An Economic Evaluation of Improvement Options at Newport State Airport

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1. Study overview

This report presents and discusses the economic effects associated with a series of improvement options proposed for the Newport State Airport (EFK), a general aviation facility located in the Northeast Kingdom of Vermont. Airports are increasingly being viewed as catalysts for local economic development. Will such improvements as extending the runway at Newport State Airport translate into long-term economic benefits? To what extent will these improvements significantly alter the economic role of Newport State Airport?

What began as an effort to assess the economic impacts associated with extending the airport runway and obtaining essential air service for commercial passengers has shifted toward a more comprehensive economic appraisal of a potential development path for Newport State Airport. A development path incorporates a number of intermediate steps that lead up to these aspired goals of runway extension and essential air service. Such a conceptual framework addresses the age-old "chicken-and-egg" dilemma—one of the core problems within economic development, specifically with respect to infrastructure improvements. To illustrate in this case study, local community and business leaders want to improve the airport by extending its runway, thereby increasing its role within the local economy. Such an improvement requires substantial investment, but building the improved infrastructure requires a level of aircraft activity that does not exist because the required infrastructure is not there. Or in the possible language of the Federal Aviation Administration, "Based on current volume of use at the airport facility, it probably does not make economic sense for the FAA to support such an improvement as a runway extension."[1]

As in many general aviation facilities, there is a panoply of potential projects—both landside and airside—under consideration at Newport State Airport. Collectively, these projects will enhance safety, increase efficiency and capacity, achieve system requirements, meet environmental stipulations, and provide opportunities for local economic development. These are all worthy goals. With the increased demand for limited financial resources in support of these capital projects, it is necessary to develop a means to prioritize or at least evaluate investments based on potential economic impact. Such evaluative procedures can be distilled to the fundamental question: *what is the return on investment?* The answer can be rather complicated due to how one defines and measures impacts. For this study, economic impacts resulting from airport-related capital investments are measured in terms of jobs, labor earnings, and output. As such, a primary focus is how off-airport users benefit from the investment in terms of expanded business activity.

[1] Unlike commercial passenger airports, general aviation airports do not enjoy a significant level of financial autonomy. Commercial airports have a number of accessible revenue streams including passenger facility charges, and direct funding from FAA.

Given that one of the measuring rods used by the Federal Aviation Administration is the level of airport activity; our particular focus is to determine the potential increased business activity within the Northeast Kingdom region associated with infrastructure improvements at the Newport State Airport. Measuring business activity at this general aviation facility at Newport State Airport represents a significant departure from its predominant use of recreational and personal flying activity.

Our approach is to consider these improvements in the context of a logical development path for Newport State Airport. In this context, we assess this sequential development path in three phases. Phase I includes improvement options over the short-term period of one to three years. These options (some of which are already underway) are in areas of navigational aids, airport ground support, airport operations, ground support transportation, and other (foreign trade zone designation; airport access road improvement; and stormwater infrastructure improvements). Phase II includes improvement options over the medium-term of four to eight years. The centerpiece of phase II is the 1,000-foot runway extension project at Newport State Airport, but includes other improvement options such as runway grooving, new terminal building and additional parking, other/infrastructure developments (airport-based business park and infrastructure improvements related to water-sewer), customs clearance on site, and air cargo service. Finally, phase III includes improvement options over the long-term of nine years and beyond. Key options under consideration are essential air service and Part 139 certification. Projects identified in any of these phases could be completed earlier or delayed depending upon FAA participation, approval of projects by the state legislature, and environmental issues.

Each of these development phases are evaluated utilizing an economic impact modeling framework. In general, an economic evaluation provides a comparative assessment of the existing situation with the recommended options. Here, economic impacts associated with the phased capital/operational aviation improvements and the resultant increased aviation use at Newport State Airport is presented for each major development phase.

The remainder of this report is organized under the following sections:

- a review of recent studies concerning Newport State Airport, specifically the most current statewide Vermont Airport System and Policy Plan, business plan with recommendations for Newport State Airport, and an environmental assessment of runway extension at Newport State Airport;
- a formal discussion on the chosen rationale scheme/plan for organizing the various improvement options at Newport State Airport;
- a general discussion of general aviation airports and economic development;

- the economic backdrop of the Northeast Kingdom and characteristics of Newport State Airport including a description of user groups;
- a discussion of the economic modeling approach utilized in this report; and
- findings and observations from the economic impact evaluation for each of the development phases.

Finally, there are concluding comments with specific recommendations on next steps for community and business leaders. Appendices that include pro formas of user groups for the general aviation facility at Newport State Airport; and a glossary of abbreviations and aviation terms complete the report.

2. Prior studies of Newport State Airport

Vermont Airport System and Policy Plan (2007).[2] Newport State Airport is one of 17 public use facilities in the State of Vermont airport system.[3] These public use airports range in size from the small single-runway facility at Island Pond to the large international airport in Burlington. Newport State Airport is classified as a general aviation facility and is included in the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS).[4] In 2007, the Vermont Agency of Transportation (VTrans) completed the *Vermont Airport System and Policy Plan*. This plan provided an updated airport systems planning guide, a set of policy recommendations and a framework for evaluating the State's aviation infrastructure needs. In its report, VTrans classifies its 16 public-use airports into four functional groupings based on current facilities/conditions and contributory roles to the statewide system. These four functional groupings include the following:

- National service airports—accommodate the highest level of general aviation activity and connect the local, regional, and statewide economy to the national and global economy. Burlington International Airport is included in this grouping.
- Regional service airports—serve primarily general aviation aircraft, with a focus on business activity, support small jet and multi-engine aircraft, and connect local and regional economies to state and national economies. Morrisville-Stowe State Airport is one of two designated regional service airports in the state.
- Local service airports—primarily serve recreational and personal flying activity, support the local economy, serve some business/corporate flights, provide flight training and provide maintenance, fuel, storage and facilities for piston-driven and multi-engine aircraft. **Newport State Airport** and Caledonia County State Airport, both located in the Northeast Kingdom, are classified as local service airports.
- Specialty service airports—provide aviation services for smaller single-engine aircraft and other non fixed-wing aircraft such as ultra-lights, gliders, and balloons. Some of these facilities are closed during the winter seasons. The John H. Boylan State Airport at Island Pond is included in this grouping.

[2] Wilbur Smith Associates, Inc. *Vermont Airport System and Policy Plan*. Prepared for the Vermont Agency of Transportation. February 2007.

[3] At the time of this study, there were 17 public use airports in the State of Vermont. Since that time, one public use airport (Fair Haven Municipal) has closed; thus, there are currently 16 public use airports in Vermont.

[4] The National Plan of Integrated Airport Systems identifies airports on the national level that have significance to the national air transportation system and classifies them as either commercial service (CS) or general aviation (GA). In order for an airport to receive federal funding from the Federal Aviation Administration, it must be included in the NPIAS.

For each of these public-use airports, specific objectives were identified, current performance evaluated and future aviation demand (for a 20-year period, 2010-2025) forecasted. For each of the categories, specific objectives include function (i.e., level of service, population served, and scope of service), activity (i.e., type of aircraft used, amount of service), facilities/services, and runway length (Table 1).

Table 1. Characteristics of Newport State Airport

Airport Characteristics	Newport State Airport (EFK)
General	Public-use , owned by Vermont Agency of Transportation Local service function; population within 20 nautical miles = 35,800
Airside facilities	Runway 5/23--4,000 feet length; 100 feet width; fair condition of asphalt; strength-single-wheel of 30,000 lbs. and dual-wheel of 44,000 lbs.; Runway 18/36--4,000 feet length; 100 feet width; good condition of asphalt; strength-single-wheel of 30,000 lbs. and dual-wheel of 44,000 lbs.;
Navigation aids & lighting	Runway 5--none lighting and none NAVAIDS Runway 23--none lighting and none NAVAIDS Runway 18--MIRL lighting and none NAVAIDS; circling NDB instrument approach; lowest visibility minima 550-1 Runway 36--MIRL lighting and none NAVAIDS; GPS, circling NDB instrument approach; lowest visibility minima 514-1
Airport landside facilities	GA terminal; Fuel availability--100LL and JetA; Airframe and minor maintenance; no ATC tower
Based aircraft	15 single-engine + 2 multi-engine = 17 aircraft
Aircraft operations	0 air carrier + 0 commuter + 0 air taxi + 5,500 GA local + 1,460 GA itinerant + 180 military = 7,140

Source: *Vermont System and Policy Plan*, 2007.

Current system performance measures utilized were accessibility, development, and safety and security. Newport State Airport meets and/or exceeds each of these measures as its role of a local service general aviation facility.[5]

The statewide system plan also provided forecasts of aviation demand for a 20-year period, using 2005 as the base year. Forecasts were prepared for both general aviation and

[5] Within the *Newport State Airport Business Plan* (2009) is the recommendation that Newport State Airport be classified as a regional airport with corporate and charter traffic that exceeds the standards established for a local service classification. In addition, there is a significant level of community interest and support in developing the airport. While it does serve several regional businesses in the region, the airport could bring in additional recreational users to the Northeast Kingdom if further airport development would occur. This is further discussed in the section focused on the Airport Business Plan, beginning on page 11.

commercial service activity at each airport (as appropriate). Projections of based aircraft and general aviation operations for Newport State Airport are provided in Table 2.

Based aircraft projections were developed using four methodologies, namely a market share approach; a demographic approach based on projected county population growth; a socioeconomic approach based on projected county employment estimates; and applying growth rates to based aircraft types, based on FAA's projections of future nationwide general aviation fleet mix. For general aviation operations, only three of these methodologies were employed; that is, operations per based aircraft, county population growth projections, and projected county employment estimates.

Table 2. Projections of airport activity at Newport State Airport: 2010-2025

	2005	2010	2015	2025
Based aircraft, total	17	18	18	20
Single-engine	15	16	16	17
Multi-engine	2	2	2	2
Jet	0	0	0	1
Operations, total	7,140	7,600	8,000	8,400
GA operations	6,960	7,400	7,800	8,200
Military operations	180	180	180	180

Source: *Vermont System and Policy Plan*, 2007.

A future systems analysis was conducted for each airport facility, based on evaluation of the existing system's performance in comparison to the stated objectives as well as analysis of future airport demand and performance. Recommendations were made with respect to strategic runway extension (both length and width), taxiway analysis (full parallel), improved approaches (e.g., instrument, ceiling height and visibility minimums, NAVAIDs, weather reporting, and ground communications) for increased accessibility throughout the state; improved covered storage and apron needs analysis; terminal building/administration building needs; auto parking and security needs; fuel needs and FBO analysis; and ground support transportation. In contrast to the various improvement options presented in this report, the systems analysis identified that Newport State Airport had specific need for additional hangar space, and enhanced security (complete fencing)[6].

[6] In 2009, fencing around the airport was installed; fencing was added to the entire airport perimeter with the exception of the area behind the private hangars to the north of the terminal apron.

Based on the recommendations for improvements, each airport established a capital plan. Newport State Airport's proposed capital plan is presented below in Table 3.

Table 3. Newport State Airport, Airport System Capital Plan

Project	Total cost	FAA 95%	State 5%	Local 0%	System Plan	Master Plan	Facility Objective
Construct 3,000 sq. ft. of covered storage	$300,000	$0	$300,000	$0	X	X	Covered storage
Fencing around operations area	$100,000	$95,000	$5,000	$0	X		Fencing
Airport layout plan update (2013 & 2023)	$240,000	$228,000	$12,000	$0	X		Planning
Reconstruct runway 5/23	$2,200,000	$2,090,000	$110,000	$0		X	Runway strength
Total	**$2,840,000**	**$2,413,000**	**$427,000**	**$0**			

Note: Perimeter fencing project was completed in 2009.
Source: *Vermont System and Policy Plan*, 2007.

Finally, a number of policy goals were developed to underscore the system plan and promote the long-term viability and effectiveness of the airport system in Vermont. Specific goals intended to guide on-going system development and accomplish the mission of the airport system include:

- Provide a system of airports that is accessible for people and goods from both the ground and the air throughout the state.
- Provide intermodal ground access opportunities/services (such as rental car, taxi, bus).
- Preserve and enhance existing infrastructure investment through maintenance, rehabilitation and development of new infrastructure.
- Promote airport-compatible land uses.
- Provide safe and secure system of airports that meets State and federal guidelines.
- Seek adequate and stable funding, including FAA assistance and assure appropriate staffing to support the Agency mission.
- Maintain and utilize Vermont's Airport Capital Facilities Program to make appropriate and timely investment decisions or project prioritization decisions.
- Maintain commercial air service at Rutland State Airport and support its development elsewhere in the state and encourage additional commercial and cargo services where appropriate.
- Maintain an up-to-date database on aviation facilities.
- Strive to generate appropriate revenues from the operation of the State-owned airports utilizing a business-oriented approach with leases.

A number of these policy goals are supported in the various improvement options recommended in Newport State Airport's development path.

Newport State Airport Business Plan (2009).[7] Business plans for each of the ten Vermont State-owned public-use airports have recently been completed. A business plan is intended to recommend potential means for improving the financial performance of the airport. In addition, the business plan identifies current and future economic development activities within the surrounding region with the goal to tie that regional development to the airport's growth and expansion.

Newport State Airport Business Plan begins with a mission statement, "…to provide safe, efficient, and fiscally sound airport facilities and services to residents and visitors to the Newport area. The airport strives to be an important part of the Newport community and catalyst for future development and growth in the Northeast Kingdom." Program goals in support of Newport State Airport's mission statement include:

- Continue to operate the airport safely and efficiently.
- Strive to manage expenditures and increase revenues at the airport.
- Encourage private sector investment in the utilization and development of the airport's facilities.
- Create an environment that facilitates business activity and access to the region's businesses.
- Pursue funding for implementation of necessary capital improvement projects to improve safety and usability to the Airport.

Included in the business plan is an evaluation of current business operating practices; an identification and evaluation of needs, opportunities, and challenges facing the airport; a five-year projection of revenues and expenses at the airport for baseline case and alternative scenarios; strategic planning recommendations; and an economic impact evaluation of the airport, identifying jobs, income, and total output associated with the airport.

The business plan provides a background section containing a description of the airport location, regional profile, and airport and regional economic profile of the Northeast Kingdom. A section on airport characteristics provides greater detail and updated information on Newport State Airport's aviation activity; airside facilities of runways, taxiways, airport

[7] *Newport State Airport Business Plan* (August 2009) was prepared by McFarland Johnson, Inc. for the Vermont Agency of Transportation (VTrans) as part of their overall program of business plans for each public-use airport in the Vermont State Airport System.

reference code, surfaces and safety areas, landside and aviation-support facilities of terminal, apron, fuel farm, hangars, auto access and parking, deicing, safety/security, aircraft rescue and firefighting, and airfield maintenance.

The business plan notes that Newport State Airport—like many other small general aviation airports—caters to a wide variety of users ranging from private individuals using the facility for recreational flying and flight training to those utilizing the airport to access nearby businesses and attractions. The Airport Master Record (updated in the report to April 2008 and updated further in the below table to August 2010) indicates that 20 single-engine aircraft were based at the airport and 8,784 operations were completed annually (Table 4).

Table 4. Airport Master Record (2010) for Newport State Airport

Based aircraft	
Ultralight	0
Single engine	20
Multi-engine	0
Jet	0
Helicopter	0
Total	**20**
Operations	
General aviation	8,564
Commercial	0
Air taxi	0
Military	220
Total	**8,784**

Source: FAA Airport Master Record (http://www.gcr1.com/5010Web/airport.cfm?Site=EFK)

This section concludes with a comparative analysis of Newport State Airport with seven other nearby public-use airports in Vermont (John H. Boylan State in Island Pond, Caledonia County State in Lyndonville, and Morrisville-Stowe State in Morrisville), New Hampshire (Skyhaven in Rochester, Northampton), Maine (Eastern Slopes Regional in Fryeburg) and New York (Oswego County in Fulton). The comparative analysis of facilities included aviation services, hangars and tie-downs, and fuel.

The business plan report includes an analysis of current financial performance and presents a five-year (2009-2013) forecast of operating revenues and expenses. Analysis of current and projected capital expenses is not contained in Newport State Airport's financial statement.[8]

[8] In many cases, the Federal government covers up to 95 percent of the capital expenses; because Vermont owns and operates its airports, the State is responsible for both the 2.5 percent state share as well as the 2.5 percent local share of capital development projects. In other words, the State is responsible for the five percent share

State-owned general aviation facilities like Newport State Airport have a modest operating revenue base consisting of land lease fees and fuel taxes and run higher operating expenses, consisting of management fees (for FBO, who serves as part-time airport manager), labor and material expenses for maintenance, insurance, and fees. Historically and projected forward, there is an increasing shortfall in operating revenues in keeping the airport open and operating.

