Chapter II – Forecasts of Aviation Demand

II.1 Introduction

This chapter presents comprehensive forecasts of aviation demand at T. F. Green Airport for the years 2005, 2010, 2015, and 2020. Three different forecast scenarios were developed to show the broad range of possible aviation activity that could be experienced at T. F. Green Airport over the next 20 years.

The first scenario, the "Existing Role" forecasts (presented in Section II.3), presumes a continuation of the existing role of T. F. Green Airport in the New England Region. Three Existing Role forecasts were prepared: Low, Medium, and High Growth. The second scenario, the "Augmented Market Share" scenario (presented in Section II.4), identifies activity that could be expected if T. F. Green were to capture an increasing share of New England traffic. Both of these scenarios consider market-driven demand for air service. These forecasts are "unconstrained" and do not take facility constraints or other outside limiting factors into consideration. In other words, for purposes of estimating demand, both of these scenarios assume facilities can be provided to meet the demand. The third scenario, presented in Section II.5, considers what activity levels could be expected in the 20-year planning horizon under various facility constraints.

It is important for the Rhode Island Airport Corporation (RIAC) to explore a range of possible future growth scenarios. This will allow RIAC to avoid being surprised by potential rapid growth or unexpected slowdowns in growth. These forecasts provide RIAC with a full-range of information from which it will be able to anticipate the airport's future activity, and plan for facilities that might be needed to accommodate future air transportation demand. After determining potential facility needs to accommodate future aviation activity, alternatives to provide any such facilities will be identified and evaluated. The subsequent environmental process will then examine alternatives and measure human, social, and other environmental impacts that may be associated with a specified forecast demand.

The consideration of some of the factors that may stimulate or constrain growth is being done early in the master planning process. (The analysis of facility constraints is not typically done until after the forecasts are developed.) The development of the forecast scenarios and the overall T. F. Green forecasting process is illustrated on **Exhibit II.1-1**. This analysis is based on input from the Study Resource Committee (SRC) that was formed as part of this study and direction from RIAC. Specifically, the methodology shown in the exhibit was developed in response to discussions at the July 25 and 26, 2001 SRC meetings and through subsequent conversations with the Federal Aviation Administration (FAA) and RIAC.

Several sets of aviation forecasts were developed previously for T. F. Green. These include:

- 1998-2000 Federal Aviation Regulation (FAR) Part 150 Noise Compatibility Study Update (*Part 150 Study*)
- 2000 Airport Revenue Bond Issue
- FAA Terminal Area Forecast (TAF)
- 1999 Master Plan Forecast

The previously prepared forecasts were developed to serve immediate and situation-specific purposes. With the exception of the 1999 Master Plan forecasts (which were based on 1995 data), none were developed specifically to guide RIAC's long-term facility planning initiatives. The introduction of air service by Southwest in 1996 has fundamentally altered T. F. Green's role and has induced rapid changes in its aviation activity. The terrorist attacks of September 11, 2001 have created further sources of uncertainty in the national economy and the airline industry. These events have caused a need to review previous forecasts, and place a premium on the most recent information.

The forecasts developed for this master plan provide RIAC with a customized, adaptive, and enduring framework to meet the needs of long-term facilities planning. Periodic updates of aviation activity forecasts will be necessary to ensure that key master plan recommendations are consistent with characteristics of aircraft activity and reasonable expectations of future activity levels.

II.1.1 Forecasting Issues and Trends

The major issues and trends that will help identify future demand for aviation activity at T. F. Green are as follows:

The Rhode Island Community

- T. F. Green is a growing gateway to all of southern New England, however, the airport primarily serves Rhode Island, eastern Connecticut, and southeastern Massachusetts. The economic prosperity of the area is a significant determinant of its future demands for aviation service. Any regional economic shift to travel-intensive sectors, such as the high technology industry, could stimulate demand at T. F. Green.
- Rhode Island residents and visitors can presently choose from several airports. Many passengers still drive to Boston to access flights, particularly to transcontinental and international destinations. Any shift in airport preferences, such as changes to the ease of surface access to the Boston Logan Airport, could affect traffic levels at T. F. Green. Similarly, Worcester, Hanscom, and other airports are potential competitors to T. F. Green, and their use could affect its traffic.
- Changes to the regional surface transportation infrastructure could affect both the ease of access to T. F. Green and the relative appeal of air and surface modes. The planned Warwick rail station, combined with the electrification of the Amtrak

New York-Boston line may create opportunities for air-rail connections, but may also attract air passengers to surface modes. Either effect could change future aviation demands.

The National Economy

- Whatever the economic strength of Rhode Island, air travel is unlikely to flourish if the national economy performs poorly. Air travel is sensitive to economic fluctuations. A weak national economy, harming incomes of would-be visitors, could suppress inbound travel and could adversely affect outbound traffic.
- Widespread anxiety about safety and security could lead to a greater reluctance to travel and exacerbate any weaknesses in the economy.
- By March 2002, the American economy was recovering from a mild recession. This recession first emerged in the second half of 2000. Even before the terrorist attacks of September 11th, the year 2001 was marked by a steady decline in travel and fares [1], and a corresponding decline in airline profitability. This trend was not altogether detrimental to T. F. Green. The growing price-sensitivity of business travelers and the low fares at T. F. Green compared to other airports in the region together prompted a seven percent growth in the first two quarters of 2001. Passenger traffic for the twelve months ending December 31, 2001 was up 1.83 percent over the previous year; a remarkable increase considering the precipitous nationwide traffic decline following September 11.

The Airline Industry

- An important trend to many communities has been the expansion of low-fare airlines. Much of the recent growth at T. F. Green results from the inauguration of air service by Southwest Airlines in 1996. This has created many new and economically priced travel options for southern New England. Such major changes in air service often result in several years of rapid growth, after which the market may stabilize. The greatest forecasting challenge is to determine when T. F. Green will return to a "normal" growth rate (i.e. a growth rate that is more reflective of growth or decline in air transportation as a mode of travel) after a half-decade of double-digit expansion.
- Airline mergers could affect T. F. Green. Airline mergers, especially between airlines with parallel networks, can stifle competition and contribute to higher fares. Despite the recent failure of the United Airlines-US Airways merger, there is growing evidence of a new wave of consolidation. This could significantly affect airline competition at T. F. Green. American Airlines, an airport tenant, has recently acquired Trans World Airlines, and will likely implement changes in its east-west domestic network. Most other carriers at T. F. Green have been

[1] According to the Air Transportation Association "Monthly Airfare Report", average domestic fares fro a 1,000 mile trip declined by 8.5 percent between 2000 and 2001.

participants in recent merger discussions and all could figure in an industry consolidation. The severe financial losses of 2001 could accelerate any trend for consolidation in the industry.

- The terrorist attacks will impose new costs on the industry. These will include increased costs for passenger and cargo screening, installation of security measures such as strengthened cockpit doors, and higher insurance premiums. These costs will be passed on to passengers through higher fares.
- Heightened security measures following the September attacks have resulted in longer security queues, more restrictions on carry-on items, and reductions in in-flight services. The demand for travel could suffer to the extent that these factors reduce the overall quality of the travel experience.
- Airlines are a tightly organized industry. Labor unions have become increasingly ambitious. Recent settlements at United, Northwest and Delta could lead to industry-wide operating cost increases. By forcing airlines to increase fares, these agreements could suppress demand.
- Volatile fuel prices affect airline costs and ticket prices. Higher fuel prices could result in higher ticket prices, and therefore contribute to reducing traffic.
- Throughout the nation, airports face increasing political, economic, and environmental hurdles in adding capacity. A congested aviation infrastructure could affect traffic growth.
- Technological change could play a role, even over the relatively short 20-year horizon. Changes in aircraft technology, such as new high performance materials or improved aerodynamics could lower aircraft operating costs, even on new versions of common aircraft such as the 737. This could lead to lower fares and increased travel.
- Trends in airline equipment could affect future demand for air travel. The recent growth of regional jet service has allowed many low volume cities to obtain service. Regional jets allow better service from T. F. Green to Cincinnati, Cleveland, and other points, but have also encouraged growth at competing airports such as Worcester.

The forecasts of future demand for T. F. Green need to incorporate the factors outlined above. While these factors affect traffic at virtually every airport in the country, each facility responds in a unique manner.

In addition to these external influences, the recent history of air traffic at T. F. Green can provide insights into the factors driving aviation demand, and how this particular market responds. Through identifying recent trends and key influences, an examination of past activity serves as a prelude to the process of constructing a statistical model for forecasting future activity. Section II.2 examines the recent history of air traffic growth at T. F. Green. It assesses how local and national economic conditions as well as trends within the aviation industry have affected T. F. Green in the recent past.

II.1.2 Summary of the Forecasts of Aviation Activity

The methodology and assumptions used to create the Existing Role and Augmented Market Share scenarios are discussed in Sections II.3 and II.4. This section contains a summary of the forecast results for both scenarios. Both of these scenarios consider market-driven demand for air service and are "unconstrained." **Table II.1-1, through Table II.1-4** present a summary of the Existing Role Medium, High, and Low forecasts and the Augmented Market Share forecasts.

In addition to the first two scenarios, the forecasting effort also considered the impact that facility constraints could have on activity levels. These capacity constrained forecasts are discussed in Section II.5.

II.1.3 Sources of Information

The forecasts rely on a wide range of information about T. F. Green, the aviation industry, and the U.S. economy. Data was obtained from the following sources:

Ten Percent Ticket Sample, U.S. Department of Transportation

The U.S. Department of Transportation (DOT) assembles a 10 percent sample of all passenger ticket coupons collected by major U.S. carriers. From the ticket sample, the DOT produces a series of reports summarizing traffic flows by city-pair.[2] The forecasts for T. F. Green relied on the following documents from the DOT data:

- Table 11 – Origin-Destination (O&D)[3] passenger traffic data by domestic city-pair by year and quarter
- Table 8 – A condensed report of domestic O&D traffic
- Database 1B - A quarterly compilation of all data as reported by participating air carriers from the Ten Percent Ticket Sample. It includes detailed fare and routing information for both international and domestic passengers.

The analyses of historical traffic at T. F. Green and the econometric models rely heavily on O&D statistics. Databases for O&D traffic include considerable information on the passengers' "true" destinations, routings, and fares. This information is essential for modeling the future dynamics of the T. F. Green market. The traffic flows reported in Tables 8 and 11 include domestic traffic and passengers traveling between T. F. Green

[2] A city-pair represents the starting point and ending point of a flight.

[3] Passenger traffic can be measured in two ways. "Origin-destination" (O&D) flows refer to passengers who begin or end their journeys at the airport in question. It is a measure of the intrinsic importance of the community as a generator of traffic. Total passenger statistics measure the number of passengers physically boarding or disembarking from an aircraft at a particular airport. It includes both passengers beginning or ending their journeys at the facility in question, and those making connections. At a non-hub airport such as T. F. Green, where connecting activity is minimal, the two measures are virtually equal.

