Boston and southwestern Connecticut. These airports play a critical role in the operational capacity of those areas, but some have constraints (infrastructure, environmental, etc.) that impact their ability to fully meet their role. These airports base the largest average amount of jet aircraft.

    - The Regional Airports have a larger geographical distribution in New England, some still within the metropolitan areas, and others still within close proximity to the Interstate highway system. Regional airports have a broad mix of users and based aircraft.

    - The Local Airports have the widest geographical distribution in New England with most being located off of the Interstate highway system on the state and local

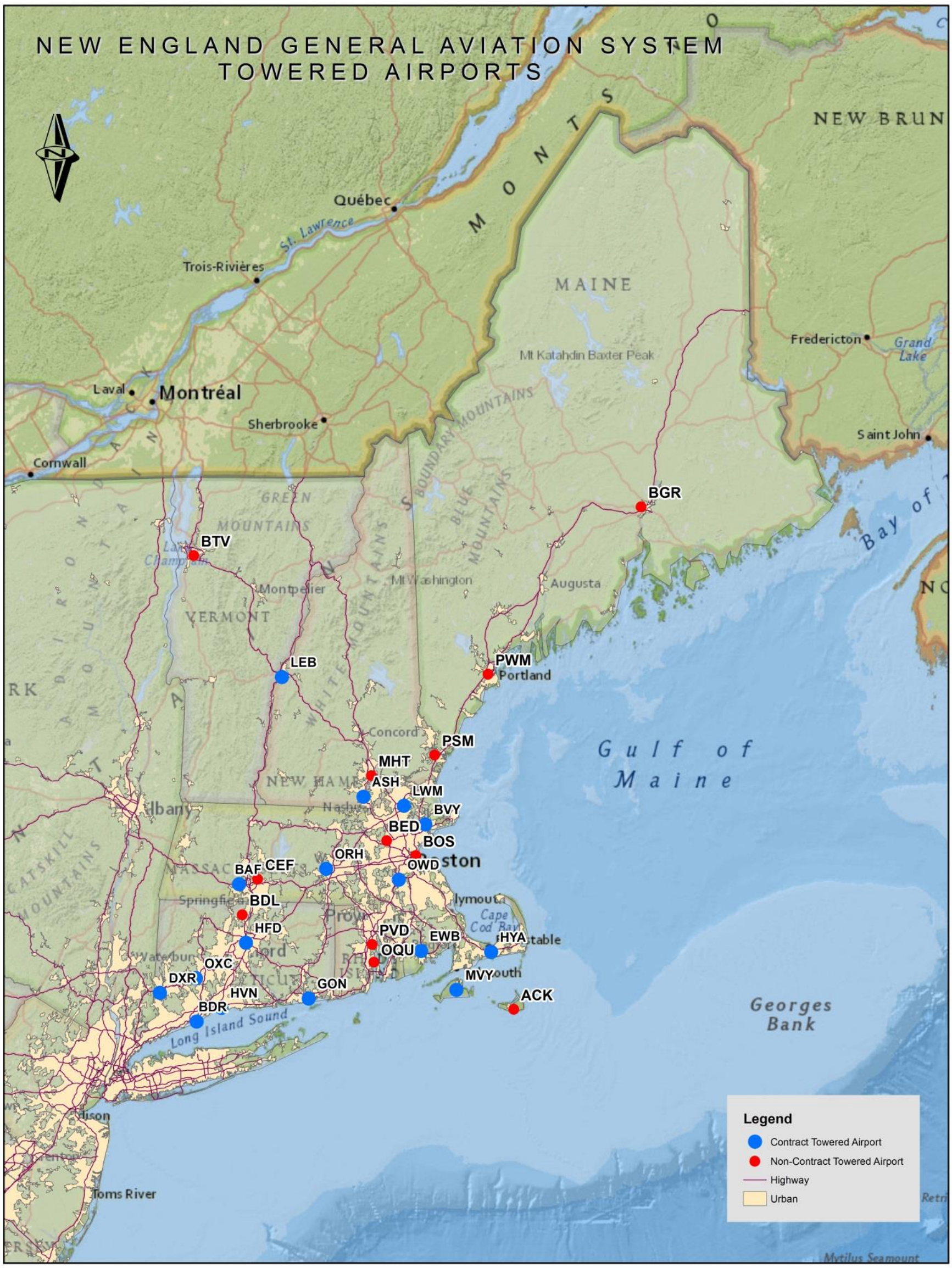
roads and some getting into the more rural areas of New England. Local airports have a broad mix of users and Based aircraft.

- The Basic Airports are all located in northern New England with all but one in Maine. From a geographical standpoint, these airports provide access to remote areas.

Each airport in each classification provides a role for New England from a geographical standpoint. Further understanding how each airport in each classification can maximize that role should be further explored.

- As a result, these geographical differences make the importance of GA unique in New England. There is reason to believe that the observations of the Phase I effort are only the surface of truly identifying a unique and complex system of airports that provide a significant benefit to New Englanders and their economy. The User and Economic perspectives offered within the body of this report are testament to their benefits to the Region, states and local economies.

FIGURE 17 / TOWERED AIRPORTS. *New England*



Appendix C provides a listing of airport identification three-letter codes.

| NEW ENGLAND BUSINESS GA ACTIVITY: ANALYSIS OF FLIGHT PLAN DATA

INTRODUCTION

A primary objective of this task was to develop an in-depth understanding of the nature and characteristics of business general aviation (GA) flying in New England by analyzing available GA activity data and conducting structured surveys and interviews of business GA users and service providers.

GA operations data was collected from the FAA's Traffic Flow Management System Counts (TFMSC, formerly ETMSC) and analyzed to document the:

- Level of business GA activity in the region and at individual airports;
- Types of aircraft used to conduct business GA operations in the region;
- Major origin and destination points; and
- Level of intra-regional activity as well as activity to other domestic markets and international destinations.

It is important to note that the majority of general aviation flights in New England, as well as nationally, are performed under visual flight rules (VFR) without filing a flight plan and are not captured in the TFMSC data. Therefore, the findings presented in this section are limited to IFR flights only. However, these IFR flights account for a high proportion of business GA and are likely to have the greatest impact on local and regional economic development.

Available data from the Federal Aviation Administration's (FAA) annual General Aviation and Air Taxi Activity (GAATA) Survey New England were also analyzed to further assess regional trends in aircraft use patterns. Trends in active aircraft and hours flown were analyzed for the period 2000 to 2010 and compared to national trends.

Structured surveys and follow-up interviews of business GA users and service providers in New England were also conducted to assess the:

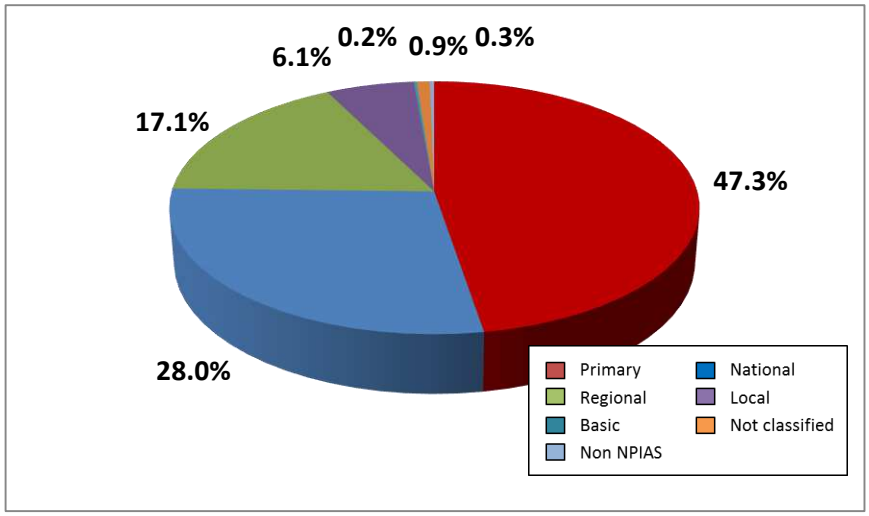
- Economic importance of business GA in New England;
- Airport facilities and services required to support current and future business GA; and
- Perceived strengths, weaknesses, and priorities for improvement across New England's system of GA airports.

PROFILE OF NEW ENGLAND BUSINESS GA ACTIVITY

LEVEL OF NEW ENGLAND BUSINESS GA ACTIVITY

In 2011, there were 168,000 GA IFR departures from New England airports, including Primary airports and non-NPIAS airports. Three-quarters of the region's GA IFR departures occurred at the Primary and National airports (Figure 18), which account for only 16% of the airports in the New England airport system. Regional airports, which represent 10% of system airports, accounted for 17% of the GA IFR departures.

FIGURE 18 / NEW ENGLAND GA IFR DEPARTURES BY AIRPORT CLASSIFICATION



Source: FAA Asset Study May 2012, FAA TFMSC Data and ICF SH&E Analysis

Hanscom Field, located off Route128/I-95 in Bedford, MA, is by far the region's busiest airport for business aviation (Table 8). There were more than 22,000 GA IFR departures recorded at Hanscom Field in 2011. Given Hanscom's convenient location to the Region's high technology firms and the City of Boston, the Airport serves as a corporate aviation Reliever to Boston Logan Airport. In 2011, Hanscom accommodated almost twice as many GA IFR departures as Boston Logan, the Region's next busiest airport for GA IFR departures.

The Region's primary airports, which also accommodate scheduled commercial airline services, account for almost half (47%) of the GA IFR departures in the New England airport system. The top Primary airports in terms of business GA flying, handled between 5,000 and 13,000 annual GA IFR departures in 2011. Although activity is concentrated at Primary, National and Regional airports, all classes of airports in New England handled GA IFR departures.

TABLE 8 / BUSIEST NEW ENGLAND AIRPORTS BASED ON GA IFR DEPARTURES

Rank	Airport	State	FAA Category	GA IFR Departures	Percent of Total NE	Cumm. % of Total
1	Bedford/Hanscom	MA	National	22,025	13.1%	13.1%
2	Boston Logan	MA	Primary	12,735	7.5%	20.6%
3	Nantucket Memorial	MA	Primary	9,657	5.7%	26.3%
4	Hartford Bradley	CT	Primary	8,800	5.2%	31.5%
5	Manchester	NH	Primary	6,504	3.9%	35.4%
6	Burlington	VT	Primary	6,194	3.7%	39.1%
7	Portland Intl Jetport	ME	Primary	5,691	3.4%	42.4%
8	Martha's Vineyard	MA	Primary	5,196	3.1%	45.5%
9	Providence TF Green	RI	Primary	5,141	3.0%	48.6%
10	Bangor	ME	Primary	5,077	3.0%	51.6%
	All Other			81,702	48.4%	
	Total			168,722	100.0%	

Source: FAA Asset Study May 2012, FAA TFMSC Data and ICF SH&E Analysis

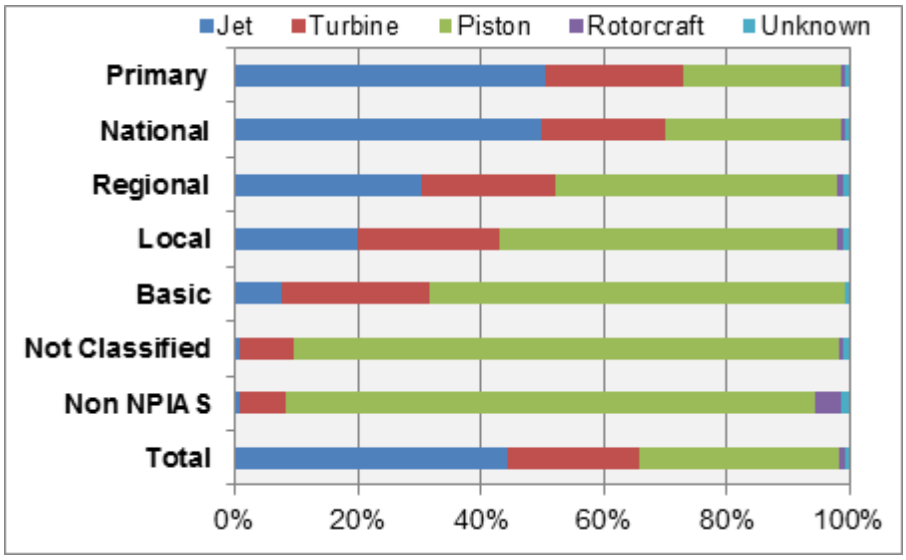
NEW ENGLAND BUSINESS GA ACTIVITY BY AIRCRAFT TYPE

Less than half (44%) of the Region's GA IFR departures were operated with business jet aircraft (Figure 19). The jet share is slightly higher for the Primary and National airports, where half of the GA IFR departures were operated with jet powered aircraft. The jet share is somewhat lower for Regional airports and Local airports, at 30% and 20% respectively.