The report lists a number of potential development impediments at the Newport State Airport, including the national business cycle, runway length and maintenance, taxiway availability, runway and taxiway lighting, neighboring property uses, regional accessibility and airport location.

The recent recession negatively impacted aviation, particularly recreational general aviation. Fuel prices and other costs dampened general aviation activity; credit crisis resulted in a chilling effect on purchasing durable goods (including aircraft); and increased unemployment due to layoffs and business closures caused people to save and curtail expenditures for flying and limit investing in aircraft. On a local level, the economic downturn affected bullish projections of sales of high-end properties at Jay Peak and Burke Mountain ski resorts. While these local developments have not been scrapped, sales of these properties have slowed and marketing efforts have been revamped; in total, such changes may (modestly) affect projected future use of the airport.

The runways at Newport State Airport are both 4,000 feet in length. Runway 18-36 is the primary runway and extends in a north-south direction, while Runway 5-23 is the crosswind (secondary) runway and extends in an east-west direction. While optimal for nearly all single-engine aircraft and some twin-engine and jet aircraft, the existing[9] runway length is not sufficient for many existing and potential users of the Airport. Development organizations and resorts in the region indicate that a runway extension is pivotal to the successful completion of proposed development projects in the Newport area. A number of potential landside developments at the airport (new hangar space, aviation-related business park) hinge on this runway extension. The current runway length will limit possibilities for future development at the airport and may deleteriously impact economic developments within the Northeast Kingdom.

Safety concerns are paramount with respect to taxiway availability and runway and taxiway lighting. Newport State Airport currently lacks a full parallel taxiway; and lighting on runway 5-23 and taxiway A is needed. The primary runway (18-36) does have runway lighting and is the only runway with an instrument approach. Lighting for runway 5-23 is deemed "not critical" as

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associated with the total cost of any airport capital development projects. If the airport is incurring an operating loss, such capital development funds must come from elsewhere other than airport-generating revenue.

[9] The focus of this discussion on runway length concerns the primary 18-36 runway.

this is a visual runway only, with very few non-daylight operations. The lack of a full parallel taxiway for runway 18-36 is an important safety concern; however, a parallel taxiway for runway 5-23 is not as critical as most aircraft utilize runway 18-36 for landings and departures. Potential safety hazards for aircraft utilizing the airport after sunset and during adverse weather conditions would be addressed with a full parallel taxiway to runway 18-36 and enhanced lighting.

Neighborhood property uses are called out in the business plan as potential constraints to development at the airport. In its circulars[10], FAA does not recommend airport expansion projects at airports with turbine-engine operations where a landfill is located within 10,000 feet from the airport operations area. Presently, the Casella Waste Systems landfill is 1,100 feet from the airport property line and 4,000 feet from the end of Runway 23. To counter such concerns as stated in the advisory circulars, a bird and wildlife mitigation program implemented by Casella has been highly successful. The Town of Coventry, in which Newport State Airport is located, has a town plan indicating the importance of the airport both to the town and to the wider Northeast Kingdom. However, the town does not have a zoning program in place, meaning that development limits are minimal for areas in the vicinity of the airport.

Regional accessibility to the airport is highlighted in the report as "challenging." Beyond a major north-south interstate highway, road access to other parts of the state (specifically, the largest city of Burlington) is difficult. Rail access via Montreal, Maine & Atlantic Railway (MMA) and the Washington County Railroad (WCR) is deemed adequate for the region. The specific location of Newport State Airport was considered as not ideal for future development of mixed-use aviation compatible land. Significant slopes surrounding the airport, the presence of the landfill and the difficult-to-expand access road could make development of industrial and mixed-use facilities difficult at the airport.

The business plan calls out a number of recommendations for improvements at the airport to meet the needs of current users as well as potential future users. Initially cited in the Airport Layout Plan Update (ALPU) for Newport in November 2007, recommendations include the extension of the runway 18-36 by 1,000 feet, the construction of additional hangar space for 26 aircraft, the construction of 12,000 square feet of automobile parking space to accommodate 20 vehicles, and the removal of 70 acres of vegetative obstructions at the end of the new runway 18-36.

A general development plan is presented within the overall business plan, detailing locations at the Airport which offer the best growth opportunities. For instance, the area immediately to

[10] FAA Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*; and AC 150/5200-34A, *Construction or Establishment of Landfills near Public Airports*.

the north of the developed area (and south of runway 5-23 end) is ideal for new private hangars and apron expansion. The areas located south of the terminal building are ideal for future development of additional hangars (box and ten-unit T-hangars) and the aviation-related business park, respectively.

Detailed in the business plan for Newport State Airport are a number of recommendations in three focus arenas: policy actions (**PA**), revenue enhancements (**RE**), and community partnership (**CP**). These recommendations include:

- A reconsideration of land leases for private hangar development, utilizing a market-driven rate per square-foot and incorporating a reversion clause (**PA**).
- Take full advantage of offers of private funding to develop facilities at the airport (**PA**).
- Extend the primary runway 18-36 by 1,000 feet and consider new runway approaches in order to accommodate larger business jets on an increased basis (**RE**).
- Make a concerted effort (with assistance of local development agencies) to develop and support a marketing program for the airport (**RE**).
- Explore options for the provision of rental cars and improved ground transportation at the airport (**RE**).
- Complete a market analysis to determine the demand for commercial passenger or charter air service at Newport State Airport. The FAA makes available small community air service development (SCASD) grant funds to study air service needs for residents and businesses in the Northeast Kingdom (**RE**).
- VTrans and the US Customs and Border Patrol should work together to provide Customs inspections at the airport (**RE**).
- Northeastern Vermont Development Association (NVDA) and other state and local entities should work together to convert a land section of the airport into an aviation-related business park (**RE**).
- Construction of a transient aircraft hangar as well as private developer construction of additional hangar space at the airport should be encouraged by VTrans and the FBO (**RE**).
- VTrans and the FBO should work together with Lyndon State College to determine the feasibility of instituting an aviation-related academic program that would utilize the airport (**RE**).
- Airport should promote itself to private medical transport providers, which would serve the needs of transporting patients to regional hospitals (**RE**)
- VTrans should consider re-branding the airport with a name to recognize the entire region, thus serving as a marketing tool for the airport as well as a tool for regional tourism and economic development organizations (**CP**).

- VTrans and the FBO should provide opportunities for the community to learn about and experience the airport such as an open house, fly-in, air show, and sponsoring school trips and offering airport tours (**CP**).

Recommendations were furthered prioritized and placed on a timeline. Immediate consideration was given to the following recommendations in order of priority: grant application for market analysis concerning commercial air service; airport branding; airport marketing website; update land leases consistent with market rates; determine potential for rental car availability; and community outreach. Medium-term (two-four years) recommendations were runway and taxiway extensions; partnership with US Customs & Border Patrol for border inspections at the airport; determine potential for partnership with Lyndon State College; and construct a state-owned hangar for transient aircraft storage. Determining the need for a business park was slated for long-term.

Closing out these recommendations was an effort to quantify potential revenues resulting from the implementation of these proposed strategies. The centerpiece of future growth and development at Newport State Airport is the runway 18-36 extension. Without the longer runway, many of the other revenue drivers and generators have limited or no possibility of coming to fruition. A runway extension will provide the potential to increase both operations and based aircraft at the airport. Operations are expected to increase by ten percent upon completion of the runway extension, based on current jet users who experience limitations in all-weather operations due to runway length and additional users of the airport who will be attracted by new business activity and new developments at the ski resorts. With recommended improvements made at the airport, the plan projects that four additional aircraft will be based at the airport. Such strategies have significant potential revenue implications for future airport operations. Lease revenues are projected to increase steadily over the forecast period (2009-2013, particularly the out years of 2011-2013), especially revenues associated with the state-owned transient storage hangar. Fuel sales—particularly for JetA—are expected to more than double, based on 700 additional take-offs each of the out years.

Finally, the business plan quantified the economic impact and contribution of Newport State Airport to the local economy for both the existing situation and for the recommended actions. Utilizing findings from an earlier economic impact study, the analysis traced the total economic effects (as measured by jobs, income, and output) from the estimated capital development program and increased airport operations, based on additional on-airport employees (Table 5).

Table 5. Estimated economic impacts of Newport State Airport

Item	Year 2003 Impacts	Year 2008 Impacts	Recommended Plan Add-on Impacts	Total 2013 Impacts
Direct impacts				
On-airport income	$25,700	$30,100	$356,000	$386,700
On-airport expenditures	$117,500	$137,500	$1,065,000	$1,202,500
On-airport employment	2	2	10	12
Off-airport income	$43,200	$50,500	N/A	$50,500
Off-airport expenditures	$113,200	$132,400	N/A	$132,400
Off-airport employment	4	4	N/A	4
Induced effects				
Induced direct and indirect	$126,800	$148,400	$338,500	$486,900
Total induced employment	1	1	4	5
Grand total monetary impacts	***$357,500***	***$418,300***	***$1,403,500***	***$1,821,800***
Grand total income impacts	***$85,300***	***$99,800***	***$457,300***	***$557,100***
Grand total employment impacts	***7***	***7***	***14***	***21***

Sources: *Newport State Airport Business Plan*, 2009; *Economic Impact of Vermont's Public-Use Airports*, 2003.

At the close of the report are a number of non-monetary benefits of aviation mentioned, including transportation benefits (i.e., time saved and cost avoided by travelers utilizing airports); stimulation of business (i.e., attraction, siting and retention of businesses in airport communities); aeromedical evacuation (i.e., intrinsic values associated with life-saving function); and recreation (i.e., location near recreational/resort offerings creates access to general aviation visitors).

Environmental Assessment of Newport State Airport (2010).[11] Of the recent studies concerning Newport State Airport, this environmental assessment is the most narrowly focused, specifically evaluating the proposed runway extension at the airport. The proposed project is based on the initiatives of the Newport City Renaissance Corporation, which is working with state and local officials to improve the regional transportation system.

The report begins with a background analysis of need and overall context. As in the business plan, the chief impediment to airport growth and development at Newport State Airport is the available runway length. The analysis of existing and future runway length requirements indicates that the current length of 4,000 feet does not meet existing and future airport demand. Newport State Airport has seen a significant increase in business aircraft activity and

[11] *Draft Environmental Assessment of Newport State Airport* (July 2010) was prepared by Stantec, Inc.

demographic and business trends indicate that future general aviation activity is projected to increase. Furthermore, Newport State Airport is located in a remote and isolated part of the state, with a marginal transportation network. These are the arguments posited for the need for the runway extension.

According to the report, the basis for need of the primary runway extension include current aviation activity, regional economic trends and the evolving role of its general aviation facility, and general aviation forecasts for Newport State Airport. National trends indicate that general aviation activity will grow at about three percent each year; with business/corporate use (including air taxi) growing at a faster rate than recreational use.

Regional economic trends over the last three to four years indicate that the Northeast Kingdom will need additional air service. "While commercial service is not realistic now or anytime in the foreseeable future, general aviation on-demand air taxi and corporate aircraft will continue to provide this needed service" (Stantec, 2010, p. 1.3). Based on jet fuel sales during the past three years, itinerant corporate aircraft and air taxi use of the airport is forecasted to double in the next four-five years and then increase by 10 percent or more annually.

Forecasted operations are based on increased use of jet and turboprop aircraft by such companies as Columbia Forest Products and ATM Corporation and increased use of pleasure aircraft related to visitation at nearby regional resorts of Jay Peak and Burke Mountain. Recent analysis of airport records (2009-2010) indicates use of Newport State Airport by regional, US and global companies with turbojet and turboprop aircraft (Table 6). Specific examples of business-related use of the airport include:

- Columbia Forest Products, North America's largest manufacturer of hardwood plywood, veneer and related products, has major facilities in Newport and nearby St. Casimir, Quebec. Corporate leaders frequent the airport on a regular basis but current requirements of many of their corporate aircraft (coupled with inadequate approach and runway length) results in the use of airports in Sherbrooke, Quebec, Burlington or Morrisville, Vermont.
- ATM Holdings (headquartered in Pittsburgh) cites the short runway as a major deterrent in opening a new business in the Northeast Kingdom. The corporate 650 Citation VII cannot land at Newport when the runway is wet.
- Jay Peak, one of the premier ski resorts in eastern North America, has been buoyed by increased use by visitors from Canada, southern New England and beyond. While visitors arrive primarily by car and chartered bus, air travel has been steadily increasing with a noteworthy rise in corporate and chartered aircraft.

Table 6. Company turbojets and turboprop aircraft using Newport State Airport

• Alaska Power & Telephone	• Malco Leasing	• Socata Aircraft
• ATM Holdings	• McNeill Transportation	• Super King Partners
• Bob Jones University	• Menzil Corporation	• Synergy International
• Columbia Forest Products	• Meyer Chatfield Aviation Services	• TD Air
• Delta Railroad Construction	• Mooney Airplane Company	• Textron Corporation
• Denton Aviation Consulting	• Myers Medical Equity	• Tyburn Management
• Earthwalk Communications	• Nighthawk Management Company	• Wal-Mart
• Elias-Savon	• Northcoast Technologies	• Watersoft
• Family Dollar	• Northeastern Aviation Corporation	• Wells Fargo Bank
• Golden Rule Financial Corp.	• Northwestern Michigan College	• Wells Fargo Equipment Finance
• GA Air	• On-Air Company	• West Highland Whites Partnership
• Highland Associates	• Ponder investment Corp.	• Wildcat Ventures
• Knowlton Aviation	• Primecare Medical	• YDJ Reinsurance Intermediaries
• Ligonair	• Rubaiyat Trading Company	• Zeliff Construction
• LJ Associates	• SIMS Innovations	

Source: *Draft Environmental Assessment of Newport State Airport* (July 2010)

In determining the required runway length proposed for Newport State Airport, a five-step process was utilized:

- Identification of critical design aircraft that will make regular use of the proposed runway during the planning period. The critical aircraft for Newport State is similar to the Cessna Citation Excel, in the turbojet 20,000 pound class.
- Identification of a family grouping of airplanes having similar performance characteristics and operating weights. These are airplanes that will require the longest runway lengths at maximum certified takeoff weight (MTOW), most likely those that are over 12,500 pounds but less than 60,000 pounds.
- Determine the method used in establishing recommended runway length, based on aircraft with a maximum certified takeoff weight of more than 12,500 pounds up to and including 60,000 pounds.
- Determine recommended runway length, based on planned operations of turbojet aircraft weighing less than 60,000 pounds MTOW in conjunction with smaller airplanes of 12,500 pounds or less. Based on this and other data (operate with 60 percent useful load), the unadjusted runway length at Newport State Airport is 4,600 feet.
- Application of necessary adjustments, including runway surface conditions and effective runway gradient would require a landing distance of 5,420 feet.

Given that conditions are not always as unfavorable as indicated within the analysis; a shorter runway in the range of 5,000 feet would serve most operations under most conditions.

Along with the proposed Runway 18-36 extension of 1,000 feet, there is a proposed construction of fully-parallel taxiway of 2,821 feet serving Runway 18-36 and removal of vegetative obstructions to protected airspace associated with the runway. Besides "no action" status quo, five other alternatives were identified including one with an offset parallel taxiway, and another one with a partial parallel taxiway.

Besides a presentation of alternatives, the report discusses the affected environment of the airport and vicinity; the environmental consequences of implementing the proposed actions; and recommended mitigation measures to avoid and minimize environmental impacts.

In summary, these recent reports call out a number of improvements needed for the general aviation facility of Newport State Airport. For each of these improvements, a rationale was presented as well as their implications for placement at the airport. With the lone exception of reconstruction of runway 5-23, these proposed improvements at Newport State Airport are recognized for both their relevance and currency.

Each of these reports envisions an enhanced role for Newport State Airport within the greater regional economy. The proposed improvements—particularly the runway extension of 18-36—will certainly aid regional economic development. For instance, a runway extension opens the airport to larger aircraft which can positively affect on-airport fleet mix and facilitating aviation use by off-airport firms that transport cargo and personnel as well as use by visitors to access regional resorts and attractions.

However, in the face of competing demands for limited public funds, how does the airport best achieve success in obtaining the required approvals and necessary funds for the runway extension? Are their intervening steps along a predesigned development path that ought to be taken to ensure success in obtaining clearance for the runway extension? In this next section, a development path for Newport State Airport marked by specific and timely proposed improvements is presented.