Table II.1-1
EXISTING ROLE FORECAST SUMMARY – MEDIUM CASE
T. F. Green Airport

	Existing	Medium Forecast			
	2000	2005	2010	2015	2020
Passenger Demand Forecast					
Domestic	5,397,121	6,086,700	7,463,100	9,031,600	10,882,400
International Charter	0	11,100	16,700	21,600	27,900
International Scheduled	33,817	40,300	48,200	57,600	68,900
Total Passengers	5,430,938	6,138,100	7,528,000	9,110,800	10,979,200
Air Cargo Forecast (in U.S. Tons)					
Belly Cargo	1,750	1,910	4,080	4,320	8,770
All Cargo	16,811	20,840	26,720	33,190	40,380
Total Cargo	18,562	22,750	30,800	37,510	49,150
Aircraft Activity Forecast					
Air Carrier Operations	49,698	57,070	68,130	81,250	96,300
Commuter Operations	47,466	50,380	55,560	57,930	63,480
All-Cargo Operations	3,433	3,980	4,680	5,380	6,200
General Aviation Operations	52,184	54,290	56,390	58,660	60,930
Military Operations	2,764	3,300	3,300	3,300	3,300
Total Operations	155,545	169,020	188,060	206,520	230,210
Peak Period Demand Forecast					
PMAD Passengers	16,813	19,004	23,304	28,207	33,992
PMAD Operations	510	555	618	678	756
Peak Hour PMAD Passengers	1,701	1,911	2,343	2,836	3,417
Peak Hour PMAD Operations	51	55	61	67	75

Note: PMAD = Peak Month Average Day

Table II.1-2
EXISTING ROLE FORECAST SUMMARY – HIGH CASE
T. F. Green Airport

	Existing	High Forecast			
	2000	2005	2010	2015	2020
Passenger Demand Forecast					
Domestic	5,397,121	6,649,000	8,284,000	10,157,500	12,382,800
International Charter	0	11,100	16,700	21,600	27,900
International Scheduled	33,817	40,300	48,200	57,600	68,900
Total Passengers	5,430,938	6,700,400	8,348,900	10,236,700	12,479,600
Air Cargo Forecast (in U.S. Tons)					
Belly Cargo	1,750	2,080	5,350	6,670	12,170
All Cargo	16,811	20,840	26,720	33,190	40,380
Total Cargo	18,562	22,920	32,070	39,860	52,550
Aircraft Activity Forecast					
Air Carrier Operations	49,698	61,660	75,850	89,830	108,980
Commuter Operations	47,466	53,820	56,380	61,970	67,990
All-Cargo Operations	3,433	3,980	4,680	5,380	6,200
General Aviation Operations	52,184	54,290	56,390	58,660	60,930
Military Operations	2,764	3,300	3,300	3,300	3,300
Total Operations	155,545	177,050	196,600	219,140	247,400
Peak Period Demand Forecast					
PMAD Passengers	16,813	20,744	25,848	31,693	38,637
PMAD Operations	510	582	646	720	813
Peak Hour PMAD Passengers	1,701	2,086	2,599	3,186	3,884
Peak Hour PMAD Operations	51	58	64	71	81

Note: PMAD = Peak Month Average Day

Table II.1-3
EXISTING ROLE FORECAST SUMMARY – LOW CASE
T. F. Green Airport

	Existing	Low Forecast			
	2000	2005	2010	2015	2020
Passenger Demand Forecast					
Domestic	5,397,121	5,495,500	6,525,100	7,690,100	9,030,500
International Charter	0	11,100	16,700	21,600	27,900
International Scheduled	33,817	40,300	48,200	57,600	68,900
Total Passengers	5,430,938	5,546,900	6,590,000	7,769,300	9,127,300
Air Cargo Forecast (in U.S. Tons)					
Belly Cargo	1,750	1,680	1,950	2,490	2,920
All Cargo	16,811	20,840	26,720	33,190	40,380
Total Cargo	18,562	22,520	28,670	35,680	43,300
Aircraft Activity Forecast					
Air Carrier Operations	49,698	50,960	60,830	68,230	80,850
Commuter/Air Taxi Operations	47,466	48,120	52,680	55,900	60,290
All-Cargo Operations	3,433	3,980	4,680	5,380	6,200
General Aviation Operations	52,184	54,290	56,390	58,660	60,930
Military Operations	2,764	3,300	3,300	3,300	3,300
Total Operations	155,545	160,650	177,880	191,470	211,570
Peak Period Demand Forecast					
PMAD Passengers	16,813	17,173	20,403	24,054	28,258
PMAD Operations	510	528	584	629	695
Peak Hour PMAD Passengers	1,701	1,727	2,051	2,418	2,841
Peak Hour PMAD Operations	51	52	58	62	69

Note: PMAD = Peak Month Average Day

Table II.I-4
AUGMENTED MARKET SHARE SCENARIO SUMMARY
T. F. Green Airport

	Existing	Augmented Market Share Scenario			
	2000	2005	2010	2015	2020
Passenger Demand Forecast					
Domestic	5,397,121	7,143,900	8,637,400	10,323,100	12,297,600
International Charter	33,817	755,000	925,100	1,109,300	1,326,500
Total Passengers	5,430,938	7,898,900	9,562,500	11,432,400	13,624,100
Aircraft Activity Forecast					
Domestic	95,320	126,620	145,240	163,010	186,310
International	1,844	12,010	14,530	17,150	20,180
Total Passenger Operations	97,164	138,630	159,770	180,160	206,490
Peak Period Demand Forecast					
PMAD Passengers	16,813	24,456	29,602	35,396	42,180
PMAD Operations	510	718	806	892	998
Peak Hour PMAD Passengers	1,701	2,477	2,998	3,583	4,269
Peak Hour PMAD Operations	51	72	81	90	101

Note: PMAD = Peak Month Average Day

and other U.S. airports as part of an international journey. For example, the entry for the T. F. Green-Los Angeles city-pair will include purely local T. F. Green-Los Angeles and Los Angeles-T.. F. Green travelers, as well as a passenger traveling from T. F. Green to Los Angeles in order to connect to a Los Angeles-Hong Kong flight. The forecasts of domestic scheduled traffic therefore implicitly include international passengers.

The location of the airport in the northeast part of the U.S. and the hubbing strategies of the airlines mean that relatively few passengers connect at the T. F. Green Airport. The O&D statistics for the airport therefore correspond closely to total enplanements (departing passengers) and deplanements (arriving passengers). Thus, they provide a satisfactory basis for development of a model.

Commuter airlines do not submit data to the O&D survey. Rather, they report quarterly volumes by on-line city-pair. Passengers who connect between these operators and mainline airlines are captured by the O&D survey. At T. F. Green, this omission affects persons traveling wholly on Cape Air, Atlantic Coast Airlines, and the commuter affiliates of US Airways. The quantities of traffic are modest and RIAC statistics provided information on these passengers.

As a foreign airline, Air Ontario does not report to the DOT's O&D survey. Its 37-seat aircraft are small enough to exempt it from submitting data to the DOT's T-100 survey. Passenger traffic for Air Ontario was provided by RIAC's airport activity statements.

The O&D survey excludes charter passengers; these were captured from the T-100 reports and RIAC's activity summaries.

Form 41 Schedule T-100, U.S. Department of Transportation

This database contains information on aircraft type; departures; available capacity; and passengers, mail, and freight transported by U.S. domestic carriers for all nonstop routes. Data is assembled on a monthly basis. The forecasts for T. F. Green use the *Domestic Market and Segment and International Market* reports. The international T-100 report was especially useful in identifying international charter traffic at T. F. Green.

Form 41 Financial Traffic Statistics, Department of Transportation

This summary of airline financial data provides passenger revenues and revenue passenger mile statistics by airline and geographical area.

298-C Commuter Airlines Traffic Tables, Department of Transportation

This database provides passenger traffic information for commuter airlines. It supplements the Ten Percent Ticket Sample by providing traffic data for persons traveling solely on commuter airlines, whose trips do not connect to flights by major carriers. For example, data regarding a passenger flying US Airways Express from

T. F. Green to Baltimore would appear in this set only if the passenger's destination were Baltimore. However, if that person were then connecting to a US Airways flight to Tampa, the flight data would also appear in the Ten Percent Ticket Sample of Database 1B.

Official Airline Guide

The Official Airline Guide (OAG) database contains every scheduled commercial airline's service on a worldwide basis. The database includes airline, aircraft type, origin, destination, and other data for every scheduled arrival and departure. The database is updated on a monthly basis and reflects ongoing changes in airline scheduling.

U.S. Government Data Sources

Regional and national demographic and economic data was collected from several Federal agencies including the U.S. Census Bureau, Office of Management and Budgets, Bureau of Labor Statistics, the Bureau of Economic Analysis, and the Office of Airline Information.

Rhode Island Airport Corporation

Passenger, operations, and cargo data was obtained from RIAC. The data included a monthly breakdown of traffic by airline since 1995.

Ticket Lift

In January 2001, RIAC assembled a database of over 40,000 tickets issued throughout southern New England by participating travel agents. This sample provides detailed information on outbound air travel patterns for every community in the region in terms of airport of departure, destination, airline chosen, routing, and fare paid. The database proved critical to identifying the T. F. Green service region and assessing the role of the regional transportation infrastructure in influencing airport choice.

II.2 Historical Review of Air Traffic and Economic Trends

This section summarizes recent historical aviation activity at the T. F. Green Airport. It also examines concurrent changes in the regional economy. It shows how the airport's traffic has evolved and will serve as the starting point for the development of comprehensive forecasts. A review of recent historical trends also identifies those factors, which have, or in the future might, influence traffic.

II.2.1 Factors Influencing Growth at T. F. Green

T. F. Green Airport is among the most dynamic and fastest growing of any in the nation, with total passenger traffic more than doubling from 2.4 million in 1993 to 5.4 million in

2000. Several major factors are responsible for the airport's recent growth. The key elements are described below:

Construction of a Modern Terminal Building/New Service by Southwest Airlines

The new Sundlun terminal building was completed in 1996. The new terminal was needed to replace the outdated 1964 terminal building. Planning for the new terminal was completed in 1990, with terminal design and construction occurring between 1992 and 1996.

In the autumn of 1996, Southwest Airlines inaugurated service to T. F. Green, its first destination in the Northeast. The arrival of Southwest Airlines is the most important event currently influencing traffic growth at T. F. Green. Although one of the airport's newest carriers, Southwest is now the largest operator in terms of passengers accommodated, nonstop points served, or seats offered. Several factors distinguish Southwest from other airlines, and make it a critically important factor at T. F. Green:

- Southwest consistently offers very low fares, even for full-fare and unrestricted travel. Its fares are usually significantly less than its competitors.
- It chooses its markets to tap a large area rather than just the immediate urban vicinity. It therefore chooses where it offers service to "serve the region, not the airport." Southwest's published schedule lists its T. F. Green and Manchester flights as serving Boston. Passengers may travel via some form of surface transportation (automobile, bus, train) over large distances to access its flights and benefit from the low fares.
- When Southwest enters a market, it begins service aggressively, with at least 10-15 daily flights to several nonstop destinations. The other carriers, in contrast, often serve an airport with only a handful of flights to their immediate hubs. Southwest's extensive air service offering at T. F. Green has been typical of its approach. At T. F. Green, Southwest carries more passengers than American, Delta, and United, combined. It is now the airport's largest operator and offers nonstop service from T. F. Green to more points than any other airline.
- Southwest operates its route network differently than most large carriers. Most airlines operate three or four large hubs across the nation, each with several hundred departures daily. Flights arrive and depart simultaneously in "banks" of up to a hundred aircraft, offering a comprehensive assortment of one-stop connecting service. In contrast, Southwest flies high-frequency short-haul service, although individual flights may hopscotch across the country. Connecting activity is distributed over many airports and throughout the day, without the large banks of flights. While Southwest is a short-haul specialist, it opportunistically flies long segments or one-stop transcontinental flights. These strategies help it maximize aircraft and gate productivity, and offer nonstop service to city-pairs that may be overlooked by its competitors.
- Southwest operates only one type of aircraft, the Boeing 737, helping to keep its costs low, simplifying operations and facilities planning.

- Southwest has developed procedures that enable it to arrive at the gate, off-load and on-load its passengers, and depart within about 20 minutes. This enhances productivity, and allows it to obtain very high activity levels per gate compared to other airlines.
- Southwest has been consistently profitable. Its strong balance sheet makes it far better positioned to expand than other airlines.
- Since Southwest does not operate a typical hub and spoke system, its overall growth prospects are not impacted by congestion at certain key airports.
- The presence of Southwest Airlines in a community is usually an important factor in determining how other airlines will use their aircraft fleet and set their fares. Sometimes, they will shift resources elsewhere. In other cases, they may match fares or boost service. At T. F. Green, US Airways used its low-fare division "MetroJet" to compete head-to-head with Southwest on routes such as T. F. Green-Baltimore. Delta Air Lines established its low-fare "Delta Express" partly to protect its Florida leisure traffic from capture by Southwest. Delta Express competes on routes from T. F. Green to Orlando. However, the "airline-within-an-airline" strategy used by traditional carriers to compete with low fare airlines has had mixed success. In late 2001, US Airways eliminated its MetroJet division along with its high frequency T. F. Green-Baltimore service. Delta Express also discontinued many services and reduced capacity at T. F. Green.
- Southwest's combination of low fares, tight strategic focus, and high quality of service have made it successful in virtually every market it enters. It stimulates traffic dramatically, by attracting new airline passengers and encouraging passengers to drive from distant communities to the airports it serves. The pattern of stimulation is so dramatic and so distinct that the DOT and the industry have dubbed it the "Southwest Effect.[4]"

Airline Deregulation

Most of the changes in air service at T. F. Green over the previous two decades have been the result of direct responses to the Airline Deregulation Act of 1978.[5] Indeed, Southwest Airlines entry to T. F. Green was itself a result of deregulation. Until 1978, it could only operate intra-Texas routes. Deregulation affected air service at T. F. Green in several ways:

- It allowed several new carriers to serve T. F. Green, including Northwest and Continental.
- It allowed new airlines to begin service. For example, Midway Airlines (now operating under Chapter 11 protection) is a product of deregulation.