At airports other than the Primary and National airports, piston-powered aircraft accounted for the majority of GA IFR departures: 46% at the Regional airports; 55% at Local airports; 67% at Basic airports; and almost 90% at all other airports. However, business jet aircraft utilize all categories of airports in New England.

The top three types of business jets operating at New England airports are long-range, mid-size jets capable of reaching transatlantic (Cessna XLS and Gulfstream IV) and transcontinental (Hawker 800) destinations. Overall, the most prevalent aircraft for GA IFR departures in New England is the Pilatus PC-12 turboprop. In addition to the Pilatus PC-12's popularity as a business aircraft, PlaneSense, based in Portsmouth, NH, is a fractional aircraft operator with an exclusive fleet of more than 30 Pilatus PC-12s. Atlas Aircraft Center, also based at Pease International Tradeport, is an authorized Pilatus service and support center. The top types of piston aircraft operating IFR flights in New England include the twin-engine Beechcraft Baron 58, the Cessna Skyhawk 172, and the Cirrus R22.

FIGURE 19 / NEW ENGLAND GA IFR DEPARTURES BY AIRCRAFT CLASS



Source: FAA Asset Study May 2012, FAA TFMSC Data and ICF SH&E Analysis

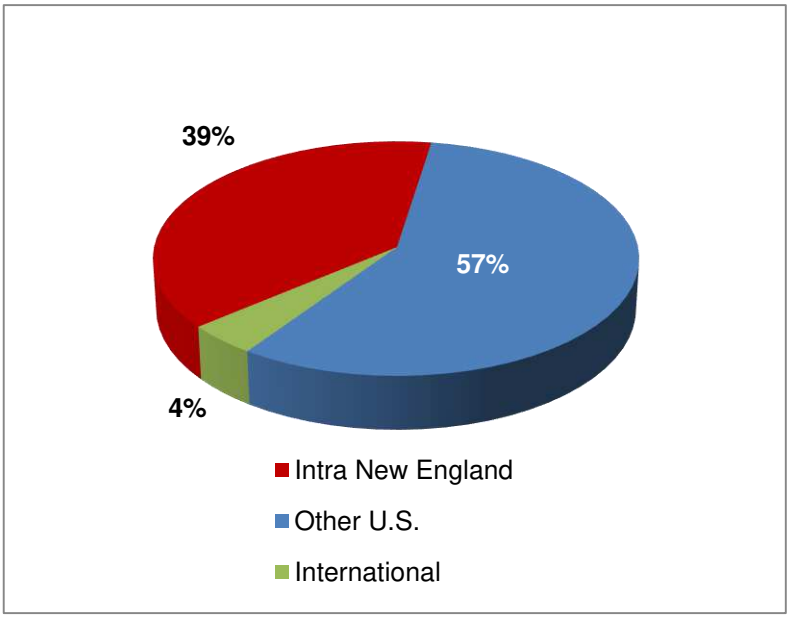
NEW ENGLAND BUSINESS GA DESTINATIONS

More than half of New England's GA IFR departures (57.1%) were destined to other U.S. airports outside New England (Figure 20). The majority of these flights (70.6%) are to airports in the FAA Eastern Region, which broadly includes Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia, West Virginia and Washington, DC. However, the top domestic airport destinations outside of New England were heavily concentrated in the New York metropolitan area reflecting the strong commercial linkages between the regions. Teterboro, one of the busiest general aviation airports in the country, and

Westchester County airports were the most frequented destinations for New England business GA flights, each with more than 10,000 annual departures in 2011. The other top domestic destinations outside New England include: Farmingdale Republic (NY), Washington Dulles (VA), Morristown (NJ), Islip (NY), Philadelphia International (PA), Albany (NY), East Hampton (NY) and Trenton Mercer (NJ). There were 1,200 to 2,800 annual departures from the New England airports to these destinations in 2011. The top domestic destinations are similar across the New England airport system regardless of airport ASSET class.

Intra-New England activity accounted for nearly 39% of the Region's GA IFR departures. GA provides vital intra-regional transportation services for travel to and from New England's commercial centers and areas that are not accessible by surface modes. Overall, Hanscom Field, a National airport that serves as a Reliever to Logan Airport and offers convenient access to the region's largest city and commercial center, was the top destination for intra-New England flights, with over 5,500 arrivals from other New England airports in 2011 (Table 9). Other top intra-regional destinations include the Region's Primary airports serving New England's business centers and Cape and Island markets.

FIGURE 20 / IFR GA DEPARTURES BY DESTINATION REGION



Source: FAA TFMSC Data and ICF SH&E Analysis

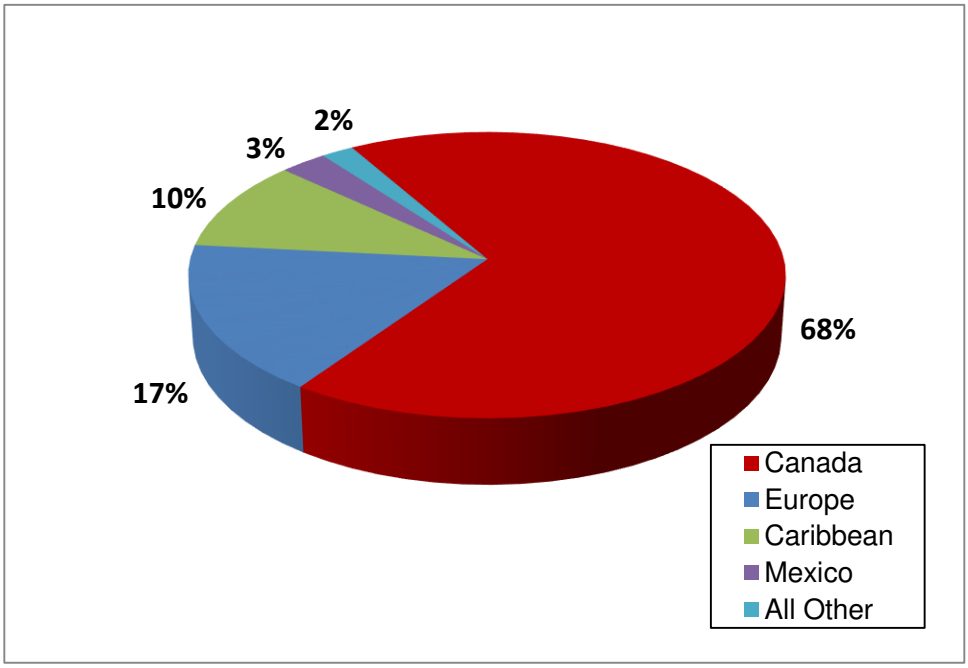
TABLE 9 / TOP INTRA-NEW ENGLAND DESTINATIONS FOR GA IFR FLIGHTS

Rank	Airport	State	GA IFR Arrivals	% of Total
1	Bedford/Hanscom	MA	5,541	8.5%
2	Nantucket Memorial	MA	4,650	7.1%
3	Manchester	NH	4,358	6.7%
4	Boston Logan	MA	2,866	4.4%
5	Martha's Vineyard	MA	2,834	4.4%
6	Portsmouth Intl at Pease	NH	2,386	3.7%
7	Burlington	VT	2,346	3.6%
8	Portland Intl Jetport	ME	2,215	3.4%
9	Hartford Bradley	CT	1,989	3.1%
10	Hyannis Barnstable Municipal	MA	1,837	2.8%
	All Other		34,099	52.4%
	Total		65,121	100.0%

Source: FAA TFMSC Data and ICF SH&E Analysis

Nearly 7,300 GA IFR flights from New England airports (4% of the total) were bound for international destinations in 2011. Of these, slightly more than two-thirds (68%) were destined to Canadian airports. European destinations accounted for 17%, the Caribbean 10% and Mexico approximately 3% (Figure 21).

FIGURE 21 / TOP INTERNATIONAL DESTINATION REGIONS FOR GA IFR DEPARTURES



Source: FAA TFMSC Data and ICF SH&E Analysis

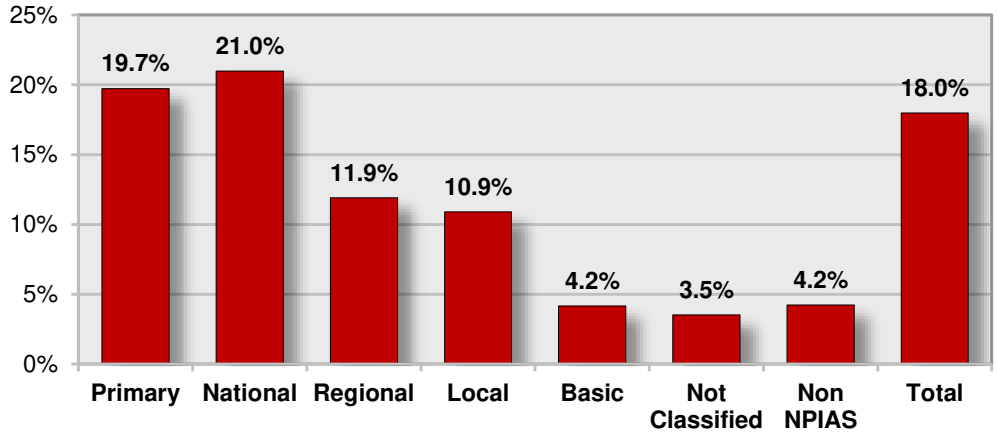
The international destinations flown to most frequently are in the Eastern Canadian provinces, another region with strong business and cultural ties to New England. There were approximately 5,000 GA IFR

departures from New England airports to airports in Canada spread over nearly 900 unique flight O&D segments. The top Canadian flight O&Ds were Portland-Yarmouth (188 departures), Hartford Bradley-Montreal Saint Hubert (177 departures) and Boston Logan –Toronto Pearson (171 departures).

General aviation services are also used to access destinations as far away as Europe. There were approximately 1,200 GA IFR departures from New England airports to airports throughout Europe spread over 470 unique O&D flight segments. Many of the top European flights departed from Bangor International Airport. These flights may originate in other parts of the country and rely on Bangor as a technical stop for re-fueling purposes.