3. Rationale for improvement options at Newport State Airport

In the context of airport improvement planning, there are numerous improvements related to enhancing airport safety, capacity, security and environmental concerns. Some of these projects are eligible for funding from the Federal Aviation Administration (FAA) under its Airport Improvement Program (AIP). In general, airport sponsors can use AIP funds on most airfield capital improvements or repairs, and in some specific instances, for terminals, hangars, and non-aviation-related development. Any professional services associated with eligible projects—such as planning, surveying, and design—are also eligible. Safety considerations and aviation demand at the airport must justify the projects, which also must meet Federal environmental and procurement requirements. The below table lists typical examples of eligible and ineligible projects for AIP funding; the list is not exhaustive (Table 7).

Table 7. Examples of eligible and ineligible projects for AIP funding

Eligible projects	Ineligible projects
• Runway construction/rehabilitation • Taxiway construction/rehabilitation • Apron construction/rehabilitation • Airfield lighting • Airfield signage • Airfield drainage • Land acquisition • Weather observation stations (AWOS) • NAVAIDs such as REILs and PAPIs • Planning studies • Environmental studies • Safety area improvements • Airport layout plans (ALPs) • Access roads located on airport property • Removing, lowering, moving lighting hazards • Glycol recovery/vacuum trucks**	• Maintenance equipment and vehicles • Office and office equipment • Fuel farms* • Landscaping • Art work • Aircraft hangars* • Industrial/business park development • Marketing plans • Training • Improvements for commercial enterprises • Maintenance or repairs to buildings

Notes: *May be eligible, subject to review; **To be eligible, vehicles must be owned and operated by the Airport and meet other requirements.
Source: Federal Aviation Administration, Airport Improvement Program.
http://www.faa.gov/airports/aip/overview/

A number of specific options/items have been suggested[12] for improving general aviation at Newport State Airport as well as strengthening its overall role within the Northeast Kingdom regional economy (Table 8).

Table 8. Improvement options under consideration at Newport State Airport

Functions/Items	Description	Status/Notes
Navigational Aids		
• Departure procedure	Enhanced departure procedure	FAA action, slated 5/2011
• Approach procedure	RNAV-GPS approach procedure	FAA action, slated 4/2012
Aircraft Ground Support		
• Deicing	Type II deicing equipment	Uncertain
Airport Operations		
• Hangar space for aircraft	Additional hangar space for storage & transient	In-planning
Ground support-transportation		
• Rental car service	Rental car availability at terminal	Pending
• On-call/for-hire taxi/van service	Taxi service in area	Shuttle service at Jay Peak resort
Airport Facilities		
• Runway 18-36 length	Extend runway 1,000' from current 4,000'	Preliminary environmental assessment
• Runway grooving	Grooving of runway 18-36	VTrans action, uncertain
• Terminal building	Design & build new terminal building	Preliminary VTrans discussions
• Terminal auto parking	Additional parking	Pending on terminal building
Airport Services		
• Customs clearance on-site	US CBP on-site processing	Interim steps needed
• Essential air service	Scheduled passenger air service	Uncertain
• Air cargo service	Scheduled air cargo service	Uncertain
Other/Infrastructure		
❖ Foreign trade zone at airport	Facilitate international commerce activities	Application stage to FTZ board
❖ Business park development	Landside airport business development	Preliminary planning
❖ Infrastructure-stormwater	Stormwater plan and infrastructure	Plan and funding in place
❖ Infrastructure -water/sewer	Water/sewer extension to airport	Preliminary planning
❖ Infrastructure -access road	Upgrade/re-construct access road to airport	On VTrans work schedule for 2012

The approach taken here in Newport State Airport improvement planning is one oriented toward placing all of these desired options within a development path context.[13] A

[12] A number of sources were utilized for this process—the aforementioned recent reports on Newport State Airport, other reports on general aviation facilities, and discussions with local and regional officials and business leaders. In addition, a task force was assembled for this study to provide oversight and guidance. Input on these potential improvements was particularly helpful.

[13] What began as an exercise of modeling the economic and fiscal impacts associated with three distinct alternatives to a base case scenario for Newport State Airport has morphed into a community-wide planning process, characterized by three improvement phases along a development continuum. The alternatives were

development path is designed here to be sequential and additive, multi-faceted, cross-functional and comprehensive over a multi-year timeline. Included in this development path are both airside and landside options as well as aviation-support facilities and infrastructure improvements which will collectively increase general aviation, enhance aviation-dependent business activity, and better integrate the airport within the regional economy.

Clearly, a number of these improvement options, such as ground support transportation, business park developments, and aircraft hangar construction, would be considered ineligible as projects for FAA's Airport Improvement Program funding. Still other improvement options, specifically the departure procedures and approached have already been approved and funded by FAA and are pending operational.

As noted in Table 8, both airside and landside developments as well as aviation-support facilities constitute the mix of improvement options currently under consideration at the Newport State Airport. Airside developments include navigational aids, airport operations, and facilities. Landside facilities at Newport include aircraft hangars and aprons, airport terminal, aviation fuel facilities, and automobile parking lots. Aviation-support facilities include the business park development, foreign trade zone designation, and infrastructure improvements.

Given the host of possible improvement options, it is particularly important to consider an implementation scheme that is oriented toward a timeline. Here, the development path is in three integrated phases:

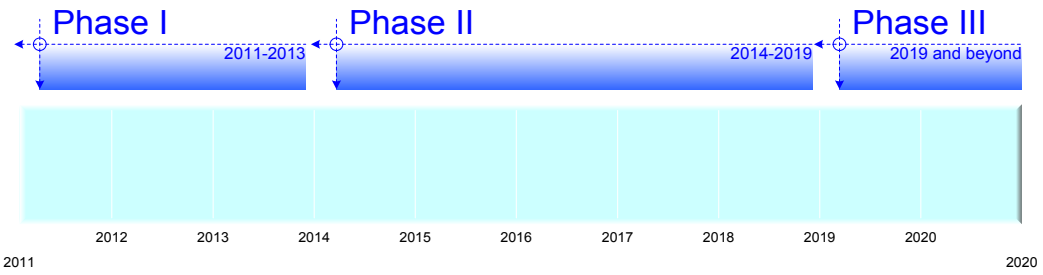
- **Phase I**--an immediate to short-term period (1-3 years) containing such improvements as:
  - navigational aids (i.e., departure procedures, and approach procedures);
  - aircraft ground support (i.e., deicing/anti-icing capabilities);
  - airport operations (i.e., hangar storage space);
  - ground support transportation (i.e., rental car availability; taxi service); and
  - other/infrastructure, namely foreign trade zone designation, and infrastructure improvements (airport access road, and stormwater).

initially centered on runway extension, essential air service, and scheduled air cargo service. While the future growth and development of Newport State Airport is centered on the linchpin of runway extension; the challenge to-date has been in mapping a viable strategy or pathway of "stepping-stones" to increase the likelihood that the runway extension and other needed improvements becomes a reality.

- **Phase II**—a medium term period (4-8 years) containing these improvements:
  - Airport facilities, specifically runway length extension of 1,000 feet; runway surface grooving; terminal building, design and re-build; and additional terminal auto parking;
  - Additional hangar space;
  - Other/infrastructure, including an aviation-related business park, and infrastructure improvements related to stormwater and water/sewer line extension;
  - Customs clearance on-site at the airport; and
  - Air cargo service.
- **Phase III**—a long-term period (9 years and beyond) that feature this proposed improvements under airport services:
  - Essential air service; and
  - Part 139 certificate.

These improvements and proposed implementation timing are shown along a phased timeline (Figure 1). Further discussion on each improvement option is detailed below, with particulars on description, potential cost, timing, and responsible parties.

Figure 1: A phased development path for Newport State Airport



Phase I: Navigational aids—departure procedures. In general, navigational aid projects have a likelihood of providing an economic return in that they support all aviation operations. Instrument departure procedures provide obstruction clearance from the terminal area to the appropriate en route structure; the availability of which is critical for all pilots operating during night and marginal visual and/or instrument meteorological conditions. There are essentially two types of departure procedures—obstacle departure procedures and standard instrument departures—both of which are published textually and graphically. These published departure procedures will provide obstacle clearance protection information for pilots. Standard

instrument departure procedures are currently under production at the Federal Aviation Administration with a stated completion date of May, 2011 for Newport State Airport (K. Gonzalez correspondence, 3 February 2011). These departure procedures will provide enhanced safety for pilots and aircraft at the air facility.

Phase I: Navigational aids—approach procedures. The Federal Aviation Administration is instituting an air navigational aid, called a wide area augmentation system (WAAS) which provides greater navigational accuracy and system integrity and permitting global positioning system to be used for near precision instrument approaches to the airport. Greater precision can only be achieved with the installation of ground-based guidance systems at the airport and with significant cost to installation and operation. The goal of WAAS is improving accuracy and availability to enable all aircraft to rely on GPS for all phases of flight, including horizontal and vertical guidance during approaches to the airport. The accuracy of WAAS would meet or exceed the requirements for Category 1 Instrument Landing System (ILS) approaches, namely, three-dimensional position information down to 200 feet (60 meters) above touchdown zone elevation. Localizer performance with vertical guidance (LPV) represent the highest precision GPS (WAAS enabled) instrument approach procedures available; designed to provide within 16 meters horizontal accuracy and within 20 meters vertical accuracy 95 percent of the time. Newport State Airport is currently in FAA's queue to have such approach procedures published slated for completion by April, 2012 (K. Gonzalez correspondence, 3 February 2011). Likewise, these approach procedures will provide enhanced safety for pilots and aircraft under most weather conditions.

Phase I: Navigational aids—approach light system. Approach light systems provide the basic means for transitioning from instrument flight to visual flight after completing the approach sequence for a landing. Newport State Airport currently has installed a precision approach path indicator (PAPI) and runway end identifier lighting (REIL). A PAPI uses light units to provide visual guidance to pilots as they approach the runway for landing. Such systems have an effective visual range of about 5 miles during the day and up to 20 miles during the night. REILs are installed to provide rapid and positive identification of the runway by using a bright white strobe light to identify the end of the runway. The system consists of a pair of synchronized flashing (or pulsating) lights located laterally on each side of the runway threshold. REILs are particularly effective in identifying the runway during times of reduced visibility. Depending on future improvements at the airport, VTrans may need to add REILs to runway end 18. Approach lighting systems are eligible projects for AIP funding by the FAA. The cost of a REIL system at Newport State Airport would be around $150,000 with an estimated approval process of upwards of six months.

Phase I: Airport ground support—deicing capability. Deicing involves the removal of frost, snow and ice from aircraft surfaces in preparation for flight. Anti-icing refers to the prevention of the accumulation of frost, snow and ice from these same aircraft surfaces. Both deicing and anti-icing operations can be performed at the airport by using mechanical means and through the application of chemical agents. In general, fixed base operators (FBOs) are responsible for aircraft deicing/anti-icing.

The demand for deicing services is limited due to the level of activity and the types of aircraft flown in general aviation airports, which are not approved for flight into known icing conditions. Many general aviation aircraft are stored in hangars overnight and during storm events eliminating the need for deicing. In addition, heated aircraft hangars are sometimes used to deice aircraft.[14] Furthermore, most general aviation aircraft do not fly in weather poor enough to require any significant deicing.

Newport State Airport presently does not have any deicing equipment. The airport currently serves (and more importantly, has the potential to serve) a diverse clientele from across the bi-national region. While leisure fliers are common at the airport, a growing number of business travelers, second-home owners, and seasonal visitors are becoming important user groups as area resorts continue to expand and the regional economy revitalizes. An all-weather general aviation airport that services the increased seasonal visitor demand as well as the year-round business traveler within the region would require having deicing/anti-icing capability in addition to temporary hangar storage.

Although runway length is a significant barrier, especially for jet aircraft, the lack of deicing capability seriously constrains seasonal demand for airport use. According to the National Weather Service in Burlington Vermont, Newport averages 170 days with temperatures below 32°F each year; in addition, measureable snowfall occurs on average 62 days each year.[15] These conditions indicate that de-icing/anti-icing could be utilized for better parts of six months out of every year.

Equipment costs would be in the range of $20,000 to $50,000 for a used deicing truck or unit mounts for standard truck chassis; deicing and anti-icing fluids costs would be paid by fee for services. This deicing/anti-icing capability may be an opportunity for the Newport State Airport to take advantage of potential support from private entities interested in expansion of service at the general aviation facility. The presence of deicing/anti-icing capability at Newport State

[14] Given the temporary hangar storage, anti-icing may still be necessary during certain weather conditions to prevent ice and snow from accumulating on aircraft surfaces during taxiing and takeoff. After leaving the hangar, aircraft are anti-iced by spraying with a small amount of glycol-based anti-icing fluid.

[15] National Weather Service, Forecast Office (Burlington, Vermont). Newport Vermont Climatology. http://www.erh.noaa.gov/btv/climo/stations/newport.shtml

Airport will not only lead to an increase in operations during a significant share of the calendar year but will lead to increase in aviation-related revenues; greater support for existing businesses and seasonal resorts in the area, and provide increased safety during wintry days for both pilots and passengers utilizing the airport.

Phase I and II: Airport Operations—hangar space. Pilots who own and/or fly an aircraft want a hangar to protect their aircraft investment from the elements and keep them readily available for service. However, there often are more general aviation aircraft than available hangars.

Assessing demand is obviously a critical feature to the planning and eventual construction of a new hangar. One gauge for demand is determining the extent of "wait-listing" for hangars. In most cases, such a waiting list indicates demand for local-based aircraft; it does not provide a gauge for temporary storage of aircraft.

Assessing demand for storage hangars requires an understanding of the local economy as well as aircraft activity at the local general aviation facility. In the *2007 Airport Layout Plan Update*, nearly 45 company-owned jets or turboprop aircraft utilized the facilities at Newport State Airport. Many of these companies have operations and/or businesses interests within the region. In addition, the Northeast Kingdom boasts of destination tourism resorts in Jay Peak Ski Resort and Burke Mountain Ski Resort. Tourism is a key and rapidly growing industry driver within the regional economy, with seasonal visitation and second-home ownership are significant components. A percentage of these visitors have the capability to travel to the region via light aircraft; and ready access by air services to increase the relative market strength of the Newport area for travelers.

A new hangar with the capability to temporary store aircraft (up to Category-II aircraft with an approach speed of 131 knots and wingspan of 64' such as Cessna Citation X, Bombardier Challenger 600, and Beechcraft King Air 350) would translate into increased year-round traffic/usage of the airport facility.

In addition, demand for hangar space should again be assessed during Phase II. With increased operations and growth in based aircraft, there may be additional need for hangar space—boxed hangar or T-hangar.

Cost of a new hangar unit is generally estimated in the range of $30-50/square foot; for a slated 7,500 square foot hangar, the build-out cost would range between $225,000 and $375,000.

Phase I: Ground support—rental car availability and on-call/for-hire taxi/shuttle service. Transient aircraft operators and passengers consider ground-based amenities in choosing a general aviation airport. When arriving at an airport like Newport, it is essential for there to be a means of ground transportation for passengers to arrive at their final local destination. While

a shuttle is provided by Jay Peak resort (with 24 hours prior notice) and a courtesy car is available at the FBO for short-term use, there are currently few other options available to travelers using Newport State Airport as an area arriving point.

A key overture for improving accessibility to and from the airport is to secure the provision of ground transport for travelers utilizing Newport State Airport. Options discussed include teaming with a rental car agency to locate at the airport or a local car dealership to place cars at the airport with the FBO acting as an informal agent for the rental car company. Recent discussions with a local car dealership to place rental cars at the airport have been encouraging.

Likewise, a taxi service will also enable airport travelers the means to arrive at their final destination. Although direct public financial support of a for-hire car service is discouraged, a local economic development organization should undertake a feasibility study for a taxi service. Results from such a study could be made available to potential investors/business owners.

Phase I: Other infrastructure improvements—foreign trade zone designation. The Newport City Renaissance Corporation, Northeastern Vermont Development Association (NVDA) and other regional organizations are keen on obtaining a foreign trade zone (FTZ) designation, co-located at the Newport State Airport. In general, a FTZ program can assist economic activity at a designated zone by allowing delayed or reduced duty payment on foreign merchandise as well as other savings. A foreign trade zone can assist businesses reduce production, transaction, and logistic-related costs by lowering effective duty rates, allowing special entry procedures, and encouraging production closer to market. Lowering production costs and thereby increasing competitiveness can encourage investment and create and retain employment opportunities within these local zones.