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4 *The Low-Cost Airline Service Revolution*, Federal Aviation Administration, United States Department of Transportation, 1996.

5 This act created a new air service operating regime (commonly referred to as Deregulation) within the U.S. domestic market, which allows airlines to operate any route and to charge any price they so choose.

- Through a wide range of processes, it led to hub-and-spoke systems, which enabled the airlines to extend their services to additional cities.
- It prompted large changes in aircraft fleets. After deregulation, most airlines adopted high flight frequency strategies, reflecting the premium passengers place on convenience. The composition of the national fleet changed, with fewer widebody aircraft on domestic routes, and a greatly expanded use of 120-150 seat aircraft and 50-seat regional jets. In addition, some jet service was changed to turboprop aircraft on short-haul trips.
- It resulted in a proliferation of competition, with even low-density city-pairs obtaining a wide range of one-stop connecting service via different hubs.
- It resulted in the failures of several airlines. Eastern Airlines, once an important link between Rhode Island and the South, failed in 1991 after a decade of decline.
- Deregulation encouraged the growth of a unique type of airline, the "low-fare carrier." This group competes primarily on the basis of price. Most low-fare carriers are relatively recent. Southwest, one of the oldest, was established in 1971. Other low-fare carriers include Air-Tran, Frontier, American TransAir, and Vanguard.

Regional and Local Socioeconomic Trends

Air transportation demand at T. F. Green Airport depends on the combination of trends in the airline industry and the socioeconomic conditions within the southern New England area. This section summarizes recent trends in the region's population, employment, income, and Gross Domestic Product (GDP).

Population

According to the 2000 Census, Rhode Island's population has increased by 4.5 percent since 1990. Washington County saw the largest percentage increase in population, at 12.3 percent. Providence County experienced the largest absolute increase, with a population gain of approximately 25,000 residents.

Both southern Massachusetts and eastern Connecticut experienced increases in population since 1990. Barnstable County, MA grew at the fastest rate of 19.1 percent, while Bristol County, MA increased by 5.6 percent, or nearly 28,000 residents. Southern Massachusetts grew at a rate of 7.3 percent between 1990 and 2000, higher than the 5.5 percent rate for the state as a whole.

These results are significant for T. F. Green Airport. The population growth and good economic times have stimulated the use of air transportation at T. F. Green. **Table II.2-1** shows 2000 Census data for Rhode Island, southern Massachusetts, and eastern Connecticut.

Table II.2-1
CENSUS 2000 CATCHMENT AREA POPULATION DATA BY COUNTY
T. F. Green Airport

State	County	2000 Population	1990-2000 Growth Rate
Rhode Island	Providence	621,602	4.2%
	Bristol	50,648	3.7%
	Kent	167,090	3.7%
	Washington	123,546	12.3%
	Newport	85,443	-2.0%
	Total	**1,048,329**	**4.5%**
Massachusetts	Bristol	534,678	5.6%
	Plymouth	472,822	8.6%
	Barnstable	222,230	19.1%
	Norfolk	650,308	5.6%
	Worcester	750,963	5.8%
	Total	**2,631,001**	**7.3%**
Connecticut	Windham	109,091	6.4%
	New London	259,088	1.6%
	Total	**368,179**	**3.0%**
Total Region		**4,047,509**	**6.2%**

Source: 2000 U.S. Census

Employment

Employment levels are an important measure of economic vitality in a region. High employment levels imply a greater amount of travel for business purposes. Leisure travel can also increase due to higher incomes. **Table II.2-2** shows recent employment and unemployment data for the area.

Table II.2-2
NEW ENGLAND EMPLOYMENT AND UNEMPLOYMENT LEVELS
T. F. Green Airport

	Nonagricultural Employment (000s)	Unemployment Rates			
Period	**Rhode Island**	**Rhode Island**	**Boston**	**Hartford**	**Portland**
1998	457.6	4.9%	2.8%	3.4%	2.3%
1999	465.3	4. 1%	2.7%	3.3%	2.1%
2000	475.8	4. 1%	2.2%	2.3%	1.8%
October 2001	479.3	4. 1%	3. 8%	3.1%	2.8%

Source: Federal Reserve Bank of Boston, *New England Economic Indicators*, December 2001

Between 1998 and 2000 Rhode Island and southern Massachusetts experienced a dramatic increase in nonagricultural employment. Rhode Island employment grew by three percent in two years.

The unemployment rate for Rhode Island fell to 4.1 percent in 2000, matching the national average. However, over the 1998-2000 period, Rhode Island experienced higher unemployment rates than most other New England states. The 2000-2001 economic slowdown caused increases in unemployment rates in most communities in New England.

The disparity between unemployment rates in Providence and Boston shows that the region, while increasingly integrated, does not yet comprise a single economic entity. It also suggests that economic integration would benefit Rhode Island, since it tends to under-perform Boston.

Personal Income

Personal income is an important determinant of air travel demand. As income levels rise in a community or nation, the propensity to travel increases. **Table II.2-3** gives historical and projected personal income data by county in the T. F. Green catchment area.

Table II.2-3
PERSONAL INCOME LEVELS BY COUNTY
T. F. Green Airport

State	County	1990 (in millions)	2000 (in millions)	2005 (in millions)	1990-2000 Growth Rate	2000-2005 Projections
Rhode Island	Providence	13,481	16,291	19,070	1.9%	3.2%
	Bristol	1,335	1,705	2,051	2.5%	3.8%
	Kent	3,927	5,006	6,065	2.5%	3.9%
	Washington	2,717	3,855	4,796	3.6%	4.5%
	Newport	2,232	2,632	2,980	1.7%	2.5%
	Total	**23,692**	**29,490**	**34,961**	**2.2%**	**3.5%**
Massachusetts	Bristol	10,870	14,349	17,447	2.8%	4.0%
	Plymouth	10,496	14,597	17,914	3.4%	4.2%
	Barnstable	5,123	7,436	9,334	3.8%	4.7%
	Norfolk	19,862	26,098	30,183	2.8%	3.0%
	Worcester	16,844	21,865	26,204	2.6%	3.7%
	Total	**63,195**	**84,344**	**101,083**	**2.9%**	**3.7%**
Connecticut	Windham	2,303	2,937	3,623	2.5%	4.3%
	New London	6,453	7,934	9,221	2.1%	3.1%
	Total	**8,756**	**10,871**	**12,845**	**2.2%**	**3.4%**
Total Region		**95,643**	**124,705**	**148,888**	**2.7%**	**3.6%**

Source: NPA Data Services Inc. from United States Census Bureau

Gross Domestic Product of Rhode Island and Southern New England

The T. F. Green catchment region has seen a steady growth of personal income levels for the 1990-2000 period. Southern Massachusetts was particularly dynamic, with an average annual rate of increase of 2.9 percent. Overall, the region's personal income levels grew at a rate of 2.7 percent, with Rhode Island growing at a rate of 2.2 percent. Counties with large increases in personal income level include Washington, RI and Barnstable, MA. Both have seen large increases in population.

Exhibit II.2-1 displays recent trends in the growth of real (inflation-adjusted) GDP for Rhode Island, New England, and the U.S. Traffic at T. F. Green Airport has increased as a result of national and regional economic growth. Over the 1980-1988 time frame, New England widely outpaced the national average economic rate of growth. The rapid growth and economic diversification of Massachusetts were factors. The Boston area benefited particularly from the growth of computer hardware and software companies. During this period, Rhode Island shared in the prosperity of Massachusetts, and grew modestly faster than the U.S., however, it suffered from several structural problems. During the 1970s, Rhode Island benefited from a strong expansion in manufacturing, especially in defense and miscellaneous manufacturing such as jewelry. The closure of

the Navy facilities that began in the 1970s was followed by a steady decline in the manufacturing sector, especially jewelry, industrial machinery, and textiles. Between 1978 and 1987, total manufacturing employment fell by 13 percent.[6]

The late 1980s saw a brief economic boom in Rhode Island, resulting from increased defense spending, spillovers from rapid growth in Massachusetts, and a temporary surge in construction. However, Rhode Island's dependence on slowly growing industrial sectors remained. The temporary surge ended with the nationwide 1990 recession. The decline of GDP was considerably steeper in Rhode Island than in the U.S. as a whole.

For the economy of the U.S., the 1990-1991 recession was both mild and brief. However, New England experienced a much more severe contraction, beginning in the late 1980s. Only in 1994 did the Gross Regional Product (GRP) reach the historic levels of 1988. Rhode Island experienced a longer slump than New England as a whole.

The national economy, in contrast, experienced only a modest dip in 1991. The late 1990s saw strong growth in the three areas. Over the 1980-2000 period, economic growth in New England exceeded that of the nation as a whole. The Gross State Product for Rhode Island grew more slowly than the national GDP, primarily because of its sluggish performance over the 1988-1995 period.

Traffic at T. F. Green closely parallels the economies of New England and Rhode Island. The 1980s saw strong growth, followed by stagnation to the mid-1990s. The latter half of the 1990s saw growth for both air traffic and Gross Regional/State Product. While the economic variables are important, the growth of traffic at T. F. Green after 1996 is far out of proportion to the region's economic expansion. It should be viewed primarily as a result of Southwest Airlines, rather than of economic expansion in Rhode Island and southern New England.

Integration of the Boston and Providence-Warwick Urban Communities

Population growth in southern New England is rapidly causing a fusion of the Boston and Providence-Warwick urban communities. An urban entity, stretching from Manchester, through Greater Boston, to southern Rhode Island, increasingly functions as a single labor market. The region is also increasingly becoming a single air service market, since many passengers from southern Massachusetts use T. F. Green. Similarly, many Rhode Islanders still travel to Boston Logan to access flights. Because of the size of the Boston market, even a small change in T. F. Green's share could represent substantial growth.

[6] Rhode Island Economic Policy Council, *Meeting the Challenge of the New Economy – Keys to Building Hope*, Annual Review 1997, Chapter 3, *Rhode Island's Economic Structure and Performance.*

The Rhode Island Economic Policy Council has evaluated this process and its consequences for the state. It has concluded "a single regional job market, shared by Rhode Island, southern New Hampshire, and eastern Massachusetts, has emerged.[7]" The Council suggests that Rhode Island has important competitive advantages, particularly affordability, relatively uncongested highways, the potential of a Quonset port facility, and a functioning airport.[8] The state is well positioned to benefit from regional integration.

However, the integration is far from complete. By many economic measures, Rhode Island still lags behind Massachusetts. In 1999, Rhode Island's per capita personal income was $29,335.[9] This ranked 16th in the United States, and exceeded the national average by three percent. This contrasts to $35,527 for Massachusetts,[10] which ranked fourth. Over the 1989-1999 period, this measure grew by an average annual rate of 4.1 percent for Rhode Island and 4.7 percent for Massachusetts; as compared to the U.S. as a whole, which grew by 4.4 percent.

The contrast between Boston and the Providence-Warwick area is equally dramatic. The 1999 per capita personal income for Providence-Warwick-Pawtucket was $29,000. This was two percent ahead of the national average of $28,546. Since 1989, this quantity has grown at an annual rate of 4.1 percent. The personal per capita income for the Boston Metropolitan Statistical Area was $36,285, ranking 15th in the nation and 27 percent higher than the national average. The average annual growth rate for the Boston area between 1989 and 1998 was 4.7 percent.

These statistics suggest that, as Rhode Island becomes increasingly integrated with the larger and wealthier Boston community, personal income levels in Rhode Island would increase. The integration to many of Massachusetts' key economic sectors is becoming increasingly important in Rhode Island. Southern Massachusetts has benefited considerably from its strengths in finance, advanced engineering, telecommunications, and information technology. These sectors will likely become more important in Rhode Island, eventually supplanting the low growth industries which still predominate.