The FAA ASSET study used the number of flights over 500 nm as a useful measure for gauging the geographical area served by an airport. In New England, 18% of the GA IFR departures involved stage lengths over 500 nm. Primary and National airports had the highest share of flights over 500 nm at approximately 20% (Figure 22). At Regional/Local airports, approximately 12% of flights were to destinations over 500 nm and at the smallest airports, the share was less than 5%.

FIGURE 22 / PERCENT OF NE IFR GA DEPARTURES GREATER THAN 500 NAUTICAL MILES



Note: Does not include departures where the destination was not provided in the flight plan.
Source: FAA ASSET Study May 2012, FAA TFMSC Data and ICF SH&E Analysis

There were more than 26,000 GA IFR departures to long range destinations (over 500 nm). These flights involved more than 7,000 unique flight O&D segments and highlight the types of destinations outside the Northeast region that are accessed with general aviation flights from New England airports. Top long haul flight segments included: Hanscom-West Palm Beach (321 departures); Portland-Chattanooga (234 departures); Hanscom-Chicago Midway (188 departures); Portland-Rowan County, North Carolina (175 departures); and Hanscom-Charlotte and Hanscom-Raleigh/Durham (each with 145 departures).

TREND IN NEW ENGLAND BUSINESS GA ACTIVITY LEVELS 2006 TO 2011

Business aviation activity in New England, as measured by GA IFR departures, has declined by approximately 15% from 2006 to 2011. This trend is consistent with an overall declining trend in itinerant GA operations (including those flown VFR and IFR) at New England airports with FAA Air Traffic Control Towers. Over the same period, itinerant GA operations at the towered airports fell by 18%.
This short-term declining trend in business GA in New England mirrors a similar trend in the broader U.S. GA market. Nationally, general aviation activity declined sharply during the 2007-2009 economic recession and financial crisis. The sluggish pace of post-recession economic growth has also affected the

recovery in general aviation activity, which has not yet rebounded to pre-recession activity levels. From 2006 to 2011, general aviation and air taxi hours flown have declined by 11.9%.[8]

Despite the declines in regional flight activity, several New England airports experienced an increase in flights between 2006 and 2011. The airports that posted the largest net increases in GA IFR flights include: Portsmouth International Airport at Pease (+1,294); Westfield Barnes Municipal (+913); Block Island State (+638); Hartford-Brainard (+304); Newport State (+239) and Belfast Municipal (+213).

Many airports experienced double-digit percentage declines in GA IFR flights from 2006 to 2011. The airports that showed the largest net declines in activity include: Boston Logan (-3,857); Hartford Bradley (-3,585); Hanscom Field (-3,547); Nashua Boire Field (-2,157); and Bangor (-1,623).

EVOLUTION OF GENERAL AVIATION IN NEW ENGLAND 2000 TO 2010

The Federal Aviation Administration (FAA) undertakes an annual survey of general aviation and air taxi aircraft owners to collect information on the use and utilization of those aircraft, including the primary use of the aircraft and the total hours flown by actual use. The results of the General Aviation and Part 135 Activity Survey, also referred to by the FAA as the General Aviation and Air Taxi Activity (GAATA) Survey, are available on the FAA website. These results are generally presented at the national level, although a limited amount of data on the total number of registered aircraft (termed the population), the number of active aircraft, and the total hours flown by those aircraft is shown at the state and regional levels. The available data for New England was analyzed to further assess regional trends in aircraft use patterns. The most recent survey for which results are available covered aircraft activity in calendar year 2010.

ACTIVE AIRCRAFT

The changes in the number of active aircraft by New England state over the 11-year period from 2000 to 2010 are shown in Figure 22. For New England as a whole the total number of active aircraft appears to have varied cyclically from year to year, with a peak in 2004 and troughs in 2002 and 2006. There appears to have been a significant decline in the Region's active aircraft since 2007. Whether this is just another cyclical trough due to the recent economic recession or the start of a longer-term trend will not become clear until more recent data becomes available. This cyclical pattern appears to vary by state, with Connecticut, Maine and New Hampshire showing the greatest declines in 2002, and Maine showing the greatest decline in 2006.

[8] FAA, Aerospace Forecast FY 2012-FY 2032 – Table 29.

FIGURE 22 / ACTIVE AIRCRAFT IN NEW ENGLAND BY STATE

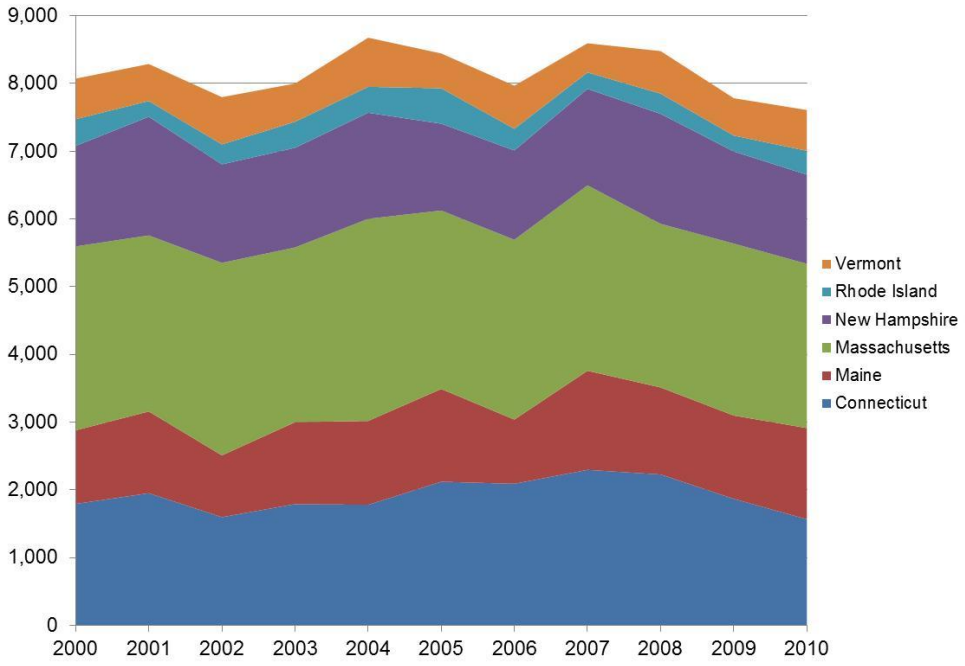
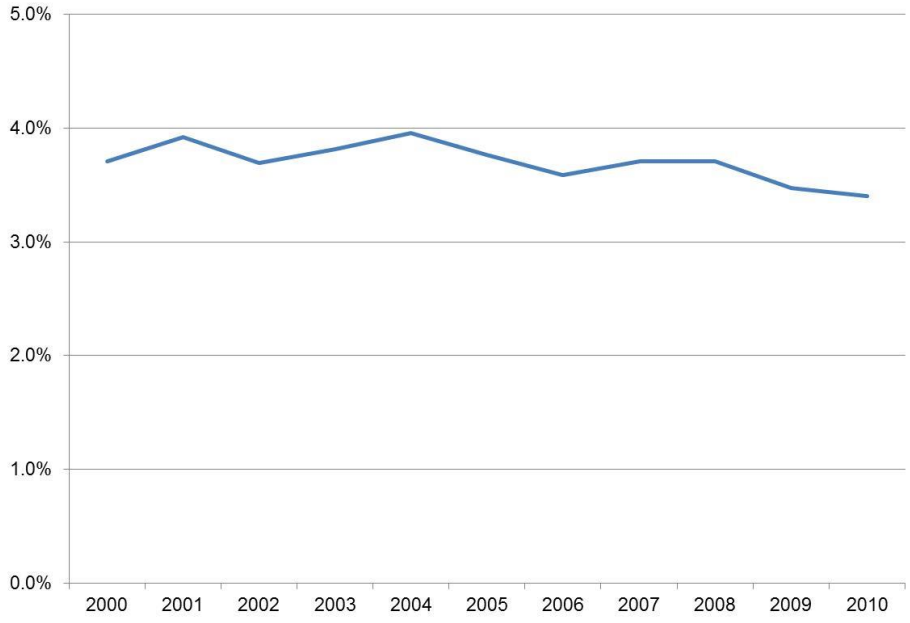


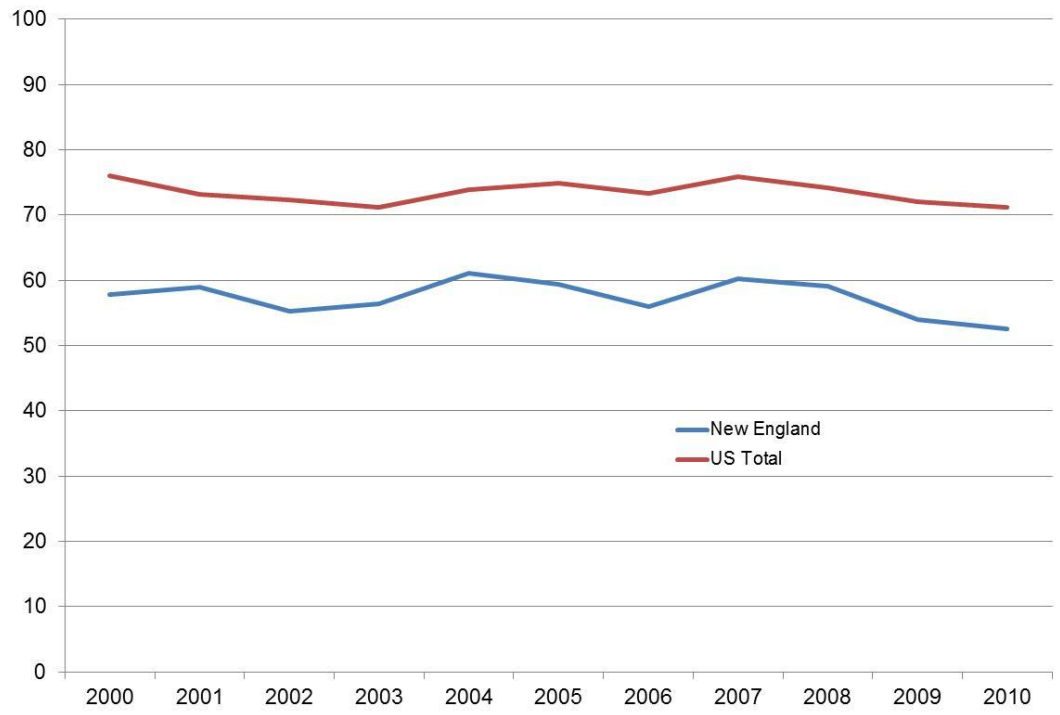
Figure 23 shows the total number of active aircraft in New England as a percentage of the total active aircraft in the U.S. This comparison suggests that the declines in the number of active aircraft in New England in 2002 and 2006 partly reflected declines at the national level, but were more pronounced. The data also indicate that there is a slow long-term decline in the New England share of the total U.S. GA and air taxi fleet.

FIGURE 23 / NEW ENGLAND ACTIVE AIRCRAFT AS A PERCENT OF THE U.S. TOTAL



In order to control for differences in population, Figure 24 shows the number of active aircraft per 100,000 people for the U.S. and the New England region. Figure 24 shows that the New England Region in total has a significantly lower ratio of active aircraft to population than the U.S., and this does not appear to have changed much from 2000 to 2008. However, from 2008 to 2010 the ratio declined more steeply for New England than for the U.S. in total. Figure 24 also suggests that from 2000 to 2007 the ratio of active aircraft to population was fairly stable, with some fluctuation from year to year, particularly the decline in the two years following the 2001 recession and during the steady increase in fuel prices from 2004 to 2006.