An application process leading to a "general-purpose" foreign trade zone designation at the Newport State Airport includes a fee ($3,200 for general purpose) and approximately six-to-ten months for approval.[16] The status of this initiative is an application is expected to filed by mid-2011.

Phase I: Other infrastructure improvements—access road to airport. Slated for re-development in Vermont Agency of Transportation's FY2012 road maintenance schedule, the airport access road will support on-going airside and landside developments at the airport. Estimated costs for repairing the access road to the airport are around $125,000 for labor and materials.

[16] Obviously, hundreds of volunteer hours are not included in the transaction fee process; nor are other costs borne by the sponsor(s). Once the FTZ Board (in the International Trade Administration of the US Department of Commerce) grants approval, the operator of the FTZ must apply for activation with the US Customs and Border Protection before merchandise can be received under zone procedures.

Phase I: Other infrastructure improvements—stormwater. Any needed improvements related to stormwater drainage and detention pond will be provided by the owner of Newport State Airport, that is, Vermont Agency of Transportation. VTrans is having stormwater permitting in place in 2011 to allow for approximately six additional private hangars to the north of the terminal area as well as two large corporate hangars to the south of the terminal area.

Phase II: Airport facilities—runway length extension. In general, runway projects—particularly runway extensions—have the highest potential to provide positive economic returns. Runway extensions can open up an airport facility to larger aircraft, which can positively affect the airport operations revenue stream (e.g., fuel sales and ground support services). Furthermore, the extension will spur potential expansion of on-airport business activity and facilitate aviation use by off-airport firms that transport cargo and passengers as well as transient aircraft operators and passengers visiting area resorts and recreational amenities. Findings from prior studies indicate that runway extension projects can help retain existing firms and/or attract new employers to the airport's service area (Wilbur Smith Associates, 2007; Weisbrod, 1991).

The major project supported and recommended by the *2007 Airport Layout Plan Update* (ALPU), the *2009 Newport State Airport Business Plan*, and the principal focus for the 2010 draft environmental assessment is the extension of the primary runway (18-36) at Newport State Airport. Construction cost and timing of the runway extension (and full-parallel taxiway) is about $5.25 million over a three-year period. The period would include the preparation of engineering design studies, an environmental impact statement, and construction activities.

Phase II. Airport facilities--runway surface grooving. The purpose of runway grooving is to lessen hydroplaning on wet runways. Grooving reduces drying time of payment which improves skid resistance for shorter braking distance of aircraft on wet pavement. Grooved surfaces also help to prevent the onset of airplane horizontal drifting at touchdown. Pilots have found that overall ground handling and stopping characteristics on grooved surfaces represent a dramatic improvement over un-grooved surfaces.

Grooving of Runway 18-36 at Newport State Airport should be considered as an important factor in attracting an increased level of corporate and business aircraft as well as scheduled or charter passenger aircraft; and in increasing safety. Most likely, runway surface grooving would occur during the runway extension construction project. According to FAA Advisory Circular 150/5320-12C, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces, the "grooving of all runways, serving or expected to serve turbojet aircraft, is considered high priority safety work and should be accomplished during initial construction. Such existing runways without grooving should be programmed as soon as practicable." Estimated costs of grooving the runway surface as part of the construction activity are about $75,000.

Phase II: Airport facilities--terminal building design and re-build. Although there is a high correlation between investment in terminal buildings at commercial passenger service airports and economic return; such a correlation is not strong at general aviation facilities. Nonetheless, there is a connection between improved/new terminal facilities and economic returns related to tourism in the region. Terminal facilities, such as a pilot lounge and restaurant, can generate some minor on-airport employment by attracting increased business use.[17]

According to Vermont Agency of Transportation personnel[18], construction of a new terminal facility would cost between $400,000-$500,000 over a nine-month period (including design, permitting, and building).

Phase II: Airport facilities—additional parking. With a new and expanded terminal building, it is likely that additional parking space will be required to meet increased use. The parking for an additional twenty automobile spaces would cost approximately $25,000 and would be completed during the terminal building construction.

Phase II: Other infrastructure improvements—aviation-related business park. There are a number of airport-related projects that fit into the building category. Hangar projects, for instance, exhibit a lower propensity to generate economic return (in terms of new jobs and/or additional economic activity). An aviation-related business park situated at the airport can generate significant economic returns.

A feasibility study would be required to determine the need for developing a business park at Newport State Airport. Such a study would assess the major constraints and estimate the impact of various potential development scenarios for the business park, and then refining estimates and assessing strategies in developing and marketing the business park.

For purposes of this study, an aviation-related business park with 20,000 square feet of space (costing $800,000 to build) is considered. Development of a business park presupposes that uses would be compatible with state and local regulations along with FAA regulations. Business park development also presumes that necessary utility and related infrastructure requirements (including water and wastewater service) will be available on-site.

Again, for specific purposes of this study, four aviation-related businesses employing a combined total of 100 employees will locate at this newly developed business park.

[17] One issue for consideration regarding the design-build of a new terminal facility is the inclusion of space considerations associated with commercial passenger service, namely a ticketing counter, office space for airline, and space for Transportation Security Administration (TSA) inspections.

[18] Personal communication on February 16, 2011 with Jason Owen, Aviation Project Manager, Vermont Agency of Transportation.

Phase II: Other infrastructure improvements—water/sewer line extension. Required for additional aviation-related business development at Newport State Airport are water and wastewater services. Extending the existing water/sewer line along Airport Road from Route 5 to service the airport area is estimated to cost $1.25 million over a five month period. Included in the cost estimate is a pumping station, pipe and materials, and labor associated with trenching.

Phase II: Airport services--scheduled air cargo service. Regular air cargo service is a result of increased regional economic activity and associated demand for goods and services; as well as the overall industry mix within the region. Growth in regional economic activity, particularly of those businesses that serve out-of-region markets, will be the key attribute in gaining air cargo service out of the Newport State Airport.

Phase II: Airport services—customs clearance on site. The Northeast Kingdom is a prime destination for travelers from eastern Canada. According to local economic development officials, a sizeable share of the vehicles on local highways has Canadian license plates. Additionally, a share of the new homes at Jay Peak and Burke Mountain ski resorts are expected to be purchased by Canadians. Currently, Burlington International Airport is the only airport of entry providing US Customs & Border Patrol services to aircraft engaged in cross border traffic to and from Vermont. In order to attract Canadians to utilize their aircraft to travel to their part-time homes, a partnership between the State of Vermont and US Customs & Border Patrol (CBP) should be pursued. How might this partnership look? Eventually, a CBP agent may be regularly present at Newport State Airport, particularly with anticipated growth within the foreign trade zone. An interim situation might have a CBP agent drive to the airport from the land border crossing at Derby Line to provide clearance for private aircraft arriving from Canada. Such an alliance would be an additional marketing point for resorts as well as businesses that may want to bring in employees and visitors from Canada.

Phase III: Airport services—Essential Air Service. Prior to the Airline Deregulation Act (ADA) of 1978, 746 communities in the United States and its territories were listed on air carrier certificates issued under section 401 of the Federal Aviation Act of 1958. Before deregulation, air carriers operating certificates for most of these communities required carriers to schedule and provide two daily round trips at each point of their certificates.[19] To address concerns that some communities may no longer be served under deregulation, Congress was prompted to add section 419 to the Federal Aviation Act, which established the Essential Air Service (EAS) program. Today, the Essential Air Service program is administered by the US Department of

[19] Newport, Vermont was one of these 746 communities; Newport was serviced by Delta Airlines from 1968 through 1975. US Department of Transportation, Office of Aviation Analysis. http://ostpxweb.dot.gov/aviation/x-50%20role_files/originaleascommunities.pdf

Transportation, ensuring that smaller communities would retain a link to the national air transportation system, with Federal subsidy if necessary.

Under this program, the US Department of Transportation (USDOT) determines the minimum level of service required at each eligible community by specifying a hub through which the community is linked to the national network, a minimum level of round trips and available seats that must be provided at that hub, certain characteristics of the aircraft utilized, and the maximum number of intermediate stops to the hub. Where necessary, USDOT pays a subsidy to the carrier to ensure that a specified level of service is provided; however, most eligible communities do not require subsidized service. As of September 1, 2010, USDOT was subsidizing service at 109 communities in the contiguous 48 states, Hawaii and Puerto Rico; and 45 communities in Alaska. The Southern Vermont Regional Airport at Rutland has been in the EAS program since 1990.

Given the current situation with the Essential Air Service program and the existing economic situation that limits the growth of EAS flights, it is unlikely that Newport will be able to obtain Essential Air Service designation. In order to gain service, the State of Vermont would need to provide sufficient information that demonstrates to an air carrier that servicing Newport State Airport is economically viable for the airline, without a subsidy, on either a regular, seasonal, or charter basis. In addition, the State would need to review the required airport-related improvements (presumably those improvements related to ground support, terminal building and associated parking).

A recommended step (mentioned in the 2009 *Business Plan* report) is for Vermont Agency of Transportation to apply for a Small Community Air Service Development (SCASD) grant from FAA to determine the viability of passenger air service for the Northeast Kingdom. Such a study would help determine the air service needs for residents and businesses in the region and the types of aircraft along with seasonal frequency to better mark out a pathway for success.

Phase III: Part 139 Certification. Federal Aviation Regulations Part 139 specifies certification and operational requirements for airports serving scheduled air carrier operations in aircraft designed for more than 9 passenger seats but less than 31 passenger seats. FAA mandates aircraft rescue and fire fighting (ARFF) services at all US airports that have scheduled passenger air carrier operations. An index is assigned to each FAA Part 139 certificate holder based on a combination of the air carrier length and average number of daily departures; such an index determines the required number of ARFF vehicles and required amount of extinguishing agents. For instance, Newport State Airport in obtaining its Part 139 certificate would be assigned to the A index—based on aircraft length of less than 90 feet (or 27 meters) and less than 5 daily departures. Under Index A, the aircraft rescue and firefighting equipment and agents would be: one vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean

agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of aqueous film-forming foam (AFFF) to total 100 gallons for simultaneous dry chemical and AFFF application.

Meeting the ARFF mandate for Newport State Airport would require significant costs: an on-site fire station, an ARFF vehicle, and firefighter equipment and training. Annual operating costs associated with plant & equipment and personnel (salaries and benefits and recurring training) would vary depending upon the level of operation (24 hours/7days versus 16/7 versus 12/7) and rapid response requirements.

4. General aviation airports and economic development

General aviation airports and local economic development are rarely mentioned together. In contrast to commercial airports in metropolitan areas, which are often viewed as catalysts for regional economic growth and development, most general aviation airports have played an unexceptional role within the local economy. Seemingly unconnected to local business activity and not a significant factor in business expansion and location, general aviation airports typically have a subdued economic presence within their respective regions.

Attribution is the key word in assessing the impact and role of general aviation airport. The ability of general aviation airports to retain and attract new businesses (and their associated employment and wages) is often used to justify public investment. But such a notion—stimulating regional economic development by investing in airport infrastructure—is neither supported by evidence nor by economic principle. While transportation is an essential underpinning in support of the operation of a market economy, airport infrastructure does not stimulate local economic development nor does local economic development stimulate airport investment. Rather, both are stimulated by regional increases in the demand for goods and services. In other words, rising demand for goods and services stimulates economic development and airport infrastructure investment, which is the facilitator of the movement of goods and services. General aviation facilities must be viewed in this light, as facilitators of growth not the source of growth.[20]

Are general aviation airport investment and local economic development directly tied? Much of the previous research in this area has been largely oriented toward commercial airports. In order to attribute economic activity associated with general aviation development, one has to ascertain the net benefits generated as a result of maintaining or improving an airport compared to a base case of not maintaining or improving that airport or even closing the airport altogether. Such a measure has three components: (1) local economic activity generated as a result of business expansion attributable to increased direct user spending at the airport and in the greater airport area (as well as from indirect and induced business growth); (2) local economic activity generated as a result of additional jobs due to new business attraction, made possible by airport improvements; and (3) additional value of those user benefits (time and cost savings) associated with accessibility.

In general, initial investment in general aviation infrastructure will have short-term, transient effects within the regional economy related to its capital budget. Undertaking a capital improvement plan at a general aviation facility will undoubtedly have regional economic implications. For instance, extending an airport runway is a significant construction project,

[20] Transport infrastructure of all kinds must be viewed as supportive not causal of economic development.

employing dozens of workers and requiring materials and supplies for its duration. Beyond this construction phase is the more challenging portion of the analysis; namely to identify, quantify and substantiate the economic development effects related to the airport's capital budget. Quantification of potential economic development effects should identify—to the extent possible—which existing industries or specific firms are anticipated to grow and which new industries/firms will locate in the airport's regional service area.[21]

Investment in general aviation facilities, particularly as illustrated in this development path scenario for Newport State Airport, underscores a fundamental shift in an airport's role within the region's economy. The investment in slated improvements represents a change in orientation from largely a recreational-based facility to one with a mixed user base that is integrated more closely to the regional economy. Rotorcraft and turbine jet aircraft—increasingly common for business-oriented and charter operations—will become the visible effects from undertaking these improvements at the Newport State Airport.

Nationwide, general aviation activity continued to decline in 2010; general aviation operations have been in the doldrums for much of the previous decade (FAA, 2011). According to the General Aviation Manufacturers Association (GAMA, 2010), US manufacturers of general aviation aircraft have had four consecutive years (2007-2010) of declining shipments. Most analysts expect economic recovery to strengthen in2011. If recovery takes hold, GAMA expects that used aircraft inventory reductions will accelerate with subsequent gains in airplane order books, increased flight activity, job creation, and greater economic prosperity (GAMA, 2011). Like most general aviation facilities within an economic recovery, Newport State Airport will experience increased demand from flight activity and a growing number of resident aircraft.

According to FAA's latest aerospace forecast, growth in general aviation operations and aircraft will be modest over the next two decades (2011-2031). General aviation hours flown are forecast to increase 2.2 percent per year on an average annual basis. Fixed-wing turbine aircraft hours flown are slated to grow at a rate of 4.0 percent per year; fixed-wing piston aircraft (the prominent recreational-based aircraft) hours flown will grow at a rate of 0.7 percent per year; and rotorcraft hours flown will increase at a rate of 3.0 percent per year. General aviation fleet increases over the 2011-2031 forecast period shows a similar pattern. While the general aviation fleet will grow an average of 0.9 percent a year over the forecast period; the fixed-wing turbine aircraft and rotorcraft fleets will grow at a rate of 3.1 percent and 2.8 percent per year respectively. Fixed-wing piston aircraft will grow at annual rate of 0.2 percent (FAA, 2011). The proposed set of improvements at Newport State Airport recognizes

[21] In addition to these direct economic development effects, an economic inter-industry model is generally used to estimate the total economic impacts associated with each phase—construction and operation.

that future growth in general aviation activity will occur in rotorcraft and turbine jet aircraft as opposed to piston-powered aircraft.

5. Northeast Kingdom regional economy and users of Newport State Airport

The Northeast Kingdom of Vermont is a three-county region comprised of Caledonia, Essex, and Orleans counties, located in the northeast corner of Vermont. The area is bounded by the Connecticut River to the east, corresponding with the Vermont/New Hampshire border and by the Canadian Province of Quebec to the north.

The 2,013 square mile region hosts a population of 64,764, according to the 2010 Census, which amounts to a population density of approximately 32 people per square mile; Vermont as a whole has a population density of approximately 67 people per square mile.

Table 9. Population change in the Northeast Kingdom, 2000-2010

	1990	2000	2010	2000-2010 Absolute Change	2000-2010 Percent Change
Vermont	***562,758***	***608,827***	***625,741***	***16,914***	***2.8%***
Northeast Kingdom	***58,304***	***62,438***	***64,764***	***2,326***	***3.7%***
Caledonia County	**27,846**	**29,702**	**31,227**	**1,525**	**5.1%**
St. Johnsbury	7,608	7,571	7,603	32	0.4%
Lyndon	5,371	5,448	5,981	533	9.8%
Hardwick	2,964	3,174	3,010	-164	-5.2%
Danville	1,917	2,211	2,196	-15	-0.7%
Burke	1,406	1,571	1,753	182	11.6%
Barnet	1,415	1,690	1,708	18	1.1%
Essex County	**6,405**	**6,459**	**6,306**	**-153**	**-2.4%**
Lunenburg	1,176	1,315	1,302	-13	-1.0%
Concord	1,093	1,209	1,235	26	2.2%
Brighton	1,562	1,260	1,222	-38	-3.0%
Canaan	1,121	1,078	972	-106	-9.8%
Orleans County	**24,053**	**26,277**	**27,231**	**954**	**3.6%**
Derby	4,479	4,604	4,621	17	0.4%
Newport City	4,434	5,005	4,589	-416	-8.3%
Newport Town	1,367	1,511	1,594	83	5.5%
Craftsbury	994	1,136	1,206	70	6.2%
Coventry	806	1,014	1,086	72	7.1%
Jay	381	426	521	95	22.3%

Note: Northeast Kingdom is comprised of Caledonia, Essex, and Orleans counties. Population for selected towns and cities are shown.
Source: US Census Bureau, 2011.