Table II.2-4 lists the major employers of Rhode Island and adjacent areas of Massachusetts. Examples of Rhode Island's increasing share of high growth activity include Amica Insurance and other large financial institutions. Fidelity plans a further expansion of a large complex at Smithfield, potentially creating an additional 2,500 jobs. Dow Chemical has plans to establish a large manufacturing and research/development plant, also at Smithfield.

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7 Rhode Island Economic Policy Council, *A Rhode Island Economic Strategy: 10 Ways to Succeed Without Losing Our Soul*, preliminary and unpublished document, August 2001.

8 Rhode Island Economic Policy Council, *A Rhode Island Economic Strategy: 10 Ways to Succeed Without Losing Our Soul.*

9 Bureau of Economic Analysis Regional Economic Information System, 2001.

10 Bureau of Economic Analysis.

Table II.2-4
MAJOR RHODE ISLAND AND BRISTOL COUNTY EMPLOYERS
T. F. Green Airport

Company	Location	Employees in Region	Business
Texas Instruments	Attleboro, MA	4,000	Engineered materials, controls and sensors
Citizen's Financial Group	Providence, RI	3,600	Banking and financial services
FleetBoston Financial	Providence, RI	3,394	Financial Services
CVS Corporation	Woonsocket, RI	3,963	Drug stores
Quaker Fabric Corporation	Fall River, MA	2,400	Upholstery fabric
MetLife Insurance	Warwick, RI	2,200	Property and casualty insurance
Titleist & Foot Joy Worldwide	Fairhaven, MA	2,000	Golf balls and equipment
Raytheon Electronics Systems	Portsmouth, RI	1,750	Oceanographic Instrumentation
Amica Mutual Insurance Company	Lincoln, RI	1,579	Automobile and home insurance
General Dynamics Corporation	Quonset, RI	1,575	Defense technology
Motorola ING	Mansfield, MA	1,400	Data communications systems and equipment

Source: Providence Business News – Book of Lists

II.2.2 Current and Recent T. F. Green Air Service

The recent history of air traffic at T. F. Green provides important information about the factors influencing aviation demand. Historic air service, air fares, and activity trends are discussed in the sections that follow.

Air Service and Passenger Trends

The following types of service are provided at T. F. Green:

- Hub and spoke service of major airlines and their affiliates
- Low-fare point-to-point service by Southwest Airlines, MetroJet (a division of US Airways), and Delta Express (a division of Delta Air Lines)
- Commuter service by Cape Air to Nantucket, Martha's Vineyard, and Hyannis
- Domestic charter service, including inbound charter flights carrying visitors to Foxwoods Resort
- International charter service, including Azores Express' summer flights to Ponta Delgada in the Azores, and winter flights to resorts such as Aruba, the Dominican Republic, and Cancun

- International scheduled service. Air Ontario, an affiliate of Air Canada, operates service to Toronto. Since all departures from Canada undergo U.S. entry formalities in Toronto, the flights can be considered, for facilities purposes, as domestic service.

Table II.2-5 lists the passenger airlines currently serving the T. F. Green Airport**.**

Table II.2-5
RECENT T. F. GREEN TRAFFIC ACTIVITY BY AIRLINE
T. F. Green Airport

	Total Passengers					Outbound Service, January 2002		
Airline	**1997**	**1998**	**1999**	**2000**	**2001**	**Flights**	**Seats**	**Nonstop Destinations**
Cape Air	7,616	22,136	35,687	44,298	44,527	222	1,998	2
American/TW	261,391	285,233	338,358	396,731	384,259	213	19,289	2
Air Ontario	5,970	29,467	31,191	33,817	34,065	64	2,368	1
Continental	315,871	374,429	407,570	382,682	348,614	366	23,564	3
Delta	655,481	654,651	627,727	639,784	692,584	279	39,895	3
Midway	0	0	0	0	33,875	0	0	0
Northwest	195,075	203,689	240,887	264,151	282,624	216	20,743	2
United	268,024	320,209	450,074	415,804	438,256	255	24,406	2
US Airways	1,261,095	1,432,978	1,452,171	1,547,302	1,450,968	796	78,768	7
Southwest	988,753	1,178,883	1,442,894	1,642,565	1,792,073	824	112,843	9
Charter	111,460	113,634	114,236	60,007	28,530	0	0	0
Total	**4,070,736**	**4,615,309**	**5,140,795**	**5,430,938**	**5,530,39**	**3,235**	**323,814**	**26**

Source: RIAC and OAG (1997-2002)

As shown in **Exhibit II.2-2**, T. F. Green has experienced several distinct phases of passenger growth over the last twenty years. Between 1980 and 1990, the airport saw a rapid expansion of passenger traffic, with an average annual growth rate of 12.8 percent. This occurred due to changes in the airline industry resulting from deregulation. Traffic then stagnated at the airport in the early 1990s as the airline industry went through serious financial problems, mergers, and consolidations. Both the New England regional and Rhode Island economies experienced slow growth during this period. The most recent period of rapid growth in passengers began in 1996 with Southwest Airlines' decision to serve T. F. Green. Between 1996 and 2000, traffic grew by 119 percent. In addition, the traffic volumes of the incumbent airlines continued to grow. They were forced to adopt a low-fare, high-volume strategy that increased their traffic, although not necessarily their profits.

As shown in **Table II.2-6**, total passenger traffic increased from 2.5 million passengers in 1996 to 4.1 million passengers in 1997, an increase of 64 percent in the first year of Southwest Airlines' service. The growth in passenger traffic was due in large part to Southwest's service and the competitive response of other carriers such as US Airways and Delta. In 2000, Southwest accounted for 30 percent of the total 5.4 million

passengers traveling to and from T. F. Green. Even after the 1998 inauguration of service by Southwest at Manchester, T. F. Green traffic has continued to grow at an average annual rate of over 10 percent. In contrast, total U.S. domestic traffic only grew at an average annual rate of 4.2 percent during the 1998-2000 period.

Table II.2-6
HISTORICAL PASSENGER TRAFFIC
T. F. Green Airport

Year	Total Passengers
1990	2,372,324
1991	2,332,208
1992	2,248,484
1993	2,373,026
1994	2,460,535
1995	2,169,994
1996	2,483,910
1997	4,070,736
1998	4,615,309
1999	5,140,795
2000	5,430,938
2001	5,530,393

Source: RIAC

The incumbent airlines reacted quickly to Southwest's entry to T. F. Green. Since 1996, American has increased its service to Chicago O'Hare. In 1999, Continental Airlines started nonstop service to Houston, competing with a parallel offering by Southwest. Southwest subsequently eliminated its T. F. Green-Houston Hobby flight, as has Continental. Atlantic Coast, an affiliate of United, has upgraded a turboprop service to Washington-Dulles to regional jets. In the summer of 2001, Air Midway briefly returned to T. F. Green with nonstop service to its Raleigh-Durham hub. Through an affiliate, Northwest has initiated nonstop service to its hub in Minneapolis/St. Paul. US Airways, formerly T. F. Green's largest tenant, established a low-fare division, MetroJet, to respond to Southwest and defend its stronghold in the northeast. MetroJet launched head-to-head competition with Southwest on the T. F. Green-Baltimore route. In January 2002, US Airways abandoned this route as its MertoJet division was eliminated. US Airways has, however, added frequencies to its Pittsburgh and Charlotte hubs.

The extraordinary growth at T. F. Green since 1996 represents a one-time adjustment of the market to the stimulus of a genuinely new and competitively priced service offering. Such annual growth rates are unlikely to continue over the long term. Once T. F. Green has fully absorbed the entry of Southwest Airlines and the response of the incumbents, traffic will likely enter a phase where growth rates would be lower, and more related to national aviation industry patterns and local and national economic trends. Annual traffic growth at T. F. Green has already fallen from a high of over 70 percent in 1997 to approximately eight percent in the first half of 2001; a sign that the rapid growth is slowing.

Exhibit II.2-3, **Exhibit II.2-4**, and **Exhibit II.2-5** trace the chronology of scheduled air service at T. F. Green. In addition, **Exhibit II.2-6** shows the top 15 T. F. Green O&D markets[11] currently without nonstop air service. The forecasts predict new nonstop destinations at T. F. Green within the planning period; these 15 markets are likely choices for new nonstop service.

Origin and Destination Passengers vs. Connecting Passengers

Most of the passengers at T. F. Green are O&D passengers. In other words, the majority of passengers either begin or end their journey at T. F. Green. The T. F. Green Airport plays only a modest role for connecting traffic. Its location in the northeast portion of the country means that it does not have the broad catchment area needed to support a hub. Rather, it serves as a spoke to hubs at Pittsburgh, Atlanta, Chicago, and other airports. **Table II.2-7** shows historical O&D passengers.

The modest scale of connecting activity has important implications for the choice of a forecasting methodology. It means that the O&D traffic at T. F. Green will be virtually identical to the total traffic. Since nearly all connecting traffic involves other New England destinations, introducing a wider range of regional or national variables, such as the GDPs of Texas or California, would not be applicable to T. F. Green.

Air Fares

Fare issues are crucial to the recent growth at T. F. Green. Average fares can often vary considerably between different airports, and passengers will often choose the airport with the lowest fares. **Exhibit II.2-7** compares average domestic fares at T. F. Green and other northeastern airports for 1995 and 2000. The numbers at the top of the graph denote percentage changes over this period. The chart shows that:

- Between 1995 and 2000, average ticket prices at T. F. Green fell by 22 percent.
- Over the same period, average prices at Boston rose by 12 percent.

[11] Top 15 markets are based on Database 1B full year 2000 data.

Table II.2-7
HISTORICAL O&D AND CONNECTING PASSENGERS
T. F. Green Airport

Year	O&D Passengers	Total Passengers
1981	655,550	N/A
1982	575,980	N/A
1983	569,850	N/A
1984	758,730	N/A
1985	1,128,600	N/A
1986	1,336,950	N/A
1987	1,563,980	N/A
1988	1,957,530	N/A
1989	2,068,300	N/A
1990	2,194,970	2,372,324
1991	1,940,960	2,332,208
1992	1,916,580	2,248,484
1993	1,839,020	2,373,026
1994	2,112,180	2,460,535
1995	1,905,980	2,169,994
1996	2,323,470	2,483,910
1997	3,873,940	4,070,736
1998	4,350,890	4,615,309
1999	4,947,120	5,140,795
2000	5,271,110	5,430,938

Note: O&D statistics from DOT exclude commuter and charter activity, whereas total statistics include this activity.
Source: U.S. DOT Database 1B; Table 11

- In 1995, the average price of a domestic ticket was 4.9 percent higher at T. F. Green than at Boston.
- In 2000, the average price of a ticket was 27 percent lower at T. F. Green than in Boston.
- In 1995, T. F. Green was the fifth most expensive of the airports shown.
- In 2000, T. F. Green had the second lowest ticket prices of all airports in the group. Only Baltimore, another and far larger stronghold for Southwest, had lower fares than T. F. Green.

These changes have greatly altered the parameters within which residents and visitors of southern New England choose between the different airports. They help explain why traffic at T. F. Green has grown so quickly since 1996.

In 2000 and 2001, T. F. Green enjoyed among the lowest average airfares in the country. The low fares from T. F. Green represent a major benefit for state residents and an important competitive advantage for the Rhode Island community.

These findings on fares have important implications for the future growth of traffic at T. F. Green. The fare differentials between T. F. Green and Boston Logan are now widely known and fully reflected in airline and passenger behavior. With fares already very low, it is unlikely that T. F. Green will experience a further decline in fares comparable to that experienced between 1995 and 2000. In fact, average fares at T. F. Green increased by 5.2 percent between 1999 and 2000.[12] This suggests that continued dynamic growth in passengers on the magnitude of the 1995-2000 period is unlikely. The destinations most likely to experience above-normal traffic growth are those not presently served by Southwest from T. F. Green.