FIGURE 24/ ACTIVE AIRCRAFT PER 100,000 POPULATION FOR NEW ENGLAND AND THE U.S.

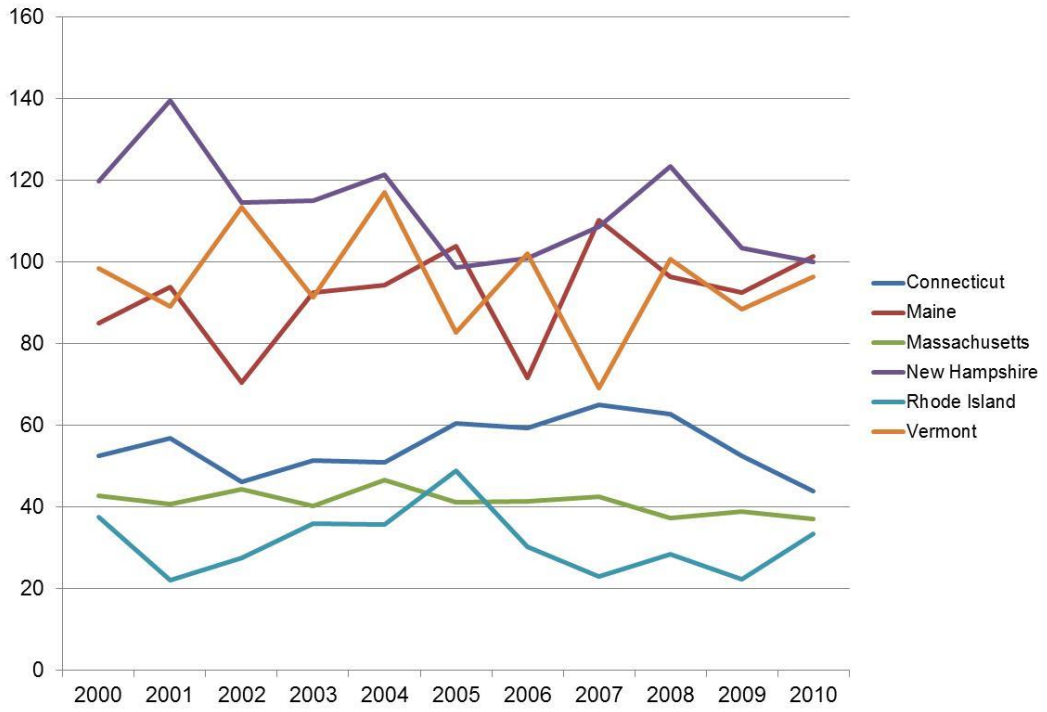


However, by 2007 the growing economy and a temporary decline in oil prices appears to have resulted in a recovery in the growth of the ratio of active aircraft to population. For the U.S., the ratio of active aircraft to population increased to a level similar to that in 2000. The ratio for New England increased in 2007 to a little short of the previous peak in 2004. The combination of the dramatic increase in oil prices in the summer of 2008 and the great recession that began at the end of 2007 and lasted until mid-2009 resulted in a fairly steady decline in the ratio of active aircraft to population for both the U.S. and New England to levels in 2010 comparable to or below the lowest levels in the previous ten years. How long this decline will continue and how much of a recovery will have taken place when more recent data becomes available remains to be seen. Certainly fuel prices since 2010 have remained at their highest historical levels apart from the relatively short-term peak in mid-2008.

The ratio of active aircraft per 100,000 people for each New England state is shown in Figure 25. As depicted, the ratio of active aircraft per 100,000 people varies widely across the states and from year to year, with the more urbanized states, Connecticut, Massachusetts, and Rhode Island, having significantly lower numbers of active aircraft per 100,000 people than the other three states. Although New

Hampshire generally had the highest ratio of active aircraft to population of the New England states, this appears to show a declining trend over the 11-year period. Conversely, the ratio for Maine appears to show a slowly increasing trend over the period.

FIGURE 25 / ACTIVE AIRCRAFT PER 100,000 POPULATION IN NEW ENGLAND STATES

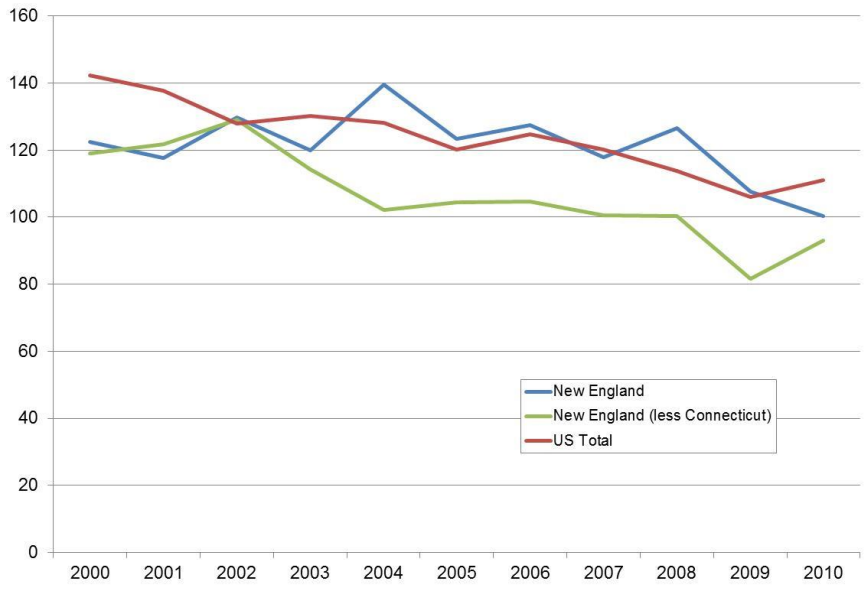


AIRCRAFT UTILIZATION

The average hours flown per year by active aircraft for the U.S. as a whole and New England overall are shown in Figure 26. Average aircraft utilization for the U.S shows a steadily declining long-term trend, with possibly a recovery starting on 2010.

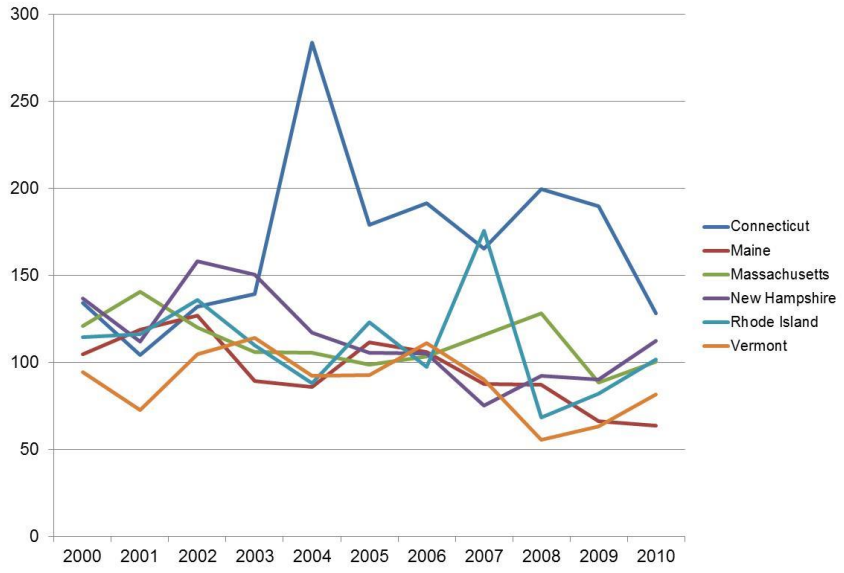
The long-term trend in average aircraft utilization for the New England region is less clear because of the effects of data anomalies and particularly high average utilization in Connecticut for a period of years (discussed below). Excluding the data for Connecticut, the combined average aircraft utilization for the other five New England states shows a declining long-term trend with values significantly below those for the U.S., with the exception of 2002.

FIGURE 26 / AVERAGE HOURS FLOWN PER YEAR BY ACTIVE AIRCRAFT IN NE AND THE U.S.



The average hours flown per year by active aircraft in each of the New England states are shown in Figure 27. Generally the levels are comparable in each of the states with the exception of Connecticut from 2004 to 2009 and Rhode Island in 2007. The values for Connecticut in 2004 and Rhode Island in 2007 appear to be data anomalies, possibly due to survey sample bias. However, the reason for the high values for Connecticut from 2005 to 2009 is less clear, since it is unlikely that the survey sampling methodology would produce similarly biased values in five successive years. Aside from the average aircraft utilization for Connecticut, the general long-term trend in average aircraft utilization appears to show a slow decline over the 11-year period in each of the other five states.

FIGURE 27 / AVERAGE HOURS FLOWN PER YEAR BY ACTIVE AIRCRAFT IN NE STATES

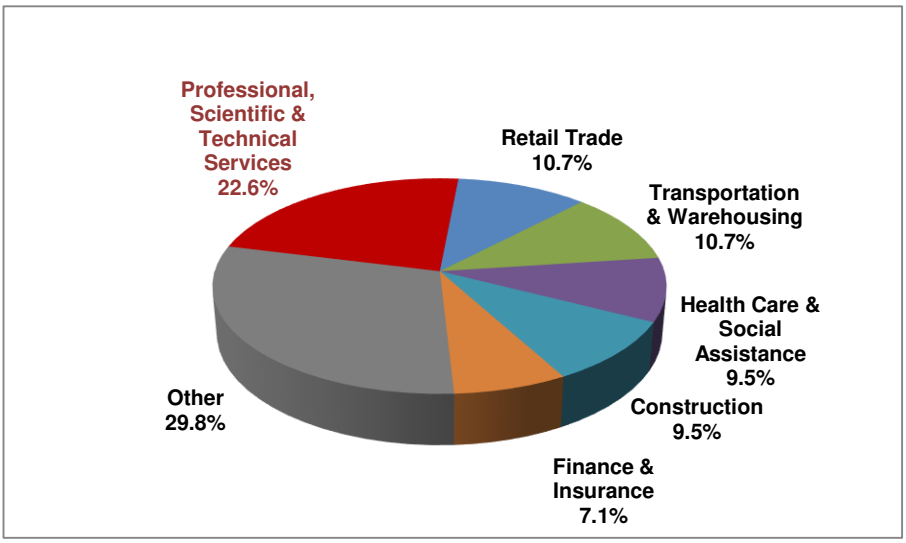


BUSINESS GA USER SURVEYS

User Surveys and follow-up interviews were conducted with business aviation users including global companies, corporate aviation departments, small business owners, and charter providers to gain an understanding of the role and function of business general aviation in New England. The National Business Aviation Association (NBAA), airport operators and FBO's assisted in publicizing the survey, which consisted of a self-administered online or paper survey that targeted business GA users and providers, such as air-taxi and fractional jet operators.