Two of the fastest growing towns during the last decade were the resort communities of Jay and Burke. Related, seasonal residence is a significant feature to the Vermont landscape. In the Northeast Kingdom, second-home ownership is very high and growing, with new developments occurring around the resorts at Jay Peak and Burke Mountain.

Table 10. Covered employment in the Northeast Kingdom, 2001-2009

Sector	2001	2003	2005	2007	2009	Percent Change 2001-2009
Total employment, private and public	***22,900***	***22,364***	***23,108***	***23,183***	***22,136***	***-3.50%***
Private	***18,771***	***18,183***	***18,663***	***18,601***	***17,499***	***-7.30%***
Goods producing	6,485	5,544	5,768	5,534	4,694	-38.20%
Natural resources & mining	421	322	358	334	439	4.10%
Agriculture, forestry, fish & hunt	400	310	343	316	424	5.70%
Construction	1,316	1,351	1,480	1,415	1,253	-5.00%
Manufacturing	4,748	3,871	3,931	3,784	3,003	-58.10%
Durable goods	3,636	3,102	3,099	2,994	2,380	-52.80%
Non-durable goods	1,112	769	832	790	623	-78.50%
Service providing	12,286	12,638	12,895	13,067	12,805	4.10%
Trade, transportation & utilities	4,201	4,161	4,310	4,381	4,189	-0.30%
Wholesale trade	455	549	570	545	481	5.40%
Retail trade	3,049	2,927	3,049	3,168	3,094	1.50%
Transportation & warehousing	599	582	626	602	554	-8.10%
Utilities	98	103	65	65	59	-66.10%
Information	390	374	412	381	324	-20.40%
Financial activities	669	698	734	767	703	4.80%
Professional & business services	680	766	820	917	1,036	34.40%
Education & health services	3,669	4,018	3,882	4,037	4,110	10.70%
Leisure & hospitality	1,944	1,959	2,061	1,939	1,869	-4.00%
Arts, entertainment & recreation	130	142	173	308	309	57.90%
Accommodation & food services	1,814	1,816	1,888	1,631	1,559	-16.40%
Other services, ex. public admin.	733	662	676	646	576	-27.30%
Government total	***4,129***	***4,181***	***4,445***	***4,582***	***4,636***	***10.90%***
Federal government	368	432	441	442	493	25.40%
State government	939	931	1,036	1,135	1,084	13.40%
Local government	2,822	2,819	2,968	3,005	3,059	7.70%

Note: Northeast Kingdom consists of Caledonia, Essex, and Orleans counties. Due to confidentiality issues, data was aggregated to the three-county region.
Source: Vermont Department of Labor

The economy of the Northeast Kingdom is historically based on goods production—natural resource-based industries of agriculture and forestry; construction; and manufacturing; as well as the natural resources oriented industry of tourism. In 2009, employment in the three-county region totaled 22,140 workers, slightly less than its 2001 employment levels (Table 10).

Like most areas of Vermont, the Northeast Kingdom saw reductions in employment and increased unemployment rates over the course of the most recent business cycle (2001-2009). Goods production industries, particularly companies within manufacturing sectors slumped during the decade. In contrast, service-providing industries fared better during the period with robust countercyclical growth in professional and business services, education and health services and arts, entertainment and recreation. The latter sector of entertainment and recreation underscores the growing economic importance of tourism to the Northeast Kingdom. Another important contributor to the regional economy is government; throughout the decade, all levels of government added employees and provided a stabilizing effect to the regional economy, particularly during the recession of 2007-2009.

Major employers in the Northeast Kingdom can be found in a variety of industries—health care, furniture-making, fabricated metals and machinery manufacturing, administrative and support, education, finance, food products, and tourism (Table 11).

Table 11. Major employers in the Northeast Kingdom

Employer	Industry	Location	Employment
North Country Health System	Health care	Newport	450
Ethan Allen	Furniture/Wood products	Orleans/Beecher Falls	450
Jay Peak Resort	Tourism	Jay	400
Catalog Retail Marketing Int.	Administrative & support	Newport	350
Weidmann Electrical Technology	Electrical transformer mfg.	Lyndonville	300
Kennametal	Fabricated metals	Lyndonville	260
NSA Industries	Fabricated metals	Lyndonville	200
Northeastern VT Regional Hospital	Health care	St. Johnsbury	200
Lyndon State College	Higher education	Lyndonville	180
Tivoly	Fabricated metals	Derby Line	150
Burke Mountain	Tourism	East Burke	150
Community National Bank	Commercial banking	Lyndonville	135
Vermont Aerospace	Machinery manufacturing	Lyndonville	130
Fairbanks Scales	Machinery manufacturing	St. Johnsbury	125
Maple Grove Farms of Vermont	Food products	St. Johnsbury	125
Passumpsic Savings Bank	Commercial banking	St. Johnsbury	125

Sources: *Vermont Business Magazine* (various issues); Northeastern Vermont Development Association (NVDA).

User groups at Newport State Airport

Like many other general aviation airports, Newport State Airport caters to a wide variety of user groups—both private and public. Private user groups range from individuals utilizing the airport for recreational flying and flight training and local businesses and corporations using the airport for business-related activities to non-local private individuals and businesses/corporations utilizing the airport to access nearby attractions (such as regional resorts) and businesses. Public user groups include various agencies from all levels of government (e.g., US Customs & Border Protection; US Department of Agriculture; Vermont Agency of Transportation; Vermont Department of Corrections) as well as military use (e.g., Vermont Army National Guard).[22]

Proximity to an airport is an important factor for businesses considering an expansion or relocation of their operations. Accessibility to nearby attractions is also an important determinant of utilizing an airport. Aviation activity is contingent on the nature and quality of airside facilities as well as landside and aviation-support facilities.

What are these user groups? Private user groups at Newport State Airport include the following:

- Transient pilots and aircraft operators
- Charter airplane pilots and/or operators
- Small business owners
- Large corporations
- Area recreational pilots and aircraft operators

Transient users. This group includes nonresident users of recreational activities (e.g., skiing, golfing, mountain biking, hiking) at regional resorts (e.g., Jay Peak, Burke Mountain) or access to second homes who flies into Newport via private aircraft. Lack of localizer performance with vertical guidance (LPV) will limit utilizing the airport in times of marginal weather. Lack of adequate deicing at the airport limits landings during portions of the year, especially the winter season. Ground transportation via shuttle may be provided by Jay Peak Resort, but currently there are no other ground transportation options within the area, particularly for those traveling to their second homes. A hanger for temporary storage also provides the nonresident traveler with security and protection from the elements during his/her vacation. Getting to, staying in and getting out of the Northeast Kingdom in a timely and safely fashion are prime

[22] Military operations represent approximately 2.4 percent of total annual operations at Newport State Airport; additional public use may bring the share to about 5 percent. Acknowledging there are economic implications of public sector use of the general aviation facility, our focus for economic analysis purposes is on private user groups.

considerations of this user group. They are typically small business persons or professionals with business and family schedules to consider. The lack of a US Customs & Border Patrol (CBP) agent to process passengers on incoming flights from Canada requires the Canadian national to first travel to Burlington International Airport for processing prior to landing at Newport State Airport.

Charter airplane pilots/operators. Charter pilots and operators are concerned about customer and aircraft resources scheduling. Aircraft and crew time are key cost elements in their business model. Their customers are driven by the same considerations of time and convenience as are private transient users. Charter operators are concerned about air safety factors and FAA regulations governing air charter operations. Getting to the airport requires approved approach procedures, adequate runway length and condition and ground support to efficiently take care of passengers, air crews and aircraft while on the ground. Charter operators remain financially viable by keeping aircraft in-service so rapid turnaround times and adequate ground support is important to this user group. Fractional owners (e.g., Netjets®) operate in a similar manner under different FAA regulations but have the same motivations.

Small business owners. Small business owners are a class of transient (although some may be based at Newport State Airport) and are similarly motivated. To a small business owner an aircraft is a business asset used to improve business efficiency by quickly moving key people to and from locations where they are needed; obtain needed supplies and materials to supplement supply chains; and provide greater access to markets for business products and services.

Large corporations. A composite group of charter airplane pilots and small business owners using company-owned fixed-wing turbine aircraft or rotorcraft. Company-owned and piloted aircraft operate subject to FAA regulations and have similar motivations comparable to charter operators and small business owners.

Recreational users. Area recreational users are typically motivated by avocation as opposed to vocation. A typical recreation user may have a history with aircraft as an occupation or as a business person and wishes to maintain that contact in their personal life. Much like there are boat, car, or golf enthusiasts there are aircraft enthusiasts. These folks choose to spend money on and around airplanes. Many retired folks or business persons enjoy spending time with their airplane. They find reasons to fly and spend their time and resources supporting their "sport."

For purposes of the analysis, pro forma of expenditure information has been developed for four of these user groups—two types of transient users, charter airplane pilots/operators, and a composite-business group. The first three groups are tourism-oriented, with visits to either regional resorts or second homes in the area. The fourth group is business-oriented; users have

regional business interests (e.g., branch operations, significant customer) and fly into Newport State Airport via charter pilot/operator or company-owned aircraft. For each user group, aircraft-related and visitor/business-related expenditures were developed. These aviation-related expenditures are subsequently used as inputs in a regional economic modeling framework to ascertain the overall economic effects within the Northeast Kingdom. Ultimately, the increased aviation operations can be traced back to the set of improvements made at Newport State Airport. These pro formas are provided in tabular format in Appendix A.

6. Economic analysis modeling framework for Newport State Airport

Economic and job creation impact modeling related to improvements at the Newport State Airport was performed using the Regional Dynamics Economic Analysis Model (hereafter "REDYN") to determine the economic and employment impacts associated with the proposed airport improvements. The REDYN model is the newest and most complete of the advanced input-output models available today. It has been used to assess the net job impacts and other economic benefits associated with development projects, the impact of new businesses, policy analyses and the impact of utility power projects in various states. More than three dozen of these impact assessment analyses have been completed by Economic & Policy Resources, Inc.

Data sources

Much of the relevant capital budget information and pro forma data was obtained from aviation experts. The data provided included a construction timeline and general construction cost estimates associated with the slate of improvements at Newport State Airport. Estimated construction costs were further subdivided into "hard construction" associated with actual building (labor, materials and supplies) and "soft construction" related to design and engineering and management.

Pro formas of four major non-recreational user groups (transient users/visitors, charter operators, and business-oriented users) were estimated based on information provided by aviation experts. Expenditure data found in each of these pro formas were then aggregated/expanded to groups of 100 parties (transient users, charter pilots/operators, business-oriented), based on slated improvements made operational at Newport State Airport.

Information provided for the aviation-oriented business park is based on national ratio data obtained from the US Census Bureau and US Bureau of Economic Analysis for business operations in selected industries. Possible business operations were taken from such industry sectors as other wood products manufacturing (NAICS 32199); sporting and athletic goods manufacturing (NAICS 33992); aircraft maintenance and repair (NAICS 48819); and other warehousing and storage (NAICS 49319). These operations were selected only for illustrative purposes. A more in-depth market analysis of appropriate and viable business activities housed at the aviation-oriented business park is strongly recommended.

Each of these main information sources—capital budget of slated improvements, non-residential user groups of the Newport State Airport, and resident businesses in the aviation-related business park are directly tied to the three development phases respectively. For instance, the capital budget associated with the improvements for Newport State Airport can be found in Table 12. Through the first two phases, the total estimated capital budget totals

$8.845 million. Costs associated with Phase III improvement options—essential air services and part 139 certification, have not been estimated.

Table 12. Estimated capital costs for Newport State Airport (in $000)

	Phase I			Phase II					Phase III		
Improvement option	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 10+
Phase I											
NAVAIDS	$50										
Approach light systems		$150									
Ground support	$20										
Ground transport support											
Hangar space	$300										
Access road		$125									
Infrastructure--stormwater											
Foreign trade zone designation											
Phase II											
Runway length extension			$225	$2,750	$2,150	$125					
Runway grooving					$75						
Terminal--design & rebuild					$125	$375					
Additional parking					$25						
Hangar space						$300					
Business park							$400	$400			
Infrastructure--sewer/water							$650	$600			
Air cargo service											
Customs clearance											
Phase III											
Essential air service											
Part 139 Certification											
Total, annual	**$370**	**$275**	**$225**	**$2,750**	**$2,375**	**$800**	**$1,050**	**$1,000**	**$0**	**$0**	**$0**

The Regional Dynamics Economic Analysis Model [REDYN]

The internet-based REDYN Model is the newest and most advanced input-output model available. It was developed by Regional Dynamics, Inc. currently of Storrs, Connecticut, through its principal creator, the late Thomas Tanner, Ph.D., a former model manager at Regional Economic Models Inc. (known as REMI) of Amherst, Massachusetts. Dr. Tanner was a former member of the faculty at University of Georgia, and most recently of The Strom Thurmond Institute of Government and Public Affairs at Clemson University until the time of his death in May of 2009. Dr. Tanner's work experience at REMI gave him the expertise to create an

alternative model to the REMI model. The result is a dynamic input-output model which has significant advantages over the existing menu of off-the-shelf input-output model choices: REMI (Regional Economic Models, Inc. of Amherst, MA), IMPLAN (which is maintained by the Minnesota IMPLAN Group, Inc. which was originally developed for the U.S. Forest Service), and RIMS II regional multiplier matrix (which is maintained by the U.S. Department of Commerce).

The REDYN Model employs a concept known as New Economic Geography, a theory first developed by Nobel Laureate Dr. Paul Krugman while he was at the Massachusetts Institute of Technology. This philosophy employs "fully generalized equilibrium" models that "derive aggregate behavior from individual maximization." This competitive framework is further translated into a model that makes the assumption that "commodities produced by an industry are truly joint in the production process, as dictated by a uniform production function for all firms in each industry based on competitive pressures to diffuse advantages quickly across all firms in an industry."

New Economic Geography also focuses on agglomeration economies and their inter-relationships in different levels of geographic space.[23] To illustrate this, consider a tight group of commercial establishments configured as a mall. This is the smallest level of an agglomeration economy. It is related to the local commercial market which is part of the regional and national market and ultimately the world market. It is the linkages between these levels of economic agglomeration that New Economic Geography seeks to explain and illustrate.

REDYN data sources

The REDYN Model uses a variety of source data provided by U.S. Government entities. The basis for the model is the North American Industry Classification System (NAICS) to the five digit level. This allows the model to provide detail for 703 industries and over 180 commodities for the geographic region specified in the model. This classification system and level of detail makes REDYN's output more compatible for comparison to government reported statistics as this is the system used for publishing economic data by the U.S. Department of Labor's Bureau of Labor Statistics (BLS), the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) and the U.S. Census Bureau. These government bureaus provide the original data that is accumulated and transformed into the REDYN Model's input-output (e.g. multipliers) and other specified relationships.

The U.S. Census Bureau's *County Business Patterns* data is the source for wage bill, payroll and employment data used in the model. The model's developers preferred this approach since it is

[23] Agglomeration economies refer to circumstances where economic units, although competing, find it mutually advantageous to co-locate or to locate sufficiently close enough to share production resources and/or customers.

an annual series that is more complete in its coverage of the workforce than the *Quarterly Census of Employment and Wages* (hereafter "QCEW") series, as it includes self employed persons, employees of private households, agricultural production workers, and railroad workers. These workers are not "covered" by most state unemployment insurance systems and are therefore not reported in the QCEW series.

County Business Patterns also is preferred because it provides detail about employment and wages down to the zip code level where concentration of industry is high enough to provide reportable data. The suppression of data due to confidentiality issues is a common problem of all types of wage and employment data used in specifying input-output models. REYDN has developed a way to fill in the blanks called method row-and-column sum (RAS).

After performing the RAS analytics on the *County Business Patterns* data it is reconciled with Regional Economic Information System (REIS) data from the Bureau of Economic Analysis of the U.S. Department of Commerce to confirm consistency. The REIS data is especially helpful for providing data in the agriculture and governmental sectors. The REIS data is also used to allocate national consumption to the more than 3,000 counties in the United States that is provided on the aggregate level by the National Income and Product Accounts (NIPA). The levels of consumption of industries and households are a key building block in the creation of input/output models.