Aircraft Operations

While scheduled passenger service is the largest component of traffic at the airport, T. F. Green accommodates a wide spectrum of aviation activity, from air cargo to general aviation operations. **Table II.2-8** and **Exhibit II.2-8** present the total annual aircraft operations at the airport over the past 12 years. Between 1990 and 1995, total operations decreased from 179,482 to 130,397. This decrease reflects the use of other state operated reliever airports by general aviation, as well as the relocation of the Air National Guard and Army Guard to Quonset Airport. However, with the introduction of service by Southwest Airlines in 1996 and the competition by other airlines that followed, total aircraft operations at T. F. Green increased by 23 percent from 124,165 operations in 1996 to 153,101 operations in 1997. In the year 2000, T. F. Green accommodated 155,545 total operations. Air carriers such as Southwest, US Airways, MetroJet, and Delta and commuters (US Express, Continental Express, Business Express, and Cape Air, etc.) conducted 65 percent of these operations with a mix of

[12] United States Department of Transportation, Database 1B.

jets, turboprops, and light twin-engine aircraft. In 2001, operations fell to 148,336 due to the reduction in travel after September 11. Passenger operations remained relatively constant and most of the reduction was in general aviation traffic.

Table II.2-8
HISTORICAL AIRCRAFT OPERATIONS
T. F. Green Airport

Year	Air Carrier	Commuter/Air Taxi	General Aviation	Military	Total
1990	33,261	26,874	118,048	1,299	179,482
1991	33,985	25,483	89,707	1,666	150,841
1992	32,412	34,152	68,030	1,504	136,098
1993	28,061	44,167	53,128	2,421	127,777
1994	30,510	35,121	53,479	2,872	121,982
1995	26,949	36,498	63,661	3,289	130,397
1996	29,463	32,275	59,063	3,364	124,165
1997	43,734	40,910	64,808	3,649	153,101
1998	46,332	40,827	66,583	3,578	157,320
1999	47,214	49,267	62,410	3,518	162,409
2000	51,587	49,010	52,184	2,764	155,545
2001	54,494	46,112	45,095	2,635	148,336

Source: RIAC

Air Cargo

United Parcel Service (UPS), Federal Express, and Airborne Express operate all-cargo service to T. F. Green. These firms provide air transportation as part of a door-to-door service that includes pickup and delivery, insurance, tracking, customs clearance, and other functions. The airport's passenger airlines also carry cargo as a by-product in the lower decks (bellies) of scheduled flights.

Throughout the early 1990s, air cargo volumes at T. F. Green grew at rates in excess of commercial passenger activity. Between 1990 and 1995, total air cargo volumes grew at an average annual rate of 6.6 percent. During the latter part of the 1990s, total air cargo has increased at an average annual rate of over 17 percent. Statistics for air cargo volumes between 1990 and 2000 are shown on **Table II.2-9** and **Exhibit II.2-9**.

II.3 Existing Role Forecasts

This section summarizes the development of forecasts assuming that the existing role of the airport remains the same in the future – that is, the growth of the airport's use will

be reflective of growth (or lack of growth) in the southern New England Region. These forecasts relate solely to market demand; they quantify the level of activity which would result from T. F. Green accommodating all potential users. They do not incorporate any physical or facility constraints, or call for a change in the current role of T. F. Green in the greater New England Region.

Table II.2-9
HISTORICAL CARGO VOLUMES
T. F. Green Airport

Year	Cargo (tons)
1990	6,076
1991	8,591
1992	7,729
1993	7,453
1994	7,903
1995	8,380
1996	8,887
1997	14,371
1998	17,231
1999	17,683
2000	18,562

Source: RIAC

The forecasts include separate Low, Medium, and High cases to reflect a possible range in the future values of several key variables affecting airport usage. The Medium case forecasts are the most likely to occur and are the most appropriate for planning purposes.

II.3.1 Forecast Methodology

Exhibit II.3-1 summarizes the overall methodology used to develop the Existing Role forecasts. Steps 1-3 of the process involve data collection. In Step 1, a 20-year history of traffic and yields[13] at the airport was reviewed and analyzed. Extensive data was also captured on Rhode Island, New England, national incomes, and economic output, as measured by the GDP. The GDP measures the total production of goods and

[13] "Yield" is defined as average revenue an airline obtains from carrying a passenger one mile. It reflects the fare, length of haul, the level of competition, carrier costs, and other factors. Yield is a commonly accepted measure of the price of air travel and a crucial determinant of airline profitability.

services within a particular area, and thus represents a measure of total economic activity. All economic variables were deflated to constant dollars to eliminate any distortions resulting from deflation.

Step 3, *T. F. Green Market Activity*, incorporates a wide range of data and observations about the T. F. Green Airport and the New England economy. Most of the insights obtained in this step are qualitative in nature and provide background information used in the process of developing a model. Specific elements include interviews and discussions with organizations such as the Rhode Island Economic Policy Council, the Greater Providence Chamber of Commerce, the Rhode Island Economic Development Corporation, and selected tenants at T. F. Green. Extensive data was obtained on the economic base and the leading employers of Rhode Island and southern Massachusetts.

In Step 4, historical scheduled passenger traffic is examined in light of variables such as GRP and airline yields. A series of mathematical techniques were applied to quantify a relationship between the variable being forecast (scheduled passengers) and the other variables.

In Steps 5 and 6, assumptions were developed about the likely evolution of the key economic variables. Organizations such as DRI-WEFA[14] and the U.S. Bureau of Economic Analysis provided projections for the economy through 2020. Forecasts of future yields were developed from an analysis of airline industry technology and operating costs (Steps 7 and 8).

The forecasts also depend on the business strategies of the carriers serving T. F. Green. Assumptions were made about airline merger activity and new service to T. F. Green. Discussions were held with Southwest Airlines regarding its development plans at T. F. Green. Prospective carriers JetBlue, AirTran, and Frontier were also consulted. The airlines are reluctant to divulge long-term business strategies or plans to enter new markets. It was therefore necessary to develop independent city-by-city assumptions on what additional markets would be served from T. F. Green (Steps 9-10).

The assumptions developed in Steps 5-10 imply that projections of the key variables drive traffic demand. These projections, when superimposed on the model developed in Step 4, provided forecasts of air traffic demand at T. F. Green (Step 11).

The raw forecasts developed in Step 11 resulted from superimposing GDP, yield, and air service growth projections on the econometric model. The forecasts were re-expressed as annual growth rates, and applied to the actual traffic volumes of the year 2000 to yield forecasts for each year through 2020.

[14] DRI-WEFA, a division of Global Insight, Inc., is a widely accepted source of information and forecasts on the U.S. and world economies. Many private and public organizations, including the FAA, use DRI-WEFA as the accepted source of macroeconomic forecasts.

Forecasts of operations were developed from the passenger traffic forecasts in Step 14. Since carriers have a wide latitude over the choice of aircraft and load factors, many different levels of operations can correspond to one set of passenger forecasts. The forecasts of operations were developed from information about airline fleet plans, scheduling strategies at downline hubs, current load factors, and assumptions about mergers and competitive strategies.

Steps 1 through 14 were completed prior to September 11th. In order to properly gauge the impact of the terrorist attacks and the war on terrorism, the latest economic data was obtained from DRI-WEFA in February of 2002. In November 2001, DRI-WEFA compiled long term forecasts through 2026 to incorporate the effects of the September attacks. In January 2002, it produced a revised set of short-term economic forecasts through 2006. Both sets of economic forecasts were combined to refine the forecast projections, resulting in the final forecasts. In addition, a review of the impacts on the industry due to the terrorist attacks of September 11th was conducted to determine if the overall long-term growth trends and resulting planning trigger points remained valid. This review is contained in **Appendix C**, *September 11 Forecast Validity Review*. The review determined that the overall growth trends were valid for long-term planning purposes.

The 2000 calendar year served as the base for developing forecasts for 2002-2020. Although data for the full 2001 calendar year became available late in the development of the forecasts, the severe disruptions to the economy and the airline industry following the September 11 attacks and the economic contraction render 2001 altogether inappropriate as a forecasting base year.

II.3.2 Passenger Forecasting Model

T. F. Green has experienced several distinct phases of development within its recent history. Most importantly, traffic has grown from just over two million annual passengers in 1995 to 5.5 million passengers in 2001. This growth, as discussed in Section II.2.2, was a direct result of Southwest Airlines' decision to serve T. F. Green. The future will likely see a fourth phase of growth, with traffic expanding at rates commensurate with the airline industry as a whole. Incorporating these discrete phases into a single model is a major challenge of the statistical modeling process for the Existing Role forecasts.

Structural Form of the Model

The 1995-2001 traffic growth at T. F. Green is typical of the "product cycle" model used in the marketing of new products. Growth is often moderate in the early stages after a new product or service is introduced. However, acceptance accelerates rapidly, and a period of rapid growth ensues. Eventually, the service has attracted most of those customers who might use it, and growth stabilizes to a more moderate level. This growth process results in an s-shaped traffic curve. The process for estimating the parameters of such functions is not immediately obvious because of the non-linear relationship between the determinants and the forecasted variable. However, business

analysts have developed several structural equation forms that can model this type of growth dynamic. One such form is the logistic model, adopted as the basis for the domestic O&D forecasts.

The logistic regression model defines an s-shaped curve by transforming a standard linear equation ($y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$) with the function:

$$\theta(x1, x2, x_3) = Exp(y) / (1 + Exp(y))$$

where:

y = domestic O&D forecasts
α = the constant of the equation
β = the coefficients of the predictor variables
x_1 = predictor variables

An alternative form of the logistic regression equation is:

$$\log [\theta(x_1, x2, x_3) / (1-\theta(x_1, x_2, x_3))] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3$$

The generalized logistic function provides a flexible curve for summarizing and comparing growth. The estimated parameters can be used to study differences in growth patterns in different independent variable groups.

Explanatory Variables in the Model

The Existing Role forecast model was developed using the classical techniques of linear regression, with the dependent "y" variable transformed according to the logistic function described above. Several preliminary models were tested, using a variety of explanatory variables and functional forms. Of the variables examined, three proved of particular importance in explaining traffic at T. F. Green:

- The output of the New England economy, as measured by the real GRP. This reflects the importance of economic activity as the key driver of air travel.
- The level of fares at T. F. Green, as measured by the overall yields (revenue per passenger-miles flown). A high yield, indicating a high price of air travel, will suppress traffic growth.
- The "Low-fare Carrier Market Penetration Factor" which measures the total quantity of traffic which could be served by low-fare airlines, and which could experience stimulation.

These historical values are presented in **Appendix B**, *Forecast Assumptions*, Table B-1, Historical *Values of Model Independent Variables*. A discussion of each predictor variable follows:

New England Gross Regional Product

One of the most important determinants of traffic growth is the strength or weakness of the economy. Air travel is a derived demand; it has no intrinsic consumption benefit of its own. It is purchased either as an input for productive activity (business travel) or as a necessary part of a larger part of consumption (leisure travel). The level of economic activity, as measured by the GDP or GRP, determines both production and consumption, hence the demand for air travel. This variable encompasses all states of New England.

A growing GRP influences air travel through many mechanisms: increased productivity, higher profits and incomes, lower unemployment rates, increased consumption and investment, changes in the current account, wealth effects from capital appreciation, and optimistic expectations. However, all of these processes depend on, and originate from, changes in the level of economic activity. The GRP variable can satisfactorily capture these effects. Population increases are also imbedded in the GRP variable. As the number of persons in the region increase, the aggregate amount of economic activity increases accordingly.

T. F. Green Average Yield

Yields are the aviation industry's measure for average ticket prices. As prices decline, passengers can better afford to fly and traffic increases. The Rhode Island market has had two periods of rapid growth in its recent history, during the mid to late 1980s and the late 1990s. In both cases there was a corresponding decline in yields. In the 1980s, yields declined as deregulation in the aviation industry compelled airlines to improve their operating efficiency in order to reduce costs (and subsequently prices) to stay competitive. In the late 1990s yields dropped dramatically as the low-fare carrier, Southwest Airlines, entered the market. **Exhibit II.3-2** shows yield levels for T. F. Green, the U.S. domestic market, and airports with Southwest service from 1995 to 2000.