In total, 175 persons/organizations responded to the online survey and of these 137 were selected as useable surveys for the analysis. Survey respondents represent a variety of industries. Approximately 23% described their businesses as Professional, Scientific or Technical services. (Figure 28)

FIGURE 28 / SURVEY RESPONDENTS BY INDUSTRY



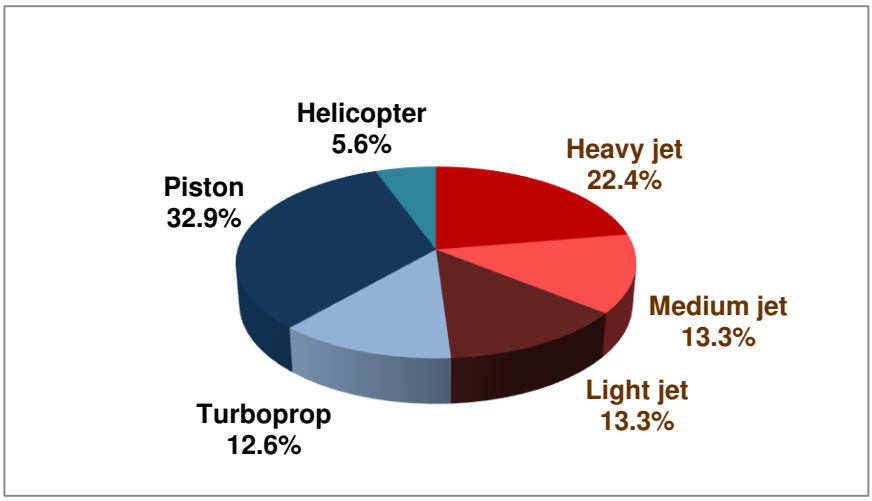
Note: Other includes Utilities, Management of Companies and Enterprises, Information, Real Estate and Rental and Leasing, Agriculture and Forestry, Administrative and Support and Waste Management, Educational Services, Health Care and Social Assistance, and Arts and Entertainment.
Source: NERASP, Business GA User Survey, 2013.

In terms of aircraft ownership, 75% of respondents indicated that they or their company owns or leases GA aircraft. Overall, 42% of the respondents affirmed that they utilize charter/air taxi or fractional aircraft services to meet their business GA travel needs.

Approximately 44% of the respondents that owned or leased aircraft indicated that they had just one aircraft in their fleets. More than one-third (35%) had three or more aircraft in their fleets. Nearly half

of the respondents that owned business GA aircraft indicated that they owned jets. Overall 22% owned heavy jets, 13% owned medium size jets and a similar number (13%) owned light jets. One-third of the overall respondents that owned aircraft indicated that they owned piston aircraft (Figure 29).

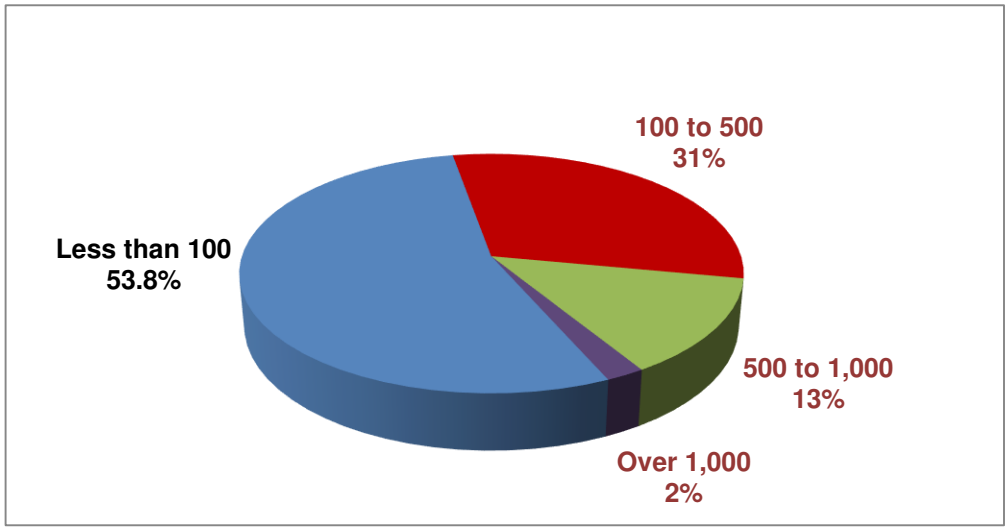
FIGURE 29 / AIRCRAFT TYPES OWNED OR LEASED BY SURVEY RESPONDENTS



Notes: MGTOW is maximum gross take-off weight. Heavy jets have a MGTOW greater than 35,000 lbs; medium jet have a MGTOW of 20,000 to 35,000 lbs.; and Light jets have a MGTOW less than 20,000 lbs.
Source: NERASP, Business GA User Survey, 2013.

Survey respondents reported varying levels of business GA usage. Approximately 46% replied that they or their companies make at least 100 business GA trips a year (Figure 30). Overall, 2% made more than 1,000 annual trips and 13% made between 500 and 1,000 annual business GA trips.

FIGURE 30 / # OF GA BUSINESS TRIPS MADE BY RESPONDENTS IN THE PAST 12 MONTHS



Source: NERASP, Business GA User Survey, 2013.

Survey respondents were asked to indicate in terms of importance (i.e., “not important”, “important”, or “very important”) the factors that motivated them to use GA services for business travel. Access and convenience factors were the most highly cited reasons for using business GA services (Table 10). Users

reported that business GA provides more flexibility than airline schedules. Utilizing GA services allows business travelers to reach their destinations on their own timetable and more quickly than with commercial airlines services that require additional time navigating the airport check-in and security screening processes as well as connecting flight layovers. Additionally, GA services allow business travelers to increase their productivity by reaching multiple destinations in a single day, which would not be possible using commercial airline services. Other reasons ranked highly in terms of importance included the ability reach destinations not served by commercial airlines and the ability to quickly respond to customer needs using GA services.

TABLE 10 / REASONS FOR BUSINESS AVIATION USE IN ORDER OF IMPORTANCE

Reasons for Business Aviation Use	Not Important	Important	Very Important	Composite Score*
Flexibility/more convenient than airline schedules	1.1%	16.1%	**82.8%**	2.8
Access locations more quickly than with scheduled airline services	4.3%	17.2%	**78.5%**	2.7
Access multiple locations in a single day	4.3%	18.3%	**77.4%**	2.7
Access locations not served by scheduled airlines	6.5%	24.7%	**68.8%**	2.6
Allows quick response to customer needs	8.6%	25.8%	**65.6%**	2.6
Cost effectiveness	17.2%	**45.2%**	37.6%	2.2
Conduct work while traveling	29.0%	30.1%	**40.9%**	2.1
Protect sensitive business discussions while traveling	37.6%	22.6%	**39.8%**	2.0
Ensure employee security	33.3%	31.2%	**35.5%**	2.0
Make connections with scheduled airline flights	**58.1%**	31.2%	10.8%	1.5
Provide employees regular shuttle service between company locations	**66.7%**	17.2%	16.1%	1.5

** Weights: Not Important = 1; Important = 2; Very Important = 3.*
Source: NERASP, Business GA User Survey, 2013.

More than two-thirds of the respondents indicated that business GA services are used to access customer sites (68.2%). Potential new business opportunities (59.1%) and other company offices or facilities (53.4%) were also frequently mentioned as the intended destinations for GA travel.

Survey respondents were also asked to indicate the types of facility improvements or services that they desired or required at New England airports (i.e., “not required”, “preferred but not essential”, and “required”). The most highly scored facility needs and services were: transient aircraft parking; airfield lighting; minimum runway length; instrument landing capability; and ground transportation services (Table 11). Hangar space, control towers, and aircraft maintenance services were scored the lowest in terms of required services and facilities. Of the respondents that indicated a minimum runway length requirement, 45% cited the need for a runway of 5,000 feet or greater and 24% cited 3,000 to 3,999 feet as the desired runway length. Of the respondents that reported a requirement for instrument landing capability, 40% specified GPS and 32% specified ILS landing systems.

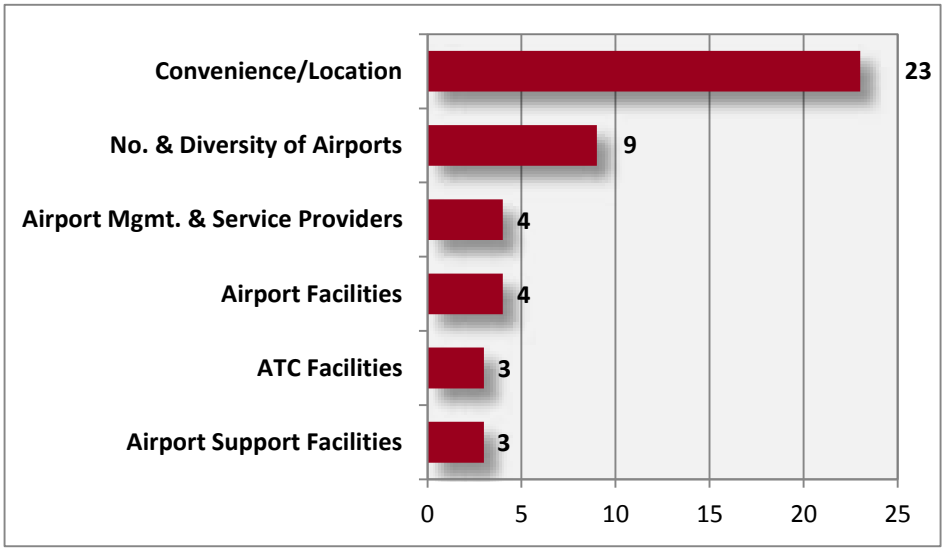
TABLE 11 / FACILITIY AND SERVICE REQUIREMENTS OF SURVEY RESPONDENTS

Facilities or Services	Not Required	Preferred but Not Essential	Required	Composite Score*
Transient aircraft parking	5.0%	26.0%	**69.0%**	2.6
Airfield Lighting	3.0%	34.0%	**62.0%**	2.6
Minimum runway length (feet)	14.0%	22.0%	**64.0%**	2.5
Instrument Landing Capability	3.0%	47.0%	**50.0%**	2.5
Ground transportation (taxi, rental car) services	5.0%	45.0%	**50.0%**	2.4
Automatic weather reporting	5.0%	**48.0%**	47.0%	2.4
Full service FBO	3.0%	**57.0%**	40.0%	2.4
Jet A fuel	33.0%	19.0%	**48.0%**	2.2
24-hour fuel availability	17.0%	**64.0%**	19.0%	2.0
Aircraft deicing	31.0%	**38.0%**	31.0%	2.0
Runway safety area	24.0%	**64.0%**	12.0%	1.9
100 LL fuel	**45.0%**	28.0%	28.0%	1.8
Hangar space	28.0%	**67.0%**	5.0%	1.8
Control tower	34.0%	**60.0%**	5.0%	1.7
Aircraft maintenance	40.0%	**53.0%**	7.0%	1.7

Weights: Not required = 1; preferred but not essential = 2; required = 3.
Source: NERASP, Business GA User Survey, 2013.

The survey also asked business GA users to indicate the strengths and weaknesses of the New England airport system. Convenience was overwhelmingly cited as a system strength (Figure 31). New England's airports provide business GA users with quick, efficient access to major population and commercial centers, provide good coverage for accessing non-urban areas, and are close to other airports and to local attractions.