The input-output tables themselves are created using BEA input-output (IO) make and use tables. The data in these tables are augmented by the biennial ten-year IO forecast tables from the Bureau of Labor Statistics. A major difference between the REDYN model and other input/output models is its use of a new distance impedance database supplied by the Oak Ridge National Laboratory. This allows the REDYN Model to add elements of trade flow and gravity theory based on distance impedance specific to road, rail, water, air and proxy transport. The combination of these data sources gives the REDYN model the power to predict with greater accuracy than ever before the economic impacts of a wide range of economic stimuli.

Model specifications

Model inputs

The modeling of economic impacts can be conducted from the supply side or the demand side of the economic equation. When modeling the economic impacts associated with the supply, one captures the direct, incremental increase in employment or wages and looks to determine the economic linkages associated with the increase. A demand side approach captures the additional spending expected to occur in the economy due to a development project, and the model would estimate the resulting employment impacts.

In this case, a demand-side approach was taken and the incremental spending in the economy was modeled in order to estimate the economic and job creation impacts related to the following:

- Phase I: Construction of improvements at Newport State Airport;
- Phase II: Increased use of airport as a result of improvements in place; and
- Phase III: Occupancy of aviation-oriented business park

Spending profiles for traveler groups, resort visitors and second-home owners, were developed based on the Vermont Department of Tourism and Marketing's 2009 benchmark study (Economic & Policy Resources, 2010). Assumptions about the spending profiles and party-size and trip duration were carefully developed and adjusted to capture expected spending levels associated with higher income visitors with an annual household income of at least $100,000. This coincides with the aircraft owners and aviation users, and is consistent with household income demographics for "high end" resort facilities and second-home owners.

Description of the Economic Model Geography

In order to complete this economic and job creation impact analysis, an impact model was constructed for the Northeast Kingdom region. The model consisted of three regions: (1) the Northeast Kingdom of Orleans, Caledonia, and Essex; (2) the rest of the State of Vermont; and (3) the balance of the United States. The sum of the impacts at the regional level, the state level and the balance of the U.S. represent the total U.S. impact. The use of REDYN model allowed for flexibility in analyzing the economic impacts by geographic region, for the NEK region, the state of Vermont and the U.S. overall, but also down to the county level for some of the quality control calculations that were done at various stages of the study.

7. Economic assessment of development phases at Newport State Airport

The REDYN model captures the economic linkages associated with the estimated new or incremental spending in the regional economy associated with these three development phases centered on Newport State Airport. This incremental spending (increase in final demand) and the associated business activity in the region will create and sustain employment, net of any off-setting job displacement due to competitive pressures on already existing businesses in the regional economy. Consideration was given to the potential for job displacement within the economy of the proposed development phases and this was accounted for in the economic and job creation impact modeling.

Phase I—Construction of improvements at Newport State Airport

Construction activity associated with improvements at the Newport State Airport will lead to additional jobs and associated wages and increased output in the Northeast Kingdom and beyond to the rest of Vermont and the remainder of the United States (Table 13).

Table 13. Summary of economic impacts for phase I—construction of improvements

Timeline	2011	2012	2013	2014	2015	2016	2017	2018
Model inputs								
Construction, output ($2011, 000s)	$267.0	$106.2	$33.8	$2,420.0	$2,090.8	$440.0	$660.0	$660.0
Prof. services, output ($2011, 000s)	$33.0	$18.8	$191.2	$330.0	$285.0	$60.0	$90.0	$90.0
Model output								
Northeast Kingdom								
Output ($2011, 000s)	$501.5	$202.4	$340.8	$4,245.1	$3,425.3	$293.7	$1,075.1	$1,050.0
Wages ($2011, 000s)	$293.8	$120.0	$210.9	$2,504.0	$2,016.5	$172.5	$630.3	$614.3
Jobs	8.4	3.4	6.6	68.1	53.9	4.5	16.3	15.7
Rest of Vermont								
Output ($2011, 000s)	$47.0	$18.9	$30.5	$398.1	$321.0	$27.4	$100.6	$98.1
Wages ($2011, 000s)	$20.5	$8.2	$13.5	$173.3	$139.5	$11.9	$43.6	$42.5
Jobs	0.4	0.2	0.3	3.6	2.9	0.2	0.9	0.8
Total, US economy								
Output ($2011, 000s)	$1,620	$618	$1,032	$14,528	$11,695	$914	$3,585	$3,492
Wages ($2011, 000s)	$692	$267	$458	$6,144	$4,943	$391	$1,516	$1,476
Jobs	15.3	5.9	10.8	128.0	101.4	8.0	30.3	29.0

Source: Economic & Policy Resources, Inc.

Economic impacts will vary year-by-year based on the schedule of improvements and the estimated capital budget as shown in the above table. For instance, the estimated direct cost of improvements (split between commercial & institutional building construction and

professional & technical services) associated with hangar construction is expected to total $300,000 in 2011. Indirect economic activity will result in related industries from which supplies and inputs are required. Such materials, supplies and inputs will be obtained from businesses within the Northeast Kingdom, in the rest of Vermont and the remainder of the United States. In addition to these direct and indirect economic effects are those changes (called "induced") due to spending on goods and services by employees in these affected industries. Thus, the total economic change in the Northeast Kingdom from hangar construction is estimated at $501,500 (i.e., total value of output); and consists of the initial direct change, the indirect impacts, and finally these induced effects. Economic activity can likewise be measured in jobs and associated wages. For 2011, total estimated jobs and wages in the region associated with hangar construction is 8 jobs with $293,800 in labor earnings.

Construction activity is expected to occur over an eight-year period with peak economic activity associated with building the airport runway extension. Slated to begin in earnest in 2013 with the approval of various required design and planning documents (e.g., environmental impact statement, permits), much of the runway extension construction is expected to occur in the following years of 2014 and 2015. During that period, the construction activity will create a total of 68 jobs with labor earnings of $2.50 million (2014) and 54 jobs and labor earnings of $2.02 million (2015) within the Northeast Kingdom.

Phase II—Increased visitor and business use of Newport State Airport

It is expected that the array of improvements put into place at Newport State Airport will result in increased usage of the general aviation facility. For instance, it is widely recognized that an extended runway would not only lead to increased activity at the airport, but would enable larger aircraft (turbojet and turboprop) to use the facility. In other words, the magnitude and mix of usage would change. Questions arise as to how much aviation usage would increase with the runway extension? Would the business traveler and the resort visitor/second-home owner become more common users of the general aviation facility? Although various usage scenarios could be forecasted, a more useful alternative is to focus on the potential economic effects from increased aviation activity of various user groups at Newport State Airport.

In the absence of forecast scenarios, pro formas of expenditure information for these various user groups were utilized as the economic analytical basis for this phase. Expenditures were grouped into two main categories: aircraft-related, including aircraft fuel, overnight aircraft storage in hangar, and deicing (seasonal); and visitor-related, including accommodations, meals, other retail shopping, and recreation. Expenditure data from each of these user profiles was then aggregated for 100 similar trips utilizing Newport State Airport. Table 14 shows results of increased aviation activity at Newport State Airport based on 100 trips for each of the four user groups of business and tourism/visitor aviation.

Table 14. Summary of economic impacts for phase II—increased visitor & business use

	Light single engine aircraft	Light twin engine aircraft	Charter pilot w/visitors	Business related aviation
Model input				
Output ($2011, 000s)				
Aircraft related	$63.8	$95.5	$688.8	$331.0
Visitor-related				
Ground transport, car rental	$15.0	$15.0	$22.0	$9.0
Gas for vehicle	$12.0	$12.0	$15.0	$4.0
Prepared meals--food & beverages	$48.0	$12.0	$132.0	$52.0
Groceries	$11.7	$42.0	$23.4	$2.0
General retail shopping	$25.2	$36.0	$70.4	$32.0
Recreation & entertainment (e.g., resort)	$72.0	$65.4	$108.0	$12.0
Lodging-high end	$150.0	$12.0	$300.0	$60.0
Subtotal, visitor related	*$333.9*	*$194.4*	*$670.8*	*$171.0*
Grand total, aircraft and visitor-related	**$397.7**	**$289.9**	**$1,359.6**	**$502.0**
Model output				
Northeast Kingdom				
Output ($2011, 000s)	$535.0	$464.6	$2,244.5	$852.9
Wages ($2011, 000s)	$262.3	$247.8	$1,252.4	$502.6
Jobs	10.0	8.9	37.7	13.2
Rest of Vermont				
Output ($2011, 000s)	$46.7	$42.7	$213.0	$83.2
Wages ($2011, 000s)	$19.8	$18.4	$91.4	$35.9
Jobs	0.4	0.4	2.0	0.8
Total, US economy				
Output ($2011, 000s)	$1,585.4	$1,412.7	$7,266.6	$2,754.5
Wages ($2011, 000s)	$630.8	$582.8	$3,031.3	$1,178.1
Jobs	16.4	14.7	68.5	24.9

Source: Economic & Policy Resources, Inc.

Light single-engine aircraft trips—aggregated to 100 trips—reflect the increased usage of the Newport State Airport by pilots/visitors to the Northeast Kingdom. From the pro forma (see #1 in Appendix A), the composition of this user group is a pilot/owner with three passengers arriving at a Northeast Kingdom regional resort for a stay of three-days. Expenditures by this party are arranged by sub-category: aviation-related (e.g., aircraft fuel, overnight storage, and deicing if necessary) and visitor-related (e.g., ground transport rental, gas, prepared meals, groceries, other retail shopping, recreational, and lodging). Aggregated, light single-engine aircraft trips will inject revenues of nearly $398,000 into the Northeast Kingdom regional economy. The ripple effect of this spending will generate another $137,000 in regional

revenues. The aircraft related and visitor expenditures from this user group will alone support a total of 10 jobs with labor earnings of about $262,000 in the Northeast Kingdom.

Light twin-engine aircraft trips—again, aggregated to 100 trips—underscore another important dynamic to the visitor industry of Northeast Kingdom, namely the second home, purchased mostly for recreational use or occasional/seasonal residence. Here, the composition of this user group (see #2 pro forma in Appendix A) is a pilot/owner with three passengers arriving for a three-day stay at their second home in the Northeast Kingdom. As in the light single-engine aircraft user group, expenditures are further subdivided into aviation-related and visitor-related. Major expenditures differences between these two user groups include higher aviation-related spending and lower visitor-related spending (confined to prepared meals and lodging categories). Aggregated expenditures within the regional economy from this user group total $290,000. Indirect and induced spending will generate another $270,000 throughout the regional economy. Aircraft-related and visitor-related spending from this user group will support about 9 jobs with labor earnings of $248,000.

Of the various user group categories, air charter operations (see #3 pro forma in Appendix A) most accentuates the regional economic opportunities associated with increased accessibility of a general aviation airport. Nationwide, there are more than 2,500 air charter operators. Charter operators conduct on-demand operations under FAR Part 135 for most business aircraft. Here, air charter operations will transport parties (4-8 passengers) for extended stays in regional resorts. Aggregated to 100 trips, direct visitor/tourism expenditures from air charter operations would inject $1.36 million into the Northeast Kingdom regional economy. Indirect and induced spending will generate another $885,000 within the regional economy. Aircraft-related and visitor-related spending from air charter operations will support about 38 jobs with $1.25 million in labor earnings.

Increased business-related usage of the general aviation facility will likewise have economic consequences for the surrounding region. According to the National Business Aviation Association, there are over 15,000 business aircraft registered in the United States; while approximately 80 percent of the Fortune 500 companies operate general aviation aircraft; the vast majority of business aircraft (97 percent) are operated by a broad cross-section of organizations and businesses (National Business Aviation Association, 2011).[24] Improvements at Newport State Airport will increase accessibility by large corporations with regional business interests (e.g., branch facility, customer support). Use of the general aviation facility by corporate or charter aircraft will inject spending and support jobs within the regional economy.

[24] Recent use of Newport State Airport reflects this broad cross-section of business-oriented general aviation use; only a very small percentage of business activity was related to Fortune 500 companies. See Table 6, *Company turbojets and turboprop aircraft using Newport State Airport* on page 16.

Aggregated to one hundred business-related trips (see #4 pro forma in Appendix A) at Newport State Airport will result in estimated total region-wide spending of $853,000 supporting about 13 jobs with $503,000 in labor earnings.

Phase III—Development of an aviation-related business park at Newport State Airport

Table 15. Summary of economic impacts for phase III—aviation-related business park

Timeline	2018	2019	2020	2021
Model inputs				
NAICS 32199, Other wood products				
output ($2011, 000s)	$4,154.0	$5,234.0	$5,742.5	$7,311.0
employment	25	30	32	40
NAICS 33992, Sporting & athletic goods				
output ($2011, 000s)	$8,317.9	$9,607.1	$11,229.1	$13,849.2
employment	20	22	25	30
NAICS 48819, Aircraft maintenance & repair				
output ($2011, 000s)	$709.8	$901.8	$1,110.6	$1,670.0
employment	15	18	20	25
NAICS 49319, Other warehousing & storage				
output ($2011, 000s)	$387.1	$491.8	$576.8	$759.0
employment	5	6	7	10
Model output				
Northeast Kingdom				
Output ($2011, 000s)	$17,544.3	$20,581.5	$23,080.1	$28,617.0
Wages ($2011, 000s)	$7,129.0	$8,339.5	$9,358.8	$11,660.6
Jobs	141.4	162.7	179.6	220.0
Rest of Vermont				
Output ($2011, 000s)	$1,394.0	$1,636.9	$1,834.1	$2,281.3
Wages ($2011, 000s)	$564.4	$660.7	$740.1	$919.8
Jobs	11.1	12.8	14.1	17.3
Total, US economy				
Output ($2011, 000s)	$54,317.5	$63,717.4	$71,473.4	$88,759.3
Wages ($2011, 000s)	$19,736.9	$23,111.9	$25,917.5	$32,225.4
Jobs	334.9	386.2	426.5	522.6

Source: Economic & Policy Resources, Inc.

Table 15 illustrates the economic effects of developing an aviation-related business park at Newport State Airport. As shown in the table, four types of activities became business

residents at the business park beginning in 2018[25]. Such businesses came to be located here to take advantage of the foreign trade zone and aviation-related developments at Newport State Airport.

This scenario represents the third phase of the airport's development path. In this phase, the airport becomes a locus of economic activity with businesses in both new industries and traditional sectors. Collectively, these businesses produce goods and services valued at $13.6 million ($2011), employing 75 people during the first year (2018) of the business park. Total regional economic effects of the aviation-related business park in its inaugural operation year is estimated at $17.5 million of output; over 141 jobs with $7.13 million in labor earnings. Expanding to full build-out by 2011, the business park located at Newport State Airport will generate an output valued at $28.6 million, employing 220 people with $11.66 million in labor earnings. At full-build-out, business park activity at the Newport State Airport will have economic ripple effects that will be felt throughout the Northeast Kingdom and beyond to the State of Vermont and the rest of the United States.

[25] This illustration represents a fast-forward scenario of potential economic developments situated at the newly-completed business park. Due diligence of a feasibility analysis has not been completed for this study.

8. Concluding comments

Newport State Airport has the potential to become a significant asset within the Northeast Kingdom of Vermont. Like most general aviation facilities, it has heretofore played a rather minor role within the regional economy. Findings from this study however demonstrate that making needed investments at Newport State Airport will pay substantial dividends to the regional economy. Beyond the transient construction phase, these airport improvements signify increased accessibility for visitors to area resorts and recreational amenities; and competitive gains for regional businesses. Such improvements translate into increased regional economic activity with dozens of additional jobs and millions of dollars in labor earnings.

The phased development path presented here represents a viable approach to help grow the regional economy by improving an infrastructure keystone—the general aviation facility at Newport State Airport. Such an alternative approach was selected given the intractable "chicken-and-egg" problem facing many general aviation facilities petitioning the Federal Aviation Administration for approval of major improvements as runway extensions. Aids in assisting agencies in making capital investment decisions, namely benefit-cost analysis (BCA), are generally of limited use for general aviation facilities in making their case. A recent report underscores the chief problem facing most general aviation facilities—obtaining a robust BCA score necessary for project approval, most notably a runway extension (Landau and Weisbrod, 2009). However, potential gains can be realized along this development pathway with stepwise improvements approaching the focal capital investment of the runway extension. A progression of improvements will help lay the groundwork in realizing support for the runway extension.