The graph shows the rapid decline in yields at T. F. Green since 1995. Before 1997, T. F. Green yields were considerably higher than the national average. By the year 2000 T. F. Green had fallen below the national average. However, after 1999, yields from T. F. Green rose modestly, following the national trend. The graph also shows that yields at mature Southwest markets do not continue in a downward spiral of decreasing yields, but rather stabilize over time. The projections of future yields used to forecast traffic consider both these factors in the High, Medium, and Low case scenarios.

Low-fare Carrier Market Penetration Factor

The rapid increase in traffic over the 1995-2000 period resulted from the low-fare service offered by Southwest Airlines. However, Southwest served, either directly or indirectly, only a small number of the many destinations to which passengers fly from T. F. Green. Despite the overall growth of T. F. Green, many markets saw very few

changes over the 1995-2000 period, and grew only modestly. For example, T. F. Green-Atlanta traffic grew only four percent yearly over this period, although total traffic at T. F. Green grew at over 20 percent yearly.[15]

In the future, Southwest will reach maturity at T. F. Green, and growth to the destinations it already serves will stabilize. However, as the airline adds other cities to its network, the traffic that they exchange with T. F. Green will grow quickly. The forecasting model must differentiate between those markets obtaining stimulation, and those remaining unaffected, through a measure of the potential market penetration of low-fare carriers at T. F. Green.

The "Low-fare Carrier Market Penetration Factor" measures the size of the T. F. Green market which could be accommodated by low-fare carriers. It is based on the 1995 pre-Southwest O&D statistics. This factor is defined as:

$$\frac{\text{Total T. F. Green O\&D Passengers to Cities Having Competitive Low-Fare Carrier Services}}{\text{Total T. F. Green Domestic O\&D Traffic}}$$

A point is defined as having "competitive low-fare carrier services" if, in 2000, it had nonstop service by a low-fare carrier from T. F. Green or if 15 percent of its traffic used a low-fare carrier. The factor can range in value from 0 to 1. As low-fare carriers expand their service from T. F. Green, this factor will increase. In 1995, the penetration factor was equal to 0, by 2000, it had reached 0.55. As low-fare carriers exhaust their opportunities for new service, the factor will stabilize and growth at T. F. Green will be moderate. Traffic forecasts require projections of this factor. This is developed by predicting the future route development of low-fare carriers at T. F. Green.

Key Assumptions

The methodology for preparing domestic O&D forecasts recognizes that key parameters such as GRP and T. F. Green yields will change. However, it assumes that the fundamental mathematical *relationships* between the three determining factors and domestic O&D passenger traffic will persist, and will support the development of realistic forecasts. This section summarizes the key assumptions underlying the future of the three key determinants.

New England Gross Regional Product

Forecasts of New England Regional Product were obtained from DRI-WEFA. These forecasts represent "real" growth rates, with all inflationary effects removed. DRI-WEFA provides forecasts of key economic variables to a wide range of users, including industry analysts, Federal and state economic planners, market research organizations, and corporate strategic planners. Their forecasts are based on sophisticated simultaneous equation models, which link thousands of related economic variables.

[15] United States Department of Transportation Databases 1A and 1B, Years Ending December 31, 1995 and December 31, 2000.

The economic forecasts call for only nominal economic growth of 2.5-2.6 percent yearly through 2005 for both the New England region and the nation as a whole. The war on terrorism is expected to require growing military and security expenditures, creating a small government deficit. The borrowing needed to cover the deficit will result in modestly higher interest rates. This is expected to reduce private consumption and investment. These impacts will be moderated by expansionary fiscal and monetary policies. By 2005, the government budget is again expected to be in surplus, and stronger growth will commence.

The forecasts are based on a continuing expansion of the economy, driven by moderate population growth. DRI-WEFA believes that the New England region will closely track the national economy. Productivity is projected to continue to grow in both the goods and services sectors, albeit at a slower pace than experienced in the 1995-1999 expansion. Energy prices will remain largely stable, although short-term supply problems (e.g. electrical shortages, price hikes by the Organization of Petroleum Exporting Countries or OPEC) may cause temporary fluctuations. It is assumed that after 2010, growing world demand for petroleum will increase OPEC's power, and the price of crude oil will climb slowly but steadily through 2025.

The new DRI-WEFA forecasts for the 2005-2020 period are somewhat more bullish than those produced in the Spring of 2001. Although the economy is expected to continue a long-term growth trend, it will remain vulnerable to the short-term contractions brought on by the business cycle. The growth rates used in the forecasts represent an average year-over-year trend; they do not try to estimate the timing and severity of recessions or the rates of recovery.

According to DRI-WEFA and other sources,[16] growth rates of GDP will moderate after 2010. In 2010, it is assumed that the first members of the Baby Boom cohort will retire, causing their average income and economic productivity to decline. The reduced participation rates in the labor force is expected to cause annual GDP growth rates to fall to still robust levels exceeding four percent over the 2010-2025 period. This long-term retirement trend, reinforced by a slow growth of the adult population and already high female participation rates will result in very tight labor markets.

The GDP forecasts assume that the service sector will generate most of the employment growth. This reflects the growth proportion of consumption directed to services. Manufacturing will be increasingly automated, or moved to low wage countries. **Table II.3-1** contrasts DRI-WEFA forecasts for New England and for the U.S.

[16] United States Department of Energy, *Annual Energy Outlook 2001 With Projections to 2020*, page 56.

Table II.3-1
FORECASTS OF COMPARATIVE GROWTH, U.S. AND NEW ENGLAND
(COMPOUNDED ANNUAL GROWTH)
T. F. Green Airport

Period	Real National GDP	Real New England GRP
1980-1985	3.31%	5.15%
1985-1990	3.27%	4.03%
1990-1995	2.47%	1.56%
1995-2000	4.70%	4.96%
2000-2005	2.61%	2.50%
2005-2010	4.97%	4.97%
2010-2015	4.55%	4.52%
2015-2020	4.30%	4.29%

Source: DRI-WEFA, May 2001

The Medium Case represents the most likely forecast and was based on DRI-WEFA's economic prospects for the New England region. Regional economic trends provide strong evidence that Rhode Island should out-perform the region. Although Rhode Island continues to rely on low growth sectors, it has, as shown in previous sections, begun the transition towards high growth industries such as finance and services. As this process continues, it will grow more rapidly than those areas which have already made the transition, specifically southern Massachusetts. Several large technology companies already operate in Bristol County, Massachusetts.

A second important process affecting Rhode Island is the integration of the Providence-Warwick-Pawtucket community into the Boston urban complex. This entity is increasingly functioning as a single market. However, there remain pronounced disparities between Providence-Warwick and Boston in terms of economic base. As shown in Section II.2, personal incomes for Boston are fully 25 percent larger than those of Providence-Warwick. As Rhode Island joins the larger and wealthier southern Massachusetts community, it is assumed that economic forces will gradually eliminate regional income differentials and personal incomes in the state will increase. The Medium Case is thus somewhat conservative.

The low economic growth case assumes a nominal 2.5 percent growth in the New England economy through 2010. This assumes large and continuing security and military expenditures, which necessitate budget deficits, higher interest rates, and reduced consumption and investment. After 2010, the GDP would expand at a rate of one percent less than that predicted by DRI-WEFA, and from its smaller base. The Low Case assumes that the retirement of the Baby Boom cohort and their growing medical expenses will constrain economic growth. By 2020, the Low Case would see a GDP that is 20 percent less than that predicted by DRI-WEFA in the Medium Case.

The High Case calls for a more robust New England economy than predicted in the Medium Case. The recovery of technology sectors and growing defense expenditures in the region will protect from the sluggish 2002-2005 growth predicted by DRI-WEFA. Between 2002 and 2005, the New England economy is projected to grow at 3.92 percent annually in the High Case. This is the average growth for the 1980-2000 period.

Exhibit II.3-3 presents a graphical presentation of the Medium, Low, and High projections of GRP growth to the year 2020. Table B-2, *New England GRP Projections (in millions)*, in **Appendix B**, *Forecast Assumptions,* provides the same information in tabular form. New England GRP is expected to grow at an average annual rate of 3.15 percent, 3.85 percent, and 4.20 percent, for the Low, Medium, and High cases respectively. Throughout the 1981-2000 period, GRP growth averaged 3.76 percent.

The Airline Industry and Air Service

Changes within the airline industry will remain a source of volatility at airports throughout the U.S. They will influence both the structure of the industry and its conduct, particularly in the deployment of capacity and the level of yields. Because of its proximity to Boston, and the growing integration of the southern New England community, air service at T. F. Green cannot be viewed in isolation. Rather, the airport's ability to attract new service will depend on the dynamics of airport choice and the growth of satellite airports to relieve Boston Logan. The forecasts of traffic therefore require assumptions about the evolution of the airline industry and its future conduct:

- Startup Airlines: The Existing Role forecasts assume limited activity by new entrants to the airline industry. The very large capital requirements for a startup, the scarcity of underserved markets, and the determination of incumbents to defend their markets will continue to pose severe obstacles for startup airlines. Airlines such as People Express, Air Florida, Western Pacific, Altair, Ozark, and MarkAir testify to the problems of new entrants. While limited startup activity will continue, it is realistic to assume that these carriers will not have a major impact on traffic. In particular, the forecasts assume that no startup airline will establish a base or a hub at T. F. Green.
- New Service to T. F. Green: AirTran, JetBlue, Frontier, and Vanguard are prospects to serve T. F. Green. The Existing Role forecasts assume that these airlines will continue to evaluate serving the airport, and will do so strictly as a reaction to traffic growth. It is assumed that they will neither be constrained from beginning service through a lack of facilities, nor will they begin service in the hope of sparking further expansion of traffic.
- Airport Congestion: Most airlines face growing congestion problems. Flight delays are mounting at major hubs such as Chicago and San Francisco. It is assumed that where these issues become significant, the carriers will respond partly by using larger aircraft. For example, at T. F. Green, Delta, US Airways, and United are operating large aircraft such as the Boeing 757, rather than increasing frequency with smaller aircraft. It is assumed that there will be

sufficient airport capacity available nationwide so that capacity limits or slot controls do not create a monopoly power that allows carriers to increase ticket prices.

- Regional Jets: Regional jets are one of the newest, most important, and still developing trends affecting the airline industry. They are particularly valuable for connecting low volume markets to hubs too distant for service by turboprop aircraft. T. F. Green currently obtains nonstop flights by regional jets to Cleveland, Cincinnati, Washington-Dulles, Raleigh-Durham, and Minneapolis/St. Paul. However, regional jets have allowed nonstop service from Worcester to Atlanta and Chicago, posing new competition to T. F. Green.

  In proportion to the number of available seats, regional jets have high capital and operating costs. They are only profitable if average fare levels are relatively high. The low average fares at T. F. Green Airport will therefore serve as an obstacle to any large scale expansion of regional jet schedules. As a result, the Existing Role forecasts assume only modest growth of regional jet service at T. F. Green.

- International Service: RIAC has conducted detailed studies of the travel patterns of Rhode Island residents. An analysis of ticket coupons issued by local travel agents confirms that the state generates significant volumes of international passengers. Most such passengers board overseas flights at Boston Logan. The Existing Role forecasts assume no major changes to this behavior. In particular, it is assumed that T. F. Green will not obtain long distance (trans-Atlantic or Caribbean/Mexican) scheduled international flights. The airport may obtain improved service to Canada, and increase its attractiveness for charter airline operations on a periodic basis.

- The Boston Market: Passengers traveling to and from southern Massachusetts will continue to choose between T. F. Green and Boston Logan. Their choice will be based on availability of service at each airport, relative fares, surface travel times, cost, convenience, and longer term habit. The Existing Role forecasts assume that these passengers will continue to use T. F. Green to the same extent as they are at present and to access the same destinations. Furthermore, it is assumed that additional passengers from southern Massachusetts will use T. F. Green as more destinations become reachable by low-fare service. For example, the same factors encouraging them to fly through T. F. Green to Baltimore or Orlando will govern their choice of airport when Southwest Airlines offers nonstop or high quality one-stop service to cities not presently served.

  However, barring the one factor of new low-fare service from T. F. Green, it is assumed that there will be no change in the overall propensity of southern Massachusetts passengers to use the airport. The Existing Role forecasts assume that Massachusetts passengers will continue to use T. F. Green in large numbers in order to benefit from low fares. The Existing Role forecasts also assume these passengers will continue to rely on Boston Logan or other area airports when levels of service and price are competitive with T. F. Green services. This assumption is reconsidered in the Augmented Market Share scenario in Section II.4.