FIGURE 31 / NEW ENGLAND AIRPORT SYSTEM STRENGHTS FOR BUSINESS GA USERS – (NUMBER OF SURVEY RESPONDENTS)

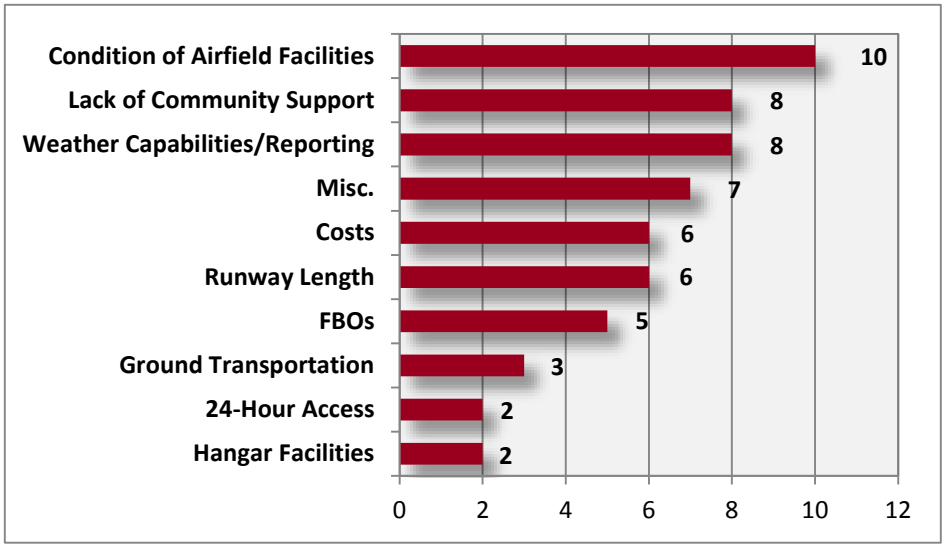


Source: NERASP, Business GA User Survey, 2013.

The condition of airfield facilities, a lack of community support and the lack of weather reporting capabilities were the top system weaknesses cited by survey respondents (Figure 32). Users reported that the facilities, including runway surfaces, at some airports are old and not well maintained. Others noted that the Reliever airports were in need of upgrades to meet minimum safety standards. In terms

of weather reporting services, some noted the lack of automatic weather reporting, particularly at smaller facilities, and the lack of instrument approaches.

FIGURE 32 / NEW ENGLAND AIRPORT SYSTEM WEAKNESSES FOR BUSINESS GA USERS – (NUMBER OF SURVEY RESPONDENTS)



Source: NERASP, Business GA User Survey, 2013.

PHASE I ACTIVITY OBSERVATIONS

The following are Phase I activity observations from the analyses of GA IFR flight activity data, the FAA GAATA Survey data, and the Business GA User Survey data.

- **Diversity of Business GA Activity**
  - Business use of general aviation in New England represents a diversity of activity. The flight activity data shows that GA IFR activity is concentrated at Primary and National airports; these airports are the most convenient to the Region's centers of population and business activity. At the same time, the data show that almost all of the Region's GA airports accommodate some level of business GA IFR flights, highlighting the use of business GA to reach destinations that are not served by commercial airlines and not readily accessible by other transportation modes.
  - Even though the primary destinations for New England's business GA flights are concentrated in the New York metropolitan area, the flight activity data also show that business GA is used to reach a myriad of destinations across the U.S. and internationally.
  - Business GA is most often associated with jet aircraft, but the IFR flight data show that piston aircraft account for one-third of all GA IFR departures from New England airports.
- **Consideration of Business User Needs from Survey**
  - The study's business user survey sheds light on the facilities and services required by business aviation flyers in New England. Three-quarters of survey respondents indicated

that they own or lease GA aircraft. Nearly half own business jets and slightly more than half own non-jet types.

- The most frequently cited facility and service requirements of jet owners include, in order of importance: minimum runway length, airfield lighting, availability of Jet A fuel, ground transportation services (i.e., rental cars, taxis), transient aircraft parking, instrument landing capability, a full service FBO, aircraft deicing services, and automatic weather reporting. More than half of the jet aircraft owner respondents indicated these as required facilities or services.

- Seventy-one percent of respondents with a minimum runway length requirement, indicated 5,000 feet as the desired length.

- Almost two-thirds of jet owners that cited a need for instrument landing capability specified GPS or ILS capabilities. Similar to jet users, more than two-thirds of responding non-jet users specified the need for GPS or ILS landing capabilities.

- The top facility requirement for non-jet business aviation users that responded to the survey is transient aircraft parking.

- Other highly important requirements of non-jet users include airfield lighting, instrument landing capability, automatic weather reporting and availability of 100LL fuel.

- These user needs should be accounted for in the development of any regional airport role objectives and performance measures.

- **Airports Supporting the Positioning and Storage of GA Corporate Aircraft**

  - The review of the IFR flight data clearly indicated a practice where aircraft are being stored outside of metropolitan areas and being ferried to larger GA and commercial service airports to pick up passengers and then proceed to their intended destination.

  - As stated in the Regional classification profile, the Connecticut regional airports, in particular the ones that border the metropolitan New York area, contribute to the region's economic development in yet another way. Some New York based companies store and maintain their aircraft at New England facilities, which may be more attractive than a local facility because of lower operating costs and greater hangar availability. This represents a direct injection of money from outside the region into the New England economy, helping to support aviation jobs in New England.

  - This trend should be evaluated in more detail to understand the potential economic impact as well as the impact on existing airport infrastructure capacities and economic development.

| ASSESSMENT OF SYSTEM MAINTENANCE COSTS: RUNWAYS AND TAXIWAYS

The goal of this task was to develop an assessment of the runway and taxiway pavement conditions which currently exist in the New England general aviation airport system, as well as the projected costs associated with rehabilitating the same. The assessment is specifically targeted at runways and taxiways because they typically consume the largest portion of FAA AIP funding every year. The overall results of this system assessment can be broadly, but effectively used to:

- Provide an understanding of future funding levels that may be required to rehabilitate the runway/taxiway pavements of the New England general aviation airports;
- Provide a comparison of these costs to projected future FAA AIP funding levels;
- Provide an understanding of the potential shortfall in funding levels;
- Provide a metric in developing funding priorities;
- Provide state and local officials with a long-range budget outlook to rehabilitate the runway and taxiway infrastructure for their state system of general aviation airports; and
- Provide a perspective of the New England funding capabilities and requirements on a national level.

While the results of this assessment of the New England general aviation airports provide a “macro” view of the regional system, this task was actually completed utilizing a “micro” or “bottom-up” approach. Specifically, each system airport’s existing airfield conditions served as the basis of the analysis for establishing a planning level cost forecast to maintain those airports’ runway and taxiway pavement surfaces in a state of good repair. An assessment of unit costs associated with system pavement maintenance was also developed. Estimates assumed one major capital reconstruction project and three major maintenance projects (at 5-year, 10-year, and 15-year intervals) during a typical 20-year life-cycle period. Capital reconstruction costs were developed for both partial and full depth scenarios to provide for a reasonable range and to account for the fact that either application could be utilized based on specific site conditions.

It is important to note that the runway and taxiway rehabilitation costs provided do not include any costs for meeting new airport design standards, obstruction clearing, drainage, airfield lighting signs, NAVAIDS, Runway Safety Area construction, etc. Estimating these costs requires detailed analyses of site-specific conditions, which are beyond the focus of this study effort. Notwithstanding these points, this assessment nevertheless provides an effective snapshot of the potential future cost burden associated with simply sustaining the existing airfield pavement in the New England GA system.

This Section of the report provides a summary of this effort. The full detailed report can be found in the Appendix of this document.

METHODOLOGY, SURVEY AND RESEARCH

In order to project future maintenance costs, the initial phase of the costing methodology included an inventory of the current year (2012) pavement conditions and pavement areas. Airport Solutions Group, LLC (ASG), with the assistance of the respective New England states, conducted a regional inventory of the pavement condition at the study airports. The focus of the inventory targeted conditions for paved runways and taxiways (i.e. asphalt and concrete). Turf runways in the system were not included in this assessment.

It is important to recognize that airports that accommodate commercial service activities also commonly accommodate general aviation activities, and that the number and impact of those general aviation activities often far outweigh that of the commercial service activities. Since the focus of this study is general aviation, it is critical that those commercial service airports that also accommodate general aviation activities to a significant level (in total number of operations and/or percent of airport operations) also be considered. Therefore, since this study's focus is on general aviation activities and the airports that accommodate them, this assessment must consider the maintenance costs associated not just with those airports singularly dedicated to general aviation, but also those commercial service airports that provide important access and capacity for the general aviation industry. Specifically, this assessment considers those study airports (both commercial and general aviation) having paved runway and/or taxiway surfaces. Application of these criteria resulted in a total of 100 New England study airports included in this assessment.

Since the study program did not require on-site inspections of every airport, data was collected primarily through desktop research and the distribution of survey questionnaires. Specifically, ASG developed, produced, and distributed a pavement-focused questionnaire to each study airport for completion. Since site-specific pavement maintenance needs at each system airport could not be evaluated in depth, assumptions were defined for strength requirements and appropriate methods of reconstruction. A conservative approach was taken in the costing methodology in order to ensure that projected costs were not underestimated.

Standard life-cycle costs for construction and maintenance were developed for the purpose of understanding order-of-magnitude funding needs. Note that these costs are not intended to replace more detailed Capital Improvement Program (CIP) cost estimates for a given airport. Nevertheless, the "bottom up" approach using the actual pavement dimensions at each study airport provides a reasonable level of confidence in the assessment of cost for the state and the regional system. That primary costing methodology was further enhanced by incorporating other considerations and variables to better approximate "real world" conditions. For example, in lieu of implementing one costing standard across the entire system, airports were further categorized by their FAA airport design classification (i.e. Airport Reference Code or ARC) since pavement demands at airports vary directly with the size and type of aircraft that they regularly service. For each classification, specific unit costs were developed to reflect their real world application in that airports that accommodate larger aircraft will generally require a more robust pavement structure, while smaller aircraft would typically require a less robust and, consequently, less expensive one.

Additionally, contingency factors were applied in order to ensure that any extenuating circumstances known to be present at a given airport could be considered and factored in to its cost assessment. For example, a contingency factor was applied to Martha's Vineyard Airport and Nantucket Memorial Airport in Massachusetts, as well as Block Island Airport in Rhode Island since construction costs on

islands are typically higher than that on the mainland. This is due, in part, to the increased costs associated with transporting raw materials and labor to the airport during construction. Another example included a contingency factor that was applied to the Westfield-Barnes Regional Airport in Massachusetts, since it was known that a significant section of Runway 2-20 would likely remain with Portland Cement Concrete, a more costly alternative to bituminous concrete. Cost contingencies for airports were only applied in situations that were viewed as professionally reasonable and defensible.

A survey was distributed to each study airport in order to determine existing pavement conditions; definitions of condition assessments and visual examples of different types of cracks were included on the survey form. The total survey response was 89%. The amount of information gathered from airports varied based on input from consultants, airport managers, and others affiliated with airport operations.

When a survey response was not provided, ASG determined conditions by the most accurate methods available. Specifically, runway pavement areas and conditions were taken from FAA 5010 data forms, and taxiway pavement areas were determined from Google Earth images. The Maine DOT provided a list of all runway and taxiway dimensions along with a list of pavement condition index (PCI) for the Maine study airports. When not provided with a survey response, Airport Reference Codes (ARC) were taken from the most recent Airport Layout Plans (ALPs) and State System Plans available on the internet. Using the data collected for each airport, the condition of the runway and taxiway pavements were then tabulated. The survey Form used is shown in Figure 33 below.