A blueprint for action

A number of improvement options for Newport State Airport have been presented within the context of a phased development path along a timeline. The next step is to translate this stepwise development path into a strategic blueprint for community action. The task force formed for this study should remain intact to spearhead this effort with the agenda to accomplish the various improvements to enhance the role of Newport State Airport in the Northeast Kingdom regional economy.

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Appendix A: Pro formas of user groups

Pro forma #1

The distinguishing characteristic of this pro forma is an aircraft pilot/owner of a light single-engine aircraft, who is a visitor to the Northeast Kingdom from out-of-state/region. The aircraft is a high performance single-engine of 3,600 pounds or less. Aircraft examples include the Cessna Skyhawk and the Cirrus SR-22. Expenditures of this trip are for four persons (e.g., pilot/owner and family members) for a three-day stay at one of the regional resorts.

Table A 1: Single-engine aircraft traveler to regional resort

Expenditure item	NAICS	Units	Unit cost	Total cost
Aircraft related	488			
Aircraft fuel (gallons)		50	$5.50	$275
Overnight storage in hangar		3	$65.00	$195
Deicing (if needed)		12	$14.00	$168
Subtotal, aircraft related				*$638*
Visitor spending				
Ground transport, car rental	485	3	$50.00	$150
Gas for vehicle	447	3	$40.00	$120
Prepared meals--food & bev	722	3	$160.00	$480
Groceries	445	3	$39.00	$117
General retail shopping	44	3	$84.00	$252
Recreation--resort	713	3	$240.00	$720
Lodging--high end	721	3	$500.00	$1,500
Subtotal, visitor spending				*$3,339*
Grand total				***$3,977***

Pro forma #2

Aircraft owner of light twin aircraft, visitor from out-of-state/region. Aircraft is a light twin-engine airplane of 5,400 pounds or less, such as a Beechcraft Baron or Cessna 310. Trip consists of 4 persons for a 3-day stay at their second home within the Northeast Kingdom.

Table A 2: Light twin aircraft traveler to NEK second home

Expenditure item	NAICS	Units	Unit cost	Total cost
Aircraft related	***488***			
Aircraft fuel (gallons)		100	$5.50	$550
Overnight storage in hangar		3	$65.00	$195
Deicing		15	$14.00	$210
Subtotal, aircraft related				*$955*
Visitor spending				
Ground transport, car rental	485	3	$50.00	$150
Gas for vehicle	447	3	$40.00	$120
Prepared meals--food & bev	722	3	$40.00	$120
Groceries	445	3	$140.00	$420
General retail shopping	44	3	$120.00	$360
Recreation--resort	713	3	$218.00	$654
Lodging--high end	721	3	$40.00	$120
Subtotal, visitor spending				*$1,944*
Grand total				***$2,899***

Pro forma #3

Charter aircraft pilot of a King aircraft. Trip consists of 6 persons for 3-days with stay in regional resort. Pilot/crew with overnight stay near airport facility. Total visitor spending includes both pilot/crew related spending and visitor spending. In the below table, total visitor spending is $6,708 (= $2,040 + $4,668).

Table A 3: Charter aircraft with out-of-state travelers to regional resort

Expenditure item	NAICS	Units	Unit cost	Total cost
Aircraft related	***488***			
Aircraft fuel (gallons)		750	$5.50	$4,125
Overnight storage in hangar		1	$65.00	$65
Deicing		25	$14.00	$350
Landing fees		2	$75.00	$150
Other charter operation expenses*		3	$732.67	$2,198
Subtotal, aircraft related				*$6,888*
Pilot/crew related spending				
Ground transport, taxi	485	1	$40.00	$40
Prepared meals--food & beverages	722	4	$150.00	$400
Lodging--medium	721	4	$100.00	$400
General retail shopping	44	4	$50.00	$200
Subtotal, pilot related				*$2,040*
Visitor spending				
Ground transport, car rental	485	3	$60.00	$180
Gas for vehicle	447	3	$50.00	$150
Prepared meals--food & beverages	722	3	$240.00	$720
Groceries	445	3	$78.00	$234
General retail shopping	44	3	$168.00	$504
Recreation--resort	713	3	$360.00	$1,080
Lodging--high end	721	3	$600.00	$1,800
Subtotal, visitor spending				*$4,668*
Grand total				***$13,596***

Pro forma #4

Combination-business-related use with charter aircraft or company-owned aircraft with pilot/crew of turbine or rotorcraft aircraft. Trip consists of 2 persons for 1-day overnight stay in region for business purposes. Pilot/crew with overnight stay near airport facility. Total visitor spending includes both pilot/crew related spending and visitor spending. In the below table, total visitor spending is $1,710 (= $1,040 + $670).

Table A 4: Charter or company-owned aircraft with out-of-state travelers for business

Expenditure item	NAICS	Units	Unit cost	Total cost
Aircraft related	***488***			
Aircraft fuel (gallons)		500	$5.50	$2,750
Overnight storage in hangar		2	$65.00	$130
Deicing		20	$14.00	$280
Landing fees		2	$75.00	$150
Subtotal, aircraft related				*$3,310*
Pilot/crew related spending				
Ground transport, taxi	485	1	$40.00	$40
Prepared meals--food & beverages	722	4	$100.00	$400
Lodging--medium	721	4	$100.00	$400
General retail shopping	44	4	$50.00	$200
Subtotal, pilot related				*$1,040*
Visitor spending				
Ground transport, car rental	485	1	$50.00	$50
Gas for vehicle	447	1	$40.00	$40
Prepared meals--food & beverages	722	1	$120.00	$120
Groceries	445	1	$20.00	$20
General retail shopping	44	1	$120.00	$120
Recreation--resort	713	1	$120.00	$120
Lodging--medium	721	1	$200.00	$200
Subtotal, visitor spending				*$670*
Grand total				***$5,020***

Appendix B: Glossary of Aviation Terms

Glossary of Aviation Terms

Abbreviations

AC - Advisory Circular
ACIP - Airport Capital Improvement Program
ADG - Airplane Design Group
AGL - Above Ground Level
AIP - Airport Improvement Program
ALS - Approach Lighting System
APV - Approach Procedures with Vertical Guidance
ARC - Airport Reference Code
ARTCC - Air Route Traffic Control Center
ASM - Available Seat Miles
ASOS - Automated Surface Observation System
ASV - Annual Service Volume
ATC - Air Traffic Control
ATIS - Automated Terminal Information Service
AWOS - Automated Weather Observing System

CIP - Capital Improvement Program

EAS - Essential Air Service

FAA - Federal Aviation Administration
FAR - Federal Aviation Regulation
FBO - Fixed Base Operator
FSS - Flight Service Station

GA - General Aviation
GBAS - Ground Based Approach Systems
GPS - Global Positioning System
GS - Glideslope

HAT - Height Above Threshold
HIRL - High Intensity Runway Lights
HITL - High Intensity Taxiway Lights

IFR - Instrument Flight Rules
ILS - Instrument Landing System

LAAS - Local Area Augmentation System

LAWRS - Limited Aviation Weather Reporting Station
LIRL - Low Intensity Runway Lights
LPV - Localizer Performance with Vertical guidance

MALS - Medium Intensity Approach Light System
MIRL - Medium Intensity Runway Lights
MITL - Medium Intensity Taxiway Lights

NAS - National Airspace System
NDB - Non-Directional Beacon
NPA - Non-Precision Approach
NPI - Non-Precision Instrument Approach
NPIAS - National Plan of Integrated Airport Systems
NAVAID - Navigational Aids
NOTAM - Notice to Airmen

O&D - Origination/Destination
ODALS - Omni-Directional Approach Lighting System

PAPI - Precision Approach Path Indicator
PCI - Pavement Condition Index
PIR - Precision Instrument Runway

RCO - Remote Communications Outlet
REIL - Runway End Identifier Lights
RSA - Runway Safety Area
RPZ - Runway Protection Zone
RW - Runway

SBAS - Satellite Based Approach Systems

TAF - Terminal Area Forecast
TL - Taxilane
TDWR - Terminal Doppler Weather Radar
TRACON - Terminal Radar Approach Control
TW - Taxiway

USDOT - United States Department of Transportation

VASI - Visual Approach Slope Indicator
VFR - Visual Flight Rules
VGSI - Visual Guide Slope Indicator
VLJ - Very Light Jet
VOR - Very High Frequency Omni-directional Range

VORTAC - Very High Frequency Omni-directional Range Station with Tactical Air Navigation
VTRANS - Vermont Agency of Transportation

WAAS - Wide Area Augmentation System

Definitions

Ad-Hoc/On-Demand Carriers—Unscheduled charter flights carrying freight or mail.

Advisory Circular (AC)—A series of FAA publications providing guidance and standards for the design, operation and performance of aircraft and airport facilities.

Air Carrier—A commercial airline with published schedules operating at least five round trips per week. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

Air Freight—Items principally transported by all-freight carriers and as belly freight on scheduled passenger services, including heavy-weight items as well as routine palletized shipments.

Air Route Traffic Control Center (ARTCC)—A Federal Aviation Administration (FAA) facility established to provide air traffic control service to aircraft operating on Instrument Flight Rules (IFR) flight plans within controlled airspace during the en route portion of flight.

Air Taxi—An aircraft operator who conducts operations for hire or compensation in accordance with FAR (Federal Aviation Regulation) Part 135 in an aircraft with 30 or fewer passenger seats and a payload capacity of 7,500 pounds or less. An air taxi operates on-demand basis and does not meet the "scheduled-flight" qualifications of a commuter.

Air Traffic Control (ATC)—A service operated by the appropriate authority to promote the safe, orderly, and expeditious flow of air traffic. The ATC system includes Air Route Traffic Control Centers (ARTCCs), Towers, airport ground radar and other elements such as navigational aids to pilots.

Aircraft Approach Category—An element of the Airport Reference Code (ARC). Airplanes are grouped based on approach speed, according to the following:

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

Aircraft Mix—The classification of aircraft into groups which are similar in size and operational characteristics.

Aircraft Operations—Airborne movements of aircraft at an airport including aircraft landings (arrivals) and takeoffs (departures). These operations can be further defined as:

- *Local operations* include those performed by aircraft that operate in the local traffic pattern or within sight of the airport; and/or are known to be departing for or arriving from a local practice area.

- *Itinerant operations* are all others.

Airplane Design Group (ADG)—An element of the Airport Reference Code (AFC) that groups airplanes based on wingspan, according to the following:

- Group I. Up to, but not including 49 feet
- Group II 49 feet up to, but not including 79 feet
- Group III 79 feet up to, but not including 118 feet
- Group IV 118 feet up to, but not including 171 feet
- Group V 171 feet up to, but not including 214 feet
- Group VI 214 feet up to, but not including 262 feet

Airport Capital Improvement Program (ACIP)—Serves as the primary planning tool for systematically identifying, prioritizing and assigning funds to critical airport development and associated capital needs of an airport. The Federal Aviation Administration relies on this program to serve as the basis for the distribution of limited grant funds under the Airport Improvement Program (AIP).

Airport Elevation—the highest point on an airport's usable runways, expressed in feet above mean sea level.

Airport Improvement Program (AIP)—A congressionally mandated program through which the Federal Aviation Administration provides funding assistance for the development and enhancement of airport facilities. This program is periodically reauthorized by Congress through appropriations from the Aviation Trust Fund, which is funded through excise taxes on airline tickets, aviation fuel, etc.

Airport Layout Plan (ALP)—A scaled drawing of existing and proposed land and facilities necessary for the operation and development of the airport. The airport layout plan shows boundaries and proposed additions to all areas owned or controlled by the airport operator for airport purposes, the location and nature of existing and proposed airport facilities and structures, as well as the location of existing and proposed non-aviation areas and improvements on the airport.

Airport Master Plan—A standard planning document that presents a concept of the ultimate development of an airport, including the research and rationale from which the plan was evolved, as well as the graphic and written formats. An airport master plan is normally presented to the Federal Aviation Administration (FAA) for approval and would typically also be approved and adopted by the airport sponsor.

Airport Reference Code (ARC)—An FAA design criteria based upon the approach speed (aircraft approach category) and wing span (airplane design group) of an aircraft which produces a minimum annual 500 operations per year at an airport.

Airport Sponsor—A public agency that is authorized to own and operate an airport, to obtain interests, to obtain funds, and to be legally, financially, and otherwise able to meet all applicable requirements of current laws and regulations.

Airside—The portion of the airport meant for taxiing, takeoff, landing, parking, loading and unloading, or any other direct aircraft operation, including aircraft parking aprons, taxiways, runways, and safety areas.

Airspace—The area above the ground in which aircraft travel. It is divided into corridors, routes, and restricted zones for the control and safety of aircraft operations.

Annual Service Volume (ASV)—A FAA planning tool that reflects the ability of airfield facilities (i.e., runways, taxiways, and approach aids) to accommodate aviation demand that includes commercial, general aviation, and military operations. It accounts for differences in runway use, aircraft mix, weather conditions, etc. that would be encountered over a calendar year's time.

Approach End of Runway—The near end of the runway as viewed from the cockpit of a landing aircraft.

Approach Lighting System (ALS)—Lighting system installed on the approach end of an airport runway and consists of a series of light bars, strobe lights, or a combination of the two that extends outward from the runway end. An approach lighting system usually serves a runway that has an instrument approach procedure associated with it and allows the pilot to visually identify the runway environment once he or she has arrived at a prescribed point on an approach.

Approach Minimums—The altitude below which an aircraft may not descend while on an Instrument Flight Rules (IFR) approach unless the pilot has the runway in sight.

Approach Surface—An Federal Aviation Regulation (FAR) Part 77 imaginary surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface.

Automated Surface Observation System (ASOS)—The primary surface weather observing system in the US that supports aviation operations and weather forecasting. An ASOS has automated sensors that record wind direction and speed, visibility, cloud ceiling, precipitation, etc. And sends that data automatically to the National Weather Service. At many locations, a computer generated voice broadcasts the minute-by-minute weather reports to pilots on a discrete radio frequency.

Automated Terminal Information Service (ATIS)—The continuous broadcast of recorded non-control information at towered airports, information typically includes wind speed, direction, and runway in use.

Automated Weather Observing System (AWOS)—An automated weather reporting system that provides airport weather observations (i.e., cloud height, visibility, wind speed and direction, temperature, dew point, etc.

Avigation Easement—A form of limited property right purchase that establishes legal land use control prohibiting incompatible development of areas required for airports and aviation-related purposes.

Based Aircraft—An aircraft that is "operational and air worthy," which is based at an airport for the majority of the year.

Capacity—A measure of the maximum number of aircraft operations that can be accommodated by an airport's airfield over a designated time period (typically an hour or a year).

Capital Improvement Program (CIP)—A schedule of planned projects and costs for an airport typically prepared and adopted by the airport sponsor and other public agencies.

Ceiling—The height above the ground of the base of the lowest layer of clouds or obscuring phenomena aloft that is reported as broken or overcast and not classified as scattered, thin, or partial. Ceiling figures in aviation weather reports may be determined as measured, estimated, or indefinite.

Charter—A nonscheduled flight offered by either a supplemental or certificated air carrier.

Circling Approach—An instrument approach procedure in which an aircraft executes the published instruction approach to one runway, then maneuvers visually to land on a different runway. Circling approaches are also used at airports that have published instrument approaches with a final approach course that is not aligned within 30 degrees of any runway.

Commercial Air Carrier—An air carrier certified in accordance with FAR Parts 121 or 127 to conduct scheduled services on specific routes. These air carriers may also provide nonscheduled or charter services as a secondary operation.

Controlled Air Space—Airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification. Controlled airspace is designated as Class A, Class B, Class C, Class D, or Class E. Aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements as specified in FAR Part 91, depending upon the class of airspace in which they are operating.

- CLASS A—Airspace between 18,000 and 60,000 feet MSL over the conterminous United States. IFR clearances are required for all aircraft operating in CLASS A airspace.

- CLASS B—Airspace area around the busiest US hub airports, typically to a radius of 20 nautical miles and up to 10,000 feet above ground level. Operations with CLASS B airspace require an ATC clearance and at least a private-pilot certificate (local waivers available), radio communication, and an altitude-reporting (Mode C) transponder.
- CLASS C—Airspace area around the busy US airports (other than CLASS B). Radio contract with approach control is mandatory for all traffic. Typically includes an area from the surface to 1,200 feet AGL out to 5 miles and from 1,200 and 4,000 feet AGL to 10 miles from the airport.
- CLASS D—Airspace around an airport with an operating control tower; typically to a radius of 5 miles from the surface to 2,500 feet AGL. Radio contract with the control tower required prior to entry.
- CLASS E—General controlled airspace comprising of control areas, transition areas, Victor airways, the Continental Control Area, etc.
- CLASS F—International airspace designation not used in the US.
- CLASS G—Uncontrolled airspace, generally the airspace from the surface up to 700 or 1,200 feet AGL in most of the US, but up to as high as 14,500 feet in some remote Western and sparsely populated areas.