- Airline Mergers: The Existing Role forecasts assume that airline mergers will continue. The American-Trans World and unsuccessful United-US Airways proposal are indicative of a long-term industry consolidation. No attempts were made to estimate the timings, the specific carriers participating in the mergers, or their impacts on T. F. Green. It is assumed that the Department of Justice will rigorously scrutinize all proposals and aggressively impose conditions to maintain competition.

"Yield" is defined as the average price paid by a revenue passenger to travel one mile. The yield serves as a proxy for the general price of air travel and is also a critical determinant of airline profitability. The forecasts assume that fares, and yields, at T. F. Green will remain low in relation to those at Boston Logan. The airport will therefore continue to attract many fare-conscious travelers.

Because of their relationship to the price of travel, yields at T. F. Green will exert a powerful influence on future traffic. The Low, Medium and High cases all assume that the future evolution of yields will be driven by costs. In competitive air transport and capital markets, carriers cannot indefinitely absorb increased operating costs, nor can they sell their services at higher than prevailing margins. Rather, they must pass on both added costs and operating economies to their customers through changes in fares.

The assumptions on future yields and costs govern the price of fuel, airline wages and salaries, and the productivity of each input. The Low, Medium and High cases assume no change in per unit airline expenses for rentals, maintenance materials, food services, interest, commissions, landing fees, terminal fees, communications, or advertising. All cases assume a 50 percent increase in insurance rates in 2002 to reflect greater perceived risks in the aftermath of the September 11 terrorist attacks. Furthermore, all cases call for a security fee of $5.00 per passenger to reflect higher security and passenger screening costs.

The fuel price assumptions are based on the Department of Energy's forecasts of energy prices.[17] The Department developed three forecasts of prices corresponding to different worldwide conditions in the demand and supply of crude oil. The "High World Price" case served as the basis for the forecasts of the Low Case for traffic at T. F. Green. The "Low World Price" provided the price assumptions underlying the High Case for traffic at T. F. Green.

Much of the growth of the airline industry is the product of technical progress, which has lowered the real cost of air travel. For example, fuel consumption per available seat-mile declined by 1.21 percent annually between 1978 and 2000. However, every increase in efficiency makes it more difficult to wrest further improvements. Eventually, fuel productivity will approach its theoretical maximum, and no further improvements will be possible. The Low traffic case assumes no further increase in fuel productivity. The Medium Case assumes a continuing 1.2 percent productivity growth per year through 2005, and 0.6 average annual percent growth until 2010. After 2010, average fuel productivity is projected to stabilize. The High case calls for an annual 1.2 percent fuel efficiency growth through 2010 and a 0.6 percent increase through 2015.

[17] United States Department of Energy, "Annual Energy Outlook 2002", December 2001

In late 2000 and early 2001, the airlines were subject to ambitious wage demands from organized labor. The scarcity of flight crews, resulting from the post-Cold War decline in military flying, has increased the negotiating leverage of pilots. Recent settlements at United, Delta, and Northwest[18], pose the threat of industry-wide wage demands, which could sharply increase the costs of air travel. These will have demonstration effects with all other airline employees.

Under the Low traffic case, organized labor would impose significantly higher wages and salaries on the airline industry. Unit labor costs would increase by three percent annually from 2001 to 2005, and by two percent through 2010. The Medium case calls for no changes in hourly labor costs or productivity. The weak economy would moderate union demands. The High case assumes that the severe airline cutbacks following the September 11 attacks and the continuing growth of low fare airlines would force airline unions to moderate their wage demands. High wage airlines would force their employees to accept wage and salary rollbacks. Furthermore, airline labor productivity, which has increased at an annual rate of 1.24 percent since 1978, would continue to grow at historical rates through 2010.

Exhibit II.3-4 shows a graphical presentation of the Medium, Low, and High projections of yield growth to the year 2020. Table B-3, *Yield Projections*, in **Appendix B**, *Forecast Assumptions*, provides this information in tabular form. Under the Low traffic case, yields in 2020 would be 13.5 percent higher than in 2000. The Medium calls for an 8.6 percent decrease in the same period. The High case assumes a 14.2 percent drop in yields.

Low-fare Carrier Penetration Factor

The future will likely see a continued expansion of low-fare airline service at T. F. Green. New entrants to the airport such as AirTran and JetBlue could initiate service, while the low-fare incumbents will likely expand their networks. In some situations, a carrier will add new cities to its network, and link them effectively with T. F. Green. In other situations, a carrier may already serve both T. F. Green and a particular city. However, its network may not presently link them effectively, but might do so in the future. This change would increase the low-fare carrier market penetration factor, a key variable in the forecasts.

Projections of the low-fare carrier penetration variable require further development of low-fare airline service at T. F. Green and elsewhere. Most carriers are many times unable to disclose their expansion plans, and may have only preliminary plans for time periods more than one to two years in the future. It is therefore necessary to project the expansion strategies of low-fare airlines, based upon their recent behavior and the number of aircraft they have on order.

[18] In August 2000, United pilots obtained immediate raises of 20 percent, with further increases totaling 16 percent. Delta's salary costs rose by 12.1 percent in 2000, while revenues grew by 8.8 percent. In May 2001, mechanics at Northwest obtained a 34 percent wage increase, phased in over three years.

The cities in the table represent only a plausible list of destinations. The carriers will likely choose a different set of destinations, and the penetration factor will differ accordingly. If the carriers choose to serve the largest remaining destinations (e.g. AirTran could inaugurate service to the large Atlanta market), the factor will increase more than projected. The precise destinations served are less important as a source of forecast error than the overall pace of growth of low-fare airline expansion. The Medium, High, and Low estimates of activity thus span a reasonable range of activity.

Table II.3-2 shows a hypothetical timing of markets obtaining high quality (nonstop or at least two one-stop routes per day) service from T. F. Green. As each destination market obtains service, its traffic is added to the penetration factor. It is estimated that the factor will reach 71 percent for the Medium case scenario, 74 percent for the High case scenario, and 68 percent for the Low case scenario. In 2000, the factor was 55 percent. **Exhibit II.3-5** shows market penetration projections through 2012. Table B-4, *Low-Fare Carrier Market Penetration Projections,* in **Appendix B**, *Forecast Assumptions,* provides this data in table format.

Table II.3-2
HYPOTHETICAL TIMING OF NEW LOW-FARE DESTINATIONS
T. F. Green Airport

Year	MEDIUM CASE	HIGH CASE	LOW CASE
2001	West Palm Beach	West Palm Beach, El Paso	West Palm Beach
2002	Norfolk, Lubbock	Norfolk, Oakland	Norfolk
2003	Richmond, Oakland	Richmond, Buffalo, Albany	Richmond
2004	Columbus, Indianapolis	Columbus, Indianapolis, Syracuse, Rochester	Columbus, Indianapolis
2005	Philadelphia/Allentown, Portland, OR	Philadelphia/Allentown, Portland	
2006	Columbia, Savannah	Columbia, Savannah, Myrtle Beach	Philadelphia/Allentown
2007	Charleston, Greenville	Charleston, Greenville	Columbia, Savannah
2008		Grand Rapids	
2009	Colorado Springs, Seattle	Colorado Springs, Seattle	Charleston, Greenville
2010		Milwaukee, Green Bay	
2011			Colorado Springs

Model Results

Table II.3-3 shows the results of the Existing Role forecast logistic regression analysis to model domestic O&D traffic based on the three prediction variables: New England GRP, T. F. Green average yield, and the low-fare carrier market penetration factor.

Table II.3-3
REGRESSION RESULTS – FINAL DEMAND MODEL
T. F. Green Airport

Variable		Regression Coefficient	t-statistic	Slope of Coefficient
Constant	α	0.5	0.014	N/A
New England GRP	β_1	1.67 E-07	2.39	0.44
T. F. Green Yield	β_2	-0.14	-2.16	-0.16
Low-fare Penetration Factor	β_3	0.05	5.24	1.24

Source	Degrees of Freedom
Regression	3
Residual	15
Total	18

Adjusted r-squared	r-squared
0.94	0.95
DW	Correlation
1.91	0.007779

The r-squared statistic, an overall measure for the "goodness of fit" of the explanatory variables to the forecast variable, ranges from 0 to 1. More importantly, the variables are statistically significant and signs are as expected (e.g. the negative sign for yields suggests that traffic will fall if prices rise). The coefficient of GRP suggests an elasticity of 1.41 (i.e. a 10 percent increase in GRP would result in a 14 percent increase in traffic; a 10 percent decrease in fares would cause a 8.6 percent increase in traffic).

The model includes corrections for serial autocorrelation.[19] The original estimates, based on Ordinary Least Squares, and with no such adjustments, are shown in **Table II.3-4**. These preliminary results, while promising, required further analysis to obtain the best estimates.

[19] Serial correlation is a statistical problem common in time series data that increases the uncertainties in the estimated coefficients. Once an appropriate model is identified using simple regression procedures, several techniques, such as the Hildreth-Lu algorithm, can eliminate this problem and provide better estimates.

Table II.3-4
REGRESSION RESULTS – PRELIMINARY DEMAND MODEL
T. F. Green Airport

Variable		Regression Coefficient	t-statistic	Slope of Coefficient
Constant	α	0.4338	15.68	N/A
New England GRP	β_1	2.8 –07E	5.52	1.65
T. F. Green Yield	β_2	-0.009745	1.214	-0.0189
Low-fare Penetration Factor	β_3	0.07554	8.8525	0.802

Source	Degrees of Freedom
Regression	3
Residual	16
Total	19

Adjusted t-squared	r-squared
0.99	0.99
DW	Correlation
1.0059	0.847

Specifications and Models Not Used

The model used in the Existing Role forecast analysis is the best representation of recent traffic growth at T. F. Green, according to several criteria including statistical adequacy, simplicity, plausibility of the results, availability of historical data, and future projections. Many specifications were considered but ultimately rejected.

Several variables were examined as measures of economic activity. Population, employment, wages and salaries, business investment, personal consumption, and personal disposable income are all highly correlated with GDP, and driven by the same economic factors. GDP has been accepted in this analyses, and countless others, as "the" most robust and comprehensive measure of activity because it incorporates the widest range of factors.

Passenger traffic at T. F. Green responds to economic stimuli originating within Rhode Island, the New England Region, and the U.S. as a whole. Ideally, a specification should include state, regional, and national economic measures, and isolate the separate roles of each. In practice this is seldom possible. The state, regional, and national variables are so strongly correlated as to be almost interchangeable. In such circumstances, the estimation procedures cannot isolate each variable's role effectively, and generate non-significant, unstable, and often implausible results. The New England GRP was therefore accepted as the most relevant measure of aggregate economic activity. **Table II.3-5** shows the statistical relationship between New England GRP and other important economic variables. Its high correlation to other variables testifies to its value as an overall measure of activity and to the dangers of including other related variables in the specification.

Table II.3-5
CORRELATION COEFFICIENT BETWEEN NEW ENGLAND GROSS PRODUCT AND OTHER RELEVANT ECONOMIC VARIABLES
T. F. Green Airport

Economic Variable	Correlation Coefficient[1]
Rhode Island Gross State Product	0.995
National GDP	0.975
Rhode Island Employment	0.835
Rhode Island Personal Income	0.974
U.S. Revenue Passenger Miles	0.985

[1] The correlation coefficient is a statistic that measures strength of the relationship between two variables. It can range in value between –1 and 1. The closer the statistic is to 1, the greater correlation between the two variables. A value of 0 suggests that no relationship exists.

Table II.3-6 shows a list of several different model specifications that were tested but ultimately rejected for various reasons. Important reasons why models are rejected include:

- Inadequate test statistics (i.e. low r-squares, t-statistics, etc.)
- Poor forecast results. Regression models produce "forecasts" of history data. A satisfactory model will generate estimates that are close to actual values.
- Theoretical contradictions, (e.g. the model indicates that GDP is negatively correlated with traffic growth)
- Simple models that do not allow for sensitivity analysis
- Overly aggressive or low forecast results that are incompatible with historical averages

Alternate Forecasting Methods

The Existing Role forecasts used the "traditional" approach of regression analysis to develop forecasts. With the appropriate independent variables, regression analysis can model changes in the underlying structure of the relationships. For example, Southwest's inauguration of service in 1996 fundamentally altered the role and future traffic prospects of T. F. Green. The different variables in the regression model allow it to include both pre- and post-1996 traffic volumes, and to forecast traffic both while the "Southwest Effect" is causing rapid growth, and after traffic finally stabilizes. Regression analysis is very versatile. It can be applied even to many non-linear models, including the growth models of particular relevance to T. F. Green.