FIGURE 33 / AIRPORT PAVEMENT DATA SURVEY. *Survey Form*

2012 New England General Aviation Airport System Study
Airport Pavement Data Survey

Examples of Cracking for Reference:

Terms and Definitions for Condition Assessments:

Pothole: Small, bowl-shaped depressions in the pavement surface that penetrate all the way through the HMA layer down to the base course.
Fatigue (Alligator) Cracking: Series of interconnected cracks caused by fatigue failure of the HMA surface (or stabilized base)
Rutting: Surface depression, typically in the wheel path.
Longitudinal Cracking: Cracks parallel to the pavement's centerline or laydown direction.
Transverse Cracking: Cracks perpendicular to the pavement's centerline or laydown direction.

Excellent – No Maintenance Required
Good – Minor routine maintenance, minor crack sealing
Fair – Major crack sealing and miscellaneous minor patching
Poor – Structural improvement and major patching/repairs
Failure – Reconstruction

FIGURE A: Fatigue (Alligator) Cracking

FIGURE B: Longitudinal Cracking

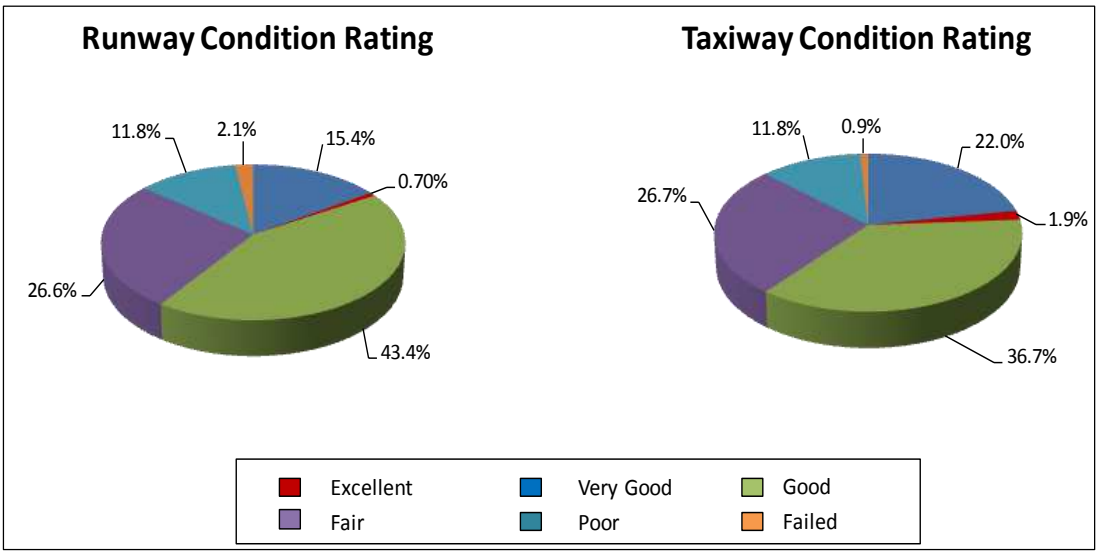
FIGURE C: Transverse Cracking

FIGURE D: Rutting

SURVEY RESULTS

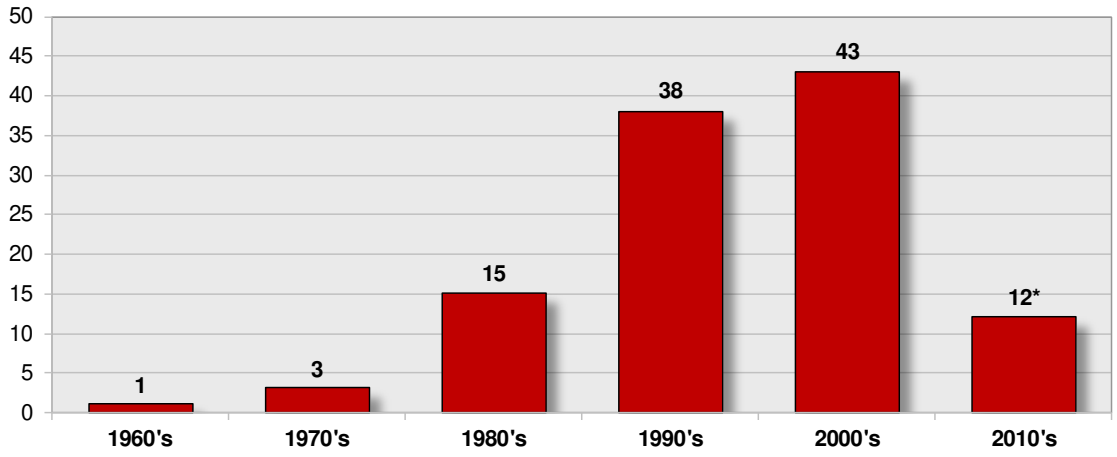
Figure 34 depicts a summary of overall pavement condition as reported within the survey responses. As shown below, approximately 60% of system airports reported a condition rating of "good" to "excellent" for their runways and taxiways. Such positive ratings likely reflect a regional priority in providing funding for capital reconstruction projects over the last 20 years, as well as a commitment to pavement maintenance.

FIGURE 34 / AIRPORT PAVEMENT CONDITION. *Survey Responses*



The airport survey also included a request for the year of the last reconstruction of the runways and taxiways. ASG had intended to address which year in the 20-year life-cycle that each pavement surface would require reconstruction. However, even with the survey, collecting accurate and complete information on the year of last reconstruction for every airport became difficult in that returned surveys had varying levels of detail and accuracy - in some cases, no information at all was provided. Additionally, many runways and taxiways were reconstructed in multiple phases and segments. Ultimately, extrapolating this information from the survey results proved to be not feasible. This directly resulted in the Project Management Team's (PMT) decision to tabulate the costs without specific years for reconstruction. Shown below are the results of the survey responses collected on the date of last runway reconstruction. This graphic reflects the regional priority on pavement reconstruction in the last twenty years, and explains the positive response by airports regarding their current pavement condition. (Note that taxiway information was not provided in most circumstances and therefore it was not feasible to quantify and depict graphically.)

FIGURE 35 / RUNWAYS. *Year of Last Reconstruction*



COST ANALYSIS ASSUMPTIONS

The cost assessment assumptions were identified through close coordination with the Project Management Team throughout the process of developing the analysis. Based on that coordination, two primary factors were used to determine the projected cost for reconstruction and maintenance of airport runways and taxiways: actual areas of pavement surface and unit costs (calculated for each AAC). The areas of pavement were determined from the survey responses (runways and taxiways), the 5010 Master Record (runways), or Google Earth (taxiways). Unit costs were calculated using the consultant's professional experience with actual construction costs, along with feedback from the state aviation agencies and the FAA. All costs were based on current-day (2012) dollars.

Pavement maintenance assumed varying levels of crack sealing and repair, plus pavement markings. Type I crack repair assumed sealing of small cracks; Type II crack repair assumed pavement repair for large cracks. Type I crack repair was measured by the linear foot; Type II crack repair was measured by the square foot. Other assumptions were made regarding the severity of cracks requiring repair at each phase of maintenance. Calculations were developed on an airport level; however, the cost data summarized herein is provided on a state and regional basis.

The 5-year maintenance cost schedule assumed a minor amount of Type I crack sealing, pavement markings and mobilization. The actual runway and taxiway pavement areas were used in the calculation.

The 10-year maintenance cost schedule assumed remarking of the pavement with the same assumptions as noted in the 5-year plan, only with a greater amount of Type I Crack Repair. The actual dimensions of the runways and taxiways were used in the calculation after the unit cost for maintenance was developed. Type I Crack Repair assumed that 50% of the pavement would have longitudinal joints, transverse cracks every 250 feet, and a small percentage of the total pavement area would have miscellaneous cracks requiring repair. A cost for mobilization was also included in the total cost.

The 15-year maintenance cost schedule assumed a greater amount of Type I, plus Type II crack repair, and remarking of the pavement with the same assumptions as in year five. The actual dimensions of the runways and taxiways were used after the unit cost for maintenance was developed. Type I assumed that 75% of the pavement length would have longitudinal joints requiring repair, transverse cracks every 250 feet, and that a slightly higher percentage (than year 10) of total area will have miscellaneous

cracks. Type II assumed repair requiring 12-inch wide excavation and patch repair, and that 50% of the total area would have miscellaneous cracks. Mobilization was assumed to be seven percent of the total cost.

The capital cost for full depth reconstruction assumed complete pavement reconstruction for both runways and taxiways. This took into consideration the depth of pavement for the different AACs. The pavement areas for runways were taken from the survey responses or 5010 Master Records. Runways at AAC D airports were further divided into two different categories: Non-Military Use and Joint Military Use. Joint Military Use airports assumed a thicker layer of P-401 Hot Mix Asphalt, as shown to the right. Complete reconstruction was assumed to include excavation, subbase course, base course, hot mix asphalt, prime coat, tack coat, pavement markings, erosion control, topsoil, and seed. The major assumptions made for unit costs of full depth reconstruction are reflected to the right.

Through the consultant's professional experience and through feedback from the state aviation agencies and the FAA, partial depth reconstruction was added as an alternative to full depth reconstruction to represent a lower range cost for reconstruction. For the purpose of this analysis, partial depth reconstruction was assumed to include reclaiming to varying depths by AAC, supplemental aggregate, fine grading, excavation, and compaction.

Additional technical assumptions for each of the areas above can be found in the full technical report located in the Appendix of this Summary of Findings.

COST ANALYSIS RESULTS

The results of the Study analysis conclude that the total system-wide cost of maintenance and reconstruction in a 20-year life cycle will range from approximately $776 million to $968 million. Of this amount, approximately $617 million to $809 million (including contingencies) is required for actual runway and taxiway reconstruction, with approximately $159 million required for regular runway and taxiway maintenance.

The total cost range for reconstruction and maintenance for each state (rounded to the nearest ten thousand) is presented in the following figure.

FIGURE 36 / COST. *Range for Reconstruction and Maintenance by State*

		Reconstruction Cost Range		
State	**Airports**	**Partial Depth**		**Full Depth**
Connecticut	12	$94,550,000	to	$120,070,000
Maine	33	$231,300,000	to	$282,380,000
Massachusetts	27	$275,580,000	to	$345,930,000
New Hampshire	13	$98,870,000	to	$124,180,000
Rhode Island	5	$36,940,000	to	$46,770,000
Vermont	10	$38,810,000	to	$48,630,000
	100	**$776,050,000**	**to**	**$967,960,000**

Study results conclude that the total cost range for reconstruction and maintenance for airports grouped by their respective FAA Asset Study category in a 20-year life cycle (rounded to the nearest ten thousand) is calculated as follows (partial depth to full depth):

FIGURE 37 / COST. *Range for Reconstruction and Maintenance ASSET Classification*

		Reconstruction Cost Range		
Asset Category	**Airports**	**Partial Depth**		**Full Depth**
National	8	$155,020,000	to	$196,980,000
Regional	15	$153,240,000	to	$190,700,000
Local	42	$189,390,000	to	$237,770,000
Basic	9	$20,230,000	to	$24,960,000
Primary*	12	$207,160,000	to	$253,970,000
Unclassified*	14	$51,010,000	to	$63,580,000
	100	**$776,050,000**	**to**	**$967,960,000**

** "Primary" and "Unclassified" are not actually categories included in the Asset Study, which is strictly focused on dedicated general aviation airports. A "primary" airport is a commercial service airport having at least 10,000 annual enplanements, while "unclassified" airports are those general aviation airports that do not meet the threshold for inclusion in the Asset Study. Primary and Unclassified airports have been included here to provide a complete picture of the study airports.*

REVIEW AND ASSESS GRANT HISTORIES FOR GA AIRPORTS IN NEW ENGLAND

This effort reviewed and collected grant histories[9] from the FAA for the last 30 years related to federal AIP dollars invested in the New England GA (non-primary) system airports and analyzed the distribution of funds based on various categories.