Decision Height—During a precision approach, the height (or altitude) at which a decision must be made to either continue the approach or execute a missed approach.

Design Aircraft—An aircraft whose dimensions and/or other operational requirements make it the most demanding aircraft currently using an airport's facilities (i.e., runways and taxiways). The design aircraft must be an aircraft that has or is expected to conduct 500 or more annual operations (250 landings) at a given airport; and is used as the basis for airport planning and design at that airport.

Distance measuring equipment (DME)—A flight instrument that measures the line-of-sight distance of an aircraft from a navigational radio station in nautical miles.

Easement—The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

Essential Air Service (EAS)—Program administered by the US Department of Transportation that is designed to ensure that selected small cities that were served by one or more air carriers prior to airline deregulation would retain a minimum level of scheduled airline service, even if such service requires the payment or subsidy.

Federal Aviation Administration (FAA)—A branch of the U.S. Department of Transportation responsible for insuring the safe and efficient use of the nation's airspace, for fostering civil

aeronautics and air commerce, and for supporting the requirements of national defense. In addition to regulating airports, aircraft manufacturing and parts certification, aircraft operation and pilot certification, the Federal Aviation Administration operates Air Traffic Control, purchases and maintains navigation equipment, certifies airports and aids airport development, among other activities. The Federal Aviation Administration also administers the Airport Improvement Program (AIP) that provides for airport development.

Federal Aviation Regulations (FARs)—The body of Federal regulations relating to aviation, published as Title 14 of the Code of Federal Regulations.

Final Approach—The flight path of an aircraft which is inbound to the airport on an approved final instrument approach course, beginning at the point of interception of that course and extending to the airport or the point where circling for landing or missed approach is executed.

Fixed Base Operator (FBO)—Any aviation business duly licensed and authorized by written agreement with the airport owner to provide aeronautical activities at the airport under strict compliance with such agreement and pursuant to these regulations and standards. Typically provide services such as hangar space, fuel, flight training, repair and maintenance to general aviation airport users.

Fixed Wing—An aircraft not considered to be a rotocraft.

Flight Service Station (FSS)—Air traffic facility operated by the Federal Aviation Administration to provide flight service assistance such as pilot briefings, en route communications, search and rescue assistance, and weather information.

Fractional Ownership—An aircraft ownership concept whereby multiple companies can partially own an aircraft through use of a common aircraft management company used to maintain the aircraft and administer the leasing of the aircraft among the owners. The aircraft owners participating in the program agree not only to share their aircraft with others having an ownership interest in that aircraft, but also to lease their aircraft to other owners in the program. Netjets® is the market leader in fractional jet ownership.

Freight Forwarder—A company that accepts small packages from shippers and consolidates them into container loads. These loads are then transferred to the non-integrated carrier or a passenger airline to deliver to an agent or subsidiary at another airport.

General Aviation—All civil aviation operations other than scheduled air services and non-scheduled air transport operations for remunerations or hire. Often misunderstood to be only small, propeller-driven aircraft; even a large jet or cargo plane operated under Federal Aviation Regulation (FAR) Part 91 is considered to be a general aviation aircraft.

General Aviation Airports—Those airports not classified as commercial service.

Glideslope (GS)—Provides vertical guidance for aircraft during approach and landing. Generally a 3-degree angle of approach to a runway established by means of airborne instruments during instrument approaches, or visual ground aids for the visual portion of an instrument approach and landing.

Global Positioning System (GPS)—Satellite-based navigation system operated by the US Department of Defense, providing extremely accurate position, time and speed information to civilian and military users. Based on a constellation of 24 satellites, global positioning system will replace ground-based navigation systems (Very High Frequency Omni-directional Range—VOR and Instrument Landing System—ILS) as the primary worldwide air navigation system in the 21st century.

Hazard to Air Navigation—An object which, as a result of a aeronautical study, the Federal Aviation Administration determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential airport capacity.

Instrument Approach—A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

Instrument Flight Rules (IFR)—Rules from Federal Aviation Regulations (14 CFR 91) that govern the procedures for conducting instrument flight. Pilots are required to follow these rules when operating in controlled airspace during Instrument Meteorological Conditions (i.e., visibility of less than three miles and/or ceiling lower than 1,000 feet). These procedures may also be used under visual conditions and provide for positive control by air traffic control (ATC).

Instrument Landing System (ILS)—Designed to provide an exact approach path for alignment and descent of aircraft. Generally consist of a localizer, glide slope, outer marker, middle marker, and approach lights. There are three types of Instrument Landing Systems:

- *Cat I*—Category I ILS which provides for approach to a height above touchdown of not less than 200 feet and with visibility of not less than ½ mile or a Runway Visual Range of not less than 2400 (RVR 18090 with operative touchdown zone and runway centerline lights).
- *Cat II*—Category II ILS approach procedure which provides for approach to a height above touchdown or not less than 100 feet and with a Runway Visual Range of not less than 1200.
- *Cat III*—Category III ILS approach procedure which provides for approaches to minima less than Cat II.

Instrument Runway—A runway equipped with electronic and visual navigation aids for which a precision or non-precision approach procedure having straight-in landing minimums has been approved.

Itinerant Operation—All aircraft operations at an airport other than local.

Land Use Compatibility—The ability of land uses surrounding the airport to coexist with airport-related activities with a minimum level of conflict.

Landside—The general public common use areas of the airport such as terminals, public roadways, parking lots, and buildings which are not contained in the airside area.

Load Factor—The ratio of how much of an airline's carrying capacity is used, calculated using the ratio of revenue passenger miles to available seat miles on a particular flight.

Local Area Augmentation System (LAAS)—An enhancement of the Global Positioning System (GPS) providing greater navigation accuracy and system integrity for civilian operations.

Local Operation—Includes aircraft operating in the local air traffic pattern or within sight of the air traffic control tower; aircraft that are known to be departing for, or arriving from local practice areas located within a 25-mile radius of the air traffic control tower; or aircraft making simulated instrument approaches or low passes at the airport.

Localizer—The component of an Instrument Landing System (ILS) which provides course guidance to the runway.

Minimum Standards—The qualifications or criteria established by an airport sponsor as the minimum requirements to be met by businesses engaged in on-airport aeronautical uses as a condition for the right to conduct those activities.

National Airspace System (NAS)—The common network of US airspace, includes air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; and procedures, technical information, manpower and material.

National Plan of Integrated Airport Systems (NPIAS)—An Federal Aviation Administration (FAA) planning document that identifies more than 3,300 airports that are significant to national air transportation and thus eligible to receive Federal grants under the Airport Improvement Program (AIP). It also includes estimates of the amount of AIP money needed to fund infrastructure development projects that will bring these airports up to current design standards and add capacity to congested airports. The FAA is required to provide Congress with a 5-year estimate of AIP eligible development every 2 years. The National Plan of Integrated Airport Systems comprises all commercial service airports, all reliever airports, and selected general aviation airports.

Navigational Aids (NAVAIDs)—A term used to describe any electrical or visual air navigational aids, lights, signs and associated supporting equipment (for example, Instrument Landing System—ILS; Precision Approach Path Indicator—PAPI; and Visual Approach Slope Indicator—VASI).

Non-Directional Beacon (NDB)—A radio beacon transmitting nondirectional signals whereby the pilot of an aircraft equipment with direction finding equipment can determine his bearing to and from the station. When the radio beacon is installed in conjunction with the ILS marker, it is normally called a compass locator.

Non-Precision Approach Procedure–A standard instrument approach procedure with only horizontal guidance or area-type navigational guidance for straight-in approaches, and no electronic vertical guidance (i.e., glidescope) is provided, such as Very High Frequency Omni-directional Range Navigational System (VOR), Tactical Air Navigation (TACAN), Non-Directional Beacon (NDB) or Localizer Beam (LOC).

Non-Towered Airport—An airport without a control tower, which includes the majority of the 13,000 airports in the United States (only about 680 airports have control towers). Note that non-towered airports are far from being "uncontrolled" in that pilots follow traffic pattern procedures and self-announce positions and intentions using the Common Traffic Advisory Frequency (CTAF), usually called the UNICOM (Universal Integrated Communication) frequency.

Notice to Airmen (NOTAM)—A notice containing information concerning the establishments, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. NOTAMs are generally distributed by telecommunications (Class I) and/or postal services (Class II).

Object Free Area (OFA)—An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except that need to be located in the Object Free Area for air navigation or aircraft ground maneuvering purposes.

Obstacle Free Zone (OFZ)—This refers to the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the Obstacle Free Zone because of their function, in order to provide clearance proetection for aircraft landing or taking off from the runway, and for missed approaches. The obstacle free zone is sub-divided as follows:

- *Runway OFZ*—the airspace above a surface centered on the runway centerline.
- *Inner-approach OFZ*—the airspace above a surface centered on the extended runway centerline. It applies to runways with an approach lighting system.
- *Inner-transitional OFZ*—the airspace above the surfaces located on the outer edges of the runway OFZ and the inner-approach OFZ. It applies to runways with approach visibility minimums lower than ¾ statute mile.

Obstruction to Air Navigation—An object of greater height than any of the heights or surfaces presented in Subpart C of Code of Federal Regulation (14CFR), Part 77. Obstructions to air

navigation are presumed to be hazards to air navigation until an FAA study has determined otherwise.

Operation—A take-off or landing of an aircraft. Every aircraft flight requires at least two operations, a take-off and landing.

Origination/Destination (O&D)—A measure of the point of origination of a passenger to the final destination that comprises that passenger's actual trip, regardless of changing flights/planes during the journey.

Part 61,141,142—The parts of FARs (Federal Aviation Regulations) covering pilot certification and flight school operations: the pilot certification and standard flight school (Part 61); the integrated curriculum type school (Part 141) requiring slightly fewer flying hours; and Part 142 program allowing replacement of more flight time with advanced flight simulators.

Part 77—The part of Federal Aviation Regulations (FARs) covering objects affecting navigable airspace. It provides for the establishment of "imaginary surfaces" on and around an airport to identify potential aeronautical hazards in order to prevent or minimize the adverse impacts to the safe and efficient use of navigable airspace. Imaginary surfaces include the primary surface, approach surfaces, transitional surfaces, the horizontal surface, and the conical surface.

Part 91, 121, 125, 135—The parts of Federal Aviation Regulations (FARs) covering non-commercial operations (Part 91); major scheduled air carriers (Part 121); commuters (Part 125); and non-scheduled carriers and air taxis (Part 135).

Part 139—Airport operating certificate to airports that serve scheduled and unscheduled air carrier aircraft with more than 30 seats; and serve scheduled air carrier operations in aircraft with more than 9 seats but less than 31 seats.

Pavement Condition Index (PCI)—Numerical index between 0 and 100 used to indicate the condition of a selected portion of pavement with 100 indicating excellent pavement conditions.

Precision Approach Path Indicator (PAPI)—Provides visual approach slope guidance to aircraft during an approach. It is similar to VASI (Visual Approach Slope Indicator) but provides a sharper transition between the colored indicator lights.

Precision Approach Procedure—A standard instrument approach procedure in which an electronic glide slope is provided, such as an Instrument Landing System (ILS). Global Positioning System (GPS) precision approaches may be operational in the future.

Public Use Airport—An airport open to public use without prior permission, and without restrictions within the physical capabilities of the facility. It may or may not be publicly owned.

Remote Communications Outlet (RCO)—An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering enroute clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

Rotocraft –A heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors. Includes helicopters and gyroplanes.

Rules and Regulations—Directions approved and enforced by an airport sponsor to protect public health, safety, interest, and welfare on the airport, as well as augment any ordinances and resolutions pertaining to the airport.

Runway (RW)—A defined rectangular surface on an airport prepared or suitable for the landing and takeoff of aircraft.

Runway End Identifier Lights (REIL)—Two synchronized flashing lights (one on each side of the runway threshold) that identify the approach end of the runway.

Runway Protection Zone (RPZ)—An area off the runway end to enhance the protection of people and property on the ground. The runway protection zone is a trapezoidal shape; its dimensions are determined by the aircraft approach speed and runway approach type and minima.

Runway Safety Area (RSA)—A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Segmented Circles—A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

Small Airplane—An airplane of 12,500 pounds or less maximum certified takeoff weight.

T-Hanger—An aircraft hanger in which aircraft are parked alternatively tail to tail, each in the T-shaped space left by the other row of aircraft or aircraft compartments

Taxilane (TL)—The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

Taxiway (TW)—An defined path established for the taxiing of aircraft from one part of an airport to another.

Terminal Area Capacity—The ability of an airport terminal area to accommodate aircraft, passengers and cargo. Individual elements within terminal areas that comprise the overall terminal capacity include airline gate positions, airline apron areas, cargo apron areas, general aviation apron areas, airline passenger terminals, general aviation terminals, cargo buildings, automobile parking and aircraft maintenance facilities, among others.

Terminal Area Forecast (TAF)—The official forecast of aviation activity at FAA facilities, which are prepared to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public. The TAF includes forecasts for the following:

FAA towered airports
Federally contracted towered airports
Non-federal towered airports
Non-towered airports

Terminal Radar Approach Control (TRACON)—An FAA Air Traffic Control Facility which uses radar and two-way communication to provide separation of air traffic within a specified geographic area in the vicinity of one or more airports. TRACONs control IFR and VFR flights.

Tie-down—An apparatus used to secure an aircraft while parked on the apron.

Touch-and-Go Operation—A flight training operation in which a landing approach is made, the aircraft touches down on the runway, but does not fully reduce speed to turn off the runway. Instead after landing, full engine power is applied while still moving and a takeoff is made, thereby practicing maneuvers as part of one continual motion. However, this counts as two separate aircraft operations.

Traffic Pattern—The traffic flow for aircraft landing and departure at an airport. Typical components of the traffic pattern include: upwind leg, crosswind leg, downwind leg, base leg, and final approach.

Turbojet Aircraft-An aircraft having a jet engine in which the energy of the jet operates a turbine which in turn drives the air compressor.

Turboprop Aircraft- An aircraft having a jet engine in which the energy of the jet operates a turbine which in turn drives the propeller.

Very High Frequency Omni-directional Range (VOR)—A ground based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the National Airspace System. The Very High Frequency Omni-directional Range periodically identifies itself by Morse Code and may have an additional voice identification feature.

Very High Frequency Omni-directional Range Station with Tactical Air Navigation (VORTAC)—A navigational aid providing Very High Frequency Omni-directional Range (VOR) azimuth and Tactical Area Navigation distance measuring equipment at one site.

Very Light Jet (VLJ)—A small jet aircraft approved for single-pilot operation, seating 4-8 people, with a maximum take-off weight of under 10,000 pounds. They are lighter than what is commonly termed business jets.

Visual Approach—An approach conducted on an Instrument Flight Rules (IFR) flight plan, operating in Visual Flight Rules (VFR) conditions under the control of an air traffic facility and having an air traffic control authorization, may proceed to destination airport under Visual Flight Rules.

Visual Approach Slope Indicator (VASI)—A visual aid for the final approach to the runway threshold consisting of two wing bars of lights located in tandem on either side of the runway. Each bar produces a split beam of light—the upper segment is white, the lower is red.

Visual Flight Rules (VFR)—Rules and procedures specified in 14 CFR 91 for aircraft operations under visual meteorological conditions, or weather conditions with a ceiling or 1,000 feet above ground level and visibility of three miles or greater. Under Visual Flight Rules, it is the pilot's responsibility to maintain visual separation and not that of the air traffic controller.

Visual Glide Slope Indicator (VGSI)—A system of lights on the side of the runway threshold near the touch-down zone that help to ensure that any obstructions in the approach area are cleared by indicating if the aircraft is higher than or lower than the appropriate glide slope angle. The two most common types of visual glide slope indicators are Precision Approach Path Indicator (PAPI) and Visual Approach Slope Indicator (VASI).

Visual Runway—A runway without an existing or planned straight-in instrument approach procedure.

Wide Area Augmentation System (WAAS)—An enhancement to the global positioning system providing greater navigation accuracy and system integrity and permitting GPS to be used for precision instrument approaches to most airports.

Wind Coverage—Percent of time for which aeronautical operations are considered safe due to acceptable crosswind components.