The goal of collecting and reviewing this data was to gain a better understanding of the funding by FAA categories, that is; Planning, Rehabilitation, Safety, Standards, Land Acquisition, etc.; and the funding by Source, that is; FAA Airport Improvement Program (AIP) by Type, that is; Entitlement, Apportionment, or Discretionary, and/or State funding programs. By understanding the historical funding patterns, it improves our ability to develop approaches to secure funding and priorities for future capital improvements.

As one can imagine, the data from a period of 30 years was significant and a detailed review of the FAA AIP data that included over 2,100 grants was beyond the scope of this effort, nor its intended purpose. To focus the review effort and to make potential comparisons to the runway and taxiway pavement cost analysis completed, the Project Management Team decided to focus on non-primary airport AIP grants with project sub types related to environmental, standards, and reconstruction. These were the likely sub types that would include runway and taxiway pavement grants and accounted for almost 1,500 of the 2,100 grants. Figure 38 shows the environmental, standards, and reconstruction funding by project sub type for all states.

[9] FAA System of Airports Reporting (SOAR), data provided by the FAA Airports New England Region (ANE).

FIGURE 38 / Grant Sub Types. *Environmental, Standards, and Reconstruction Funding*

	Environmental	Standards	Reconstruction
Apron		50,093,277	48,139,727
Building		16,408,542	
Equipment		48,746,850	
Homes	6,414,552		
Land	28,855,728	27,645,558	
New Airport		7,356,630	
Other	2,405,596	45,483,791	
Planning	11,955,737		
Runway	405,489	68,024,090	170,470,969
Terminal		8,677,104	
Taxiway	1,653,837	42,787,877	63,848,153
State Block	2,469,716	7,466,722	21,491,050
Total	**54,160,655**	**322,690,440**	**303,949,898**

As a result of this information, the PMT further agreed to narrow the focus down to the runway and taxiway categories shown from these grant sub-types. The 30-year summary of this information is shown in Figure 39 below. It is important to note that this effort did not attempt to bring the historical dollar values to current year dollars and was simply meant to provide a starting point to understand historical funding compared to future runway and taxiway pavement needs.

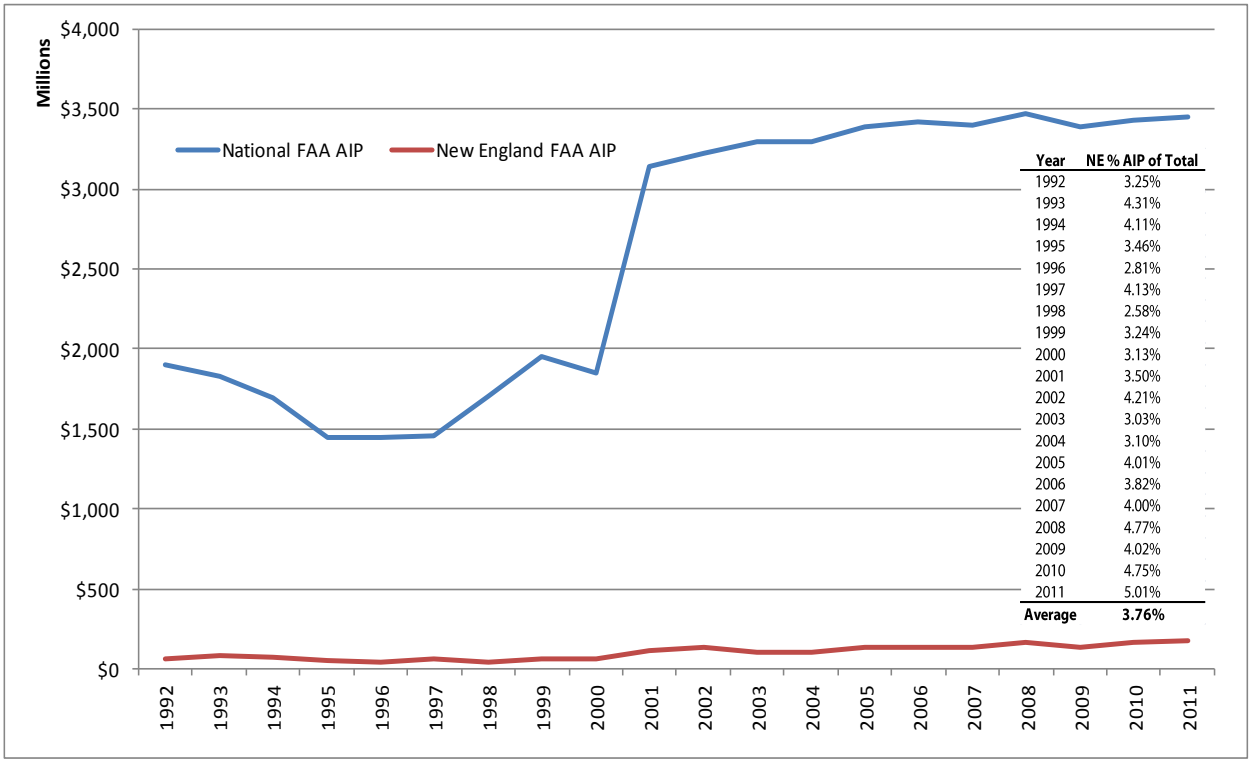
FIGURE 39 / Grant Sub Types. *Environmental, Standards, and Reconstruction Funding*

30 Year Historical AIP Grant Funding	Total	Avg per year (30yrs)
Standards – Runway	$ 68,024,090	$2,267,469
Standards – Taxiway	$ 42,787,877	$1,426,262
Reconstruction – Runway	$170,470,969	$5,682,365
Reconstruction – Taxiway	$ 63,848,153	$2,128,271
Total Stds/Recon – Runway	$238,495,059	$7,949,835
Total Stds/Recon – Taxiway	$106,636,030	$3,554,534

When the historical grant data is compared to the future needs you will note a significant shortfall in funding. Even though there are various items that could ultimately close the funding gap, like bringing both values to current year dollars, and more research on how the grants were classified to assure similar projects, the funding gap is worth noting with perhaps some future planning on understanding pavement life and maintenance programs to prolong pavement life beyond its intended 20-year design life.

As a closing point to the grant summary review, the historical FAA AIP funding was also graphed to understand how New England compared to the nation in AIP funding over the last 20-years. This data is shown below and shows New England receiving an average of 3.76% over the time period with slightly more than that annual average in each of the last six years.

FIGURE 40 / AIP. *National FAA AIP Versus New England FAA AIP*



Year	NE % AIP of Total
1992	3.25%
1993	4.31%
1994	4.11%
1995	3.46%
1996	2.81%
1997	4.13%
1998	2.58%
1999	3.24%
2000	3.13%
2001	3.50%
2002	4.21%
2003	3.03%
2004	3.10%
2005	4.01%
2006	3.82%
2007	4.00%
2008	4.77%
2009	4.02%
2010	4.75%
2011	5.01%
Average	**3.76%**

PHASE I SYSTEM MAINTENANCE OBSERVATIONS

The following are Phase I system maintenance observations as result of the Phase I tasks on assessing the costs of maintaining the runway and taxiway infrastructure in New England. These are a result of the findings and numerous discussions with the Project Management Team along the course of the Phase I effort.

- **Significant Pavement (Runway and Taxiway) Costs to Maintain the System**
    - The results of this task were significant to understand the potential for capital infrastructure funding needs in the future. While Appendix B provides the full report on this task for Phase I, the findings indicate the potential for significant funding that far out

paces any historical funding levels for the New England Region in total, not just for pavement.

- An important message from this effort is the need for, and complete understanding of pavement maintenance in the New England Region to maximize and extend pavement life, as well as incorporate new design methods to extend pavement life beyond the 20-year life cycle. An important component of this is the management of pavement maintenance. Many of the New England states have pavement management plans in place or one is currently in development. The funding of these plans is an important component of managing and efficiently funding runway and taxiway pavements projects in the future.

- **Timing of Next Wave of Pavement Costs in New England**

  - In the 2000's, of the airports which returned the pavement surveys, there were 43 runways which were reconstructed. If the runways are to meet the FAA design criteria of a 20-year life cycle, it can be anticipated that in the 2020's these runways will be due for another reconstruction.

  - Over the course of the next decade the system can anticipate a scenario where there will be peaks and valleys in the demand for funding to address aging pavement which includes runway and taxiway reconstruction. As the FAA's sustainability initiative moves forward and the design improvements of pavements comes to fruition and exceeds the 40 year mark, it can be anticipated that the initial design and construction costs will be higher but the overall life cycle costs will decrease.

- **Pavement Design Considerations that Could Impact Funding Needs**

  - The FAA in conjunction with private business partners has begun evaluating what is being called a "sustainability initiative" to extended pavement life beyond the current 20-year life cycle design. The current research shows that pavements deteriorate with time for many reasons but pavement life can be extended with proper maintenance. There comes a point, even with proper maintenance where deterioration ultimately reaches a level of unacceptable serviceability and will need to be replaced. There are many aspects of pavement design and construction that can contribute to pavement lasting longer than the 20-year lifecycle. In some estimates, upwards of 40 years can be achieved with the right design and construction elements in place. Items related to longer pavement life include:

    1. Design Thicknesses
    2. Subsurface Drainage
    3. Traffic Operations
    4. Climate
    5. Durability related to the quality of materials
    6. Plans and Specifications
    7. Construction Processes
    8. Quality Control/Quality Assurance
    9. Maintenance Practices

- It will be important to monitor the progress of this initiative to determine how it will impact future costs to maintain the runway and taxiway system in New England. During this evaluation approximately 60% of system airports reported a runway pavement condition rating of "good" to "excellent" for their runways and taxiways. Such positive ratings reflect a regional focus on providing funding for capital reconstruction projects over the last 20 years, as well as a commitment to pavement maintenance. It can be expected that these ratings will continue to decline and over the course of the pavement life, signs of age will begin to surface.

- **Federal and State Funding Levels and Programs**

  - Through the Phase I process, federal and state grant data were reviewed. While it was not an in depth effort to understand all grant activity, and grant data was not brought to current year values, it is clear that capital infrastructure needs continue to outweigh available funding. This was identified through the pavement cost evaluation where just those needs alone outweigh historical funding levels.

  - All of the States have various funding programs and staffing levels that impact their ability to fund projects above and beyond federally eligible projects. Overall, there is a clear message that the process to identify and fund projects must meet the priorities of the Region and States, and be done in the most efficient manner possible.

  - The potential to develop regional performance measures in any subsequent phases of study should be considered to aid decision makers in the use of limited funding as well as the justification for additional or new funding mechanisms for general aviation airports.

APPENDIX A

New England Business GA Activity

Analysis of Flight Plan Data

NEW ENGLAND REGIONAL AIRPORT SYSTEM PLAN
GENERAL AVIATION

APPENDIX B

Assessment of System Maintenance Costs

Runways and Taxiways

NEW ENGLAND REGIONAL AIRPORT SYSTEM PLAN
GENERAL AVIATION

APPENDIX C

Index of Airport 3-Letter Facility Codes

NEW ENGLAND REGIONAL AIRPORT SYSTEM PLAN
GENERAL AVIATION