Table II.3-6
OTHER MODEL SPECIFICATIONS
T. F. Green Airport

Explanatory Variables	Form
RPM, Yield, Low-fare	Logistic
Rhode Island GSP, Yield, Low-fare	Logistic
National GDP, Yield, Low-fare	Logistic
Massachusetts GSP, Yield, Low-fare	Logistic
Yield, RPM	Logistic
Yield, National GDP	Logistic
RPM	Double Log
RPM, Yield	Double Log
RPM, Yield, Low-fare	Double Log
National GDP, Yield, Low-fare	Double Log
Rhode Island Personal Income, Yield, Low-fare	Double Log
National GDP, New England GRP, Yield	Double Log
National GDP, Yield	Linear
RPM, Yield	Linear

In addition to regression analysis, several forecasting approaches were considered. A discussion of each follows:

- Using the FAA's TAF: Every year the FAA produces traffic forecasts for airports throughout the country, including T. F. Green. One option would simply be to prepare no independent forecasts, but to rely entirely on those of the FAA.

  This method was rejected because a thorough and responsive Master Plan requires a comprehensive and independent forecast of future demand. In addition, the TAF does not include the level of detail needed for a Master Plan. A further problem is that the FAA releases its forecasts in March of each year. The most recent forecasts, released in March 2001, are already dated for use in the Airport Master Plan. However, the FAA TAF provides an excellent means to validate the Master Plan forecasts. The combination of two independent sets of forecasts, used together, is one means to ensure a thorough, objective, and forward-looking Master Plan. Section II.3-7 contains a comparison of the FAA TAF and Master Plan forecasts.

- Applying Other Current Forecast Sources: The FAA, International Civil Aviation Organization, International Air Transport Association, Boeing, and Airbus Industrie currently produce forecasts of the growth of aviation throughout the world. They predict growth rates by large route groupings, such as North Atlantic or U.S. domestic services. These rates could be applied to the most recent traffic volumes at T. F. Green to produce forecasts.

Although these forecasts are of high quality, they would not provide an effective means to project traffic at T. F. Green. They would necessarily require an assumption that T. F. Green's traffic would grow at the same rate as the national average. By submerging T. F. Green in an averaging process, they would neglect the important region-specific and airport-specific factors that have created the unique and complicated growth patterns identified in the previous section. While traffic at T. F. Green will be shaped by important national trends, it will grow in a very unique and specific way that reflects the dynamics of southern New England.

- Interviews with Carriers: It is the specific decisions of the airlines on which communities to serve, what capacities to offer, and what prices to charge that determines traffic at literally every airport. It was the airlines, responding to T. F. Green's facilities, the needs of the southern New England market, and competing opportunities that created the several phases of growth observed earlier. As part of their market planning efforts, the airlines themselves develop forecasts for different routes, which directly imply future traffic levels at T. F. Green. One approach would therefore be to interview T. F. Green's tenant and prospective airlines, and assemble individual airline forecasts into a total for the airport.

  The research for this forecast did include interviews with selected carriers. However, airlines will seldom have airport-specific forecasts for periods exceeding three or four years. Furthermore, airlines are generally unable to disclose long-term expansion plans for competitive reasons. While the airlines can, and for this study did, disclose some valuable information on operations, the data was not of a long enough horizon or of sufficient detail to provide 20-year forecasts of passengers and operations.

- Time Series Approaches: "Time series" methodologies refer to several mathematically similar but distinct approaches for studying a series of data. These methods explain the growth of a time series strictly in terms of its past history. This process can be determined by comparing the value of the series in one year to its values in the previous years. For example, traffic at T. F. Green one year in the future will depend in some systematic manner on the traffic in the current and previous years.

  Time series approaches include exponential smoothing, moving averages, spectral analysis, adaptive filtering, and Box-Jenkins approaches. The techniques are not commonly used to forecast traffic at an airport. Most techniques require a "stationary" series in which there is no long-term growth trend. The processes acting on the series must be similar in all periods. Time series analysis thus could not model T. F. Green traffic, which has evolved in several distinct phases. Many time series models require very lengthy series; sometimes hundreds of observations. They are of value in monitoring many processes in the physical and natural sciences, and have been applied successfully to financial markets. However, they are of limited applicability to modeling air traffic, where data is limited and underlying relationships can change quickly and decisively.

- Growth Models: Market researchers have analyzed the patterns of acceptance for new products and services. The volume of sales begins at zero and originally sees sluggish growth. However, as additional customers imitate the earliest users, sales will increase rapidly. Eventually, the market will be saturated. With few new customers purchasing the product, sales will stabilize at a high but slowly growing level. This behavior generates the "s-curve" so common in market acceptance literature. As shown in the previous section, traffic growth at T. F. Green has followed an "s-curve", following Southwest's inauguration of service in 1996. Since it has changed the behavior of the region's passengers, Southwest's services conform closely to this new product model.

  The Logistics and Gompertz functions can model these processes. The parameters can be selected to portray a wide range of market behavior. The traffic forecasts developed in this report include a logistic function growth model, superimposed on a regression analysis.

- National and Regional Traffic Share Analysis: These methods involve developing traffic forecasts for a larger entity than a single airport such as a region or a nation. The forecasts are then distributed to a particular airport through assuming some form of market share relationship. In this case, such an approach would involve forecasting total traffic for all of southern New England, or the entire country, and allocating a share of the total to T. F. Green.

  The major flaw of this approach is the need for precise estimates of future market shares for T. F. Green. The airport's share of the total southern New England traffic has grown rapidly since 1996, and will likely expand in the future. This method will therefore need a detailed and very accurate model to predict changing traffic shares. Since it also requires forecasts of the total southern New England market, this method has many potential sources of error. The difference between its Low, Medium, and High forecasts would be larger than for the regression approach that was adopted.

  A variant of this methodology was followed in the Augmented Market Share scenario. The scenario assumes T. F. Green will compete with Boston Logan and other area airports for an expanded share of the southern New England traffic. Specific traffic flows were re-distributed to different airports, based on the evolution of new service at different airports in the region.

- Comparison with other airports: This approach depends on identifying other airports that are similar now to what T. F. Green will probably be like in the future. For example, T. F. Green will have a similar mix of service, a similar growth rate, or a similar share of traffic as is now present at these reference facilities.

  This methodology was examined as a means to model the "Southwest Effect" at T. F. Green. Many other airports have seen a dramatic surge of traffic after Southwest initiated scheduled service, and could provide insights on future growth at T. F. Green. In particular, they would provide information on the eventual size of the traffic increase and the amount of time that elapsed after Southwest's entry for the market to return to "normal" growth.

The research examined airports throughout the nation to identify instances that could be informative. The airports had to serve communities largely similar to Providence-Warwick. These airports must have been served by Southwest for sufficient time to have passed the initial growth phase. Furthermore, their service by Southwest and other airlines must be largely similar to those at T. F. Green.

No satisfactory analogy airports could be found. T. F. Green was Southwest's first station in New England. Baltimore-Washington, the only airport in the northeast with a longer history of Southwest Airlines, is a poor example. It has been selected by Southwest as a focus city, with routes emanating throughout the country. The airline's buildup continues aggressively, even eight years after its first service. Southwest operates high density inter-city service in California, which contrast to its lower frequency service from T. F. Green, to all points except Baltimore-Washington. Furthermore, the California cities have a lengthy exposure to low-fare carriers because of now-defunct Pacific Southwest Airlines. Literally every city with more than eight years of service by Southwest was examined as a possible analogy. Tucson, Little Rock, Louisville, and Albuquerque provided the closest examples. However, their experience in the first five years of service by Southwest is markedly different from T. F. Green's. Despite the initial appeal of this approach, it did not prove useful to model the "Southwest Effect" at T. F. Green.

The method did see a limited use in the development of fleet-mix assumptions. T. F. Green and Bradley International are similar in many respects, such as a location in the northeast, a lack of long haul international service, and roles as O&D rather than connecting airports. However, the network carriers at Bradley have larger operations than at T. F. Green, with more frequencies, larger aircraft, and nonstop service to more destinations such as St. Louis, Dallas/Fort Worth, Denver, and other points. If T. F. Green evolves in a manner similar to Bradley, it will over time obtain similar service by similar types of aircraft.

The forecasts of traffic at T. F. Green used a broad range of methodologies. However, they rely primarily on traditional regression analysis. No other technique was found to have the relevance, versatility, or rigor that could be obtained from a thoroughly specified and carefully estimated regression model.

II.3.3 Forecasts of Passenger Demand

This section provides summaries of the Existing Role forecasts of passenger demand. The forecasts of passenger traffic are the most critical of the various aviation demand elements since most of the other activity elements, such as aircraft operations, are derived from these forecasts. The passenger demand has been split between domestic passengers (scheduled and charter), international charter passengers, and international scheduled passengers.

Domestic Passenger Forecasts

Based on the assumptions discussed in the previous section and the regression model, O&D passenger traffic was projected for the Medium, Low, and High growth cases as shown on **Exhibit II.3-6**.

Table II.3-7 gives the resulting projected growth rates in five-year intervals. The data shows that traffic will continue to grow at high rates in the next 5 to 10 years as new markets receive low-fare service, but decline to more moderate rates in later years.

Table II.3-7
O&D PASSENGER FORECAST GROWTH RATES
T. F. Green Airport

Period	Medium	High	Low
1990-1995	-2.78%	-2.78%	-2.78%
1995-2000	22.56%	22.56%	22.56%
2000-2005	2.43%	4.26%	0.36%
2005-2010	4.16%	4.50%	3.49%
2010-2015	3.89%	4.16%	3.34%
2015-2020	3.80%	4.04%	3.27%

Since few passengers connect between flights at T. F. Green, O&D and total passenger volumes are similar, but not the same. The model produces O&D passengers, which were calibrated to total traffic statistics provided by RIAC to produce final passenger forecasts. These passenger forecasts are shown in **Table II.3-8**. Domestic passengers are forecast to increase from 5.4 million in 2000 to 10.9 million in 2020 in the Medium case, an average annual growth rate of 3.6 percent. The High growth case predicts 12.4 million passengers in 2020 (4.2 percent average annual growth from 2000 to 2020) while the Low case shows 9.0 million passengers in the same year (2.6 percent average annual growth from 2000 to 2020).

International Charter Passenger Forecasts

The construction of the Sundlun Terminal and dedication of the Federal Inspection Services (FIS) gate allowed T. F. Green to serve as a gateway to international charter destinations. The terminal replaced a cramped and outmoded facility on the north side of the airport that had proven an impediment to international traffic. As a result of the FIS construction, T. F. Green can accommodate charter flights from destinations without pre-clearance facilities.

Table II.3-8
DOMESTIC PASSENGER FORECAST
T. F. Green Airport

Forecast Year	Medium	High	Low
2000	5,397,121	5,397,121	5,397,121
2005	6,086,700	6,649,000	5,495,500
2010	7,463,100	8,284,000	6,525,100
2015	9,031,600	10,157,500	7,690,100
2020	10,882,400	12,382,800	9,030,500
Average Annual Compound Growth Rate			
2000-2005	2.4%	4.3%	0.4%
2005-2010	4.2%	4.5%	3.5%
2010-2015	3.9%	4.2%	3.3%
2015-2020	3.8%	4.0%	3.3%
2000-2020	3.6%	4.2%	2.6%

During the 2000-2001 winter season, tour operators such as GWV and TNT used T. F. Green on a trial basis for flights to Caribbean sunspots. During the 2001-2002 winter season GWV and TNT will use T. F. Green on a more regular basis introducing weekly seasonal charters to Punta Cana and Aruba. Currently, the tour operators use T. F. Green as a third gateway in New England augmenting their service out of Hartford and Boston. Tour operators are finding a responsive market in Rhode Island and have recently added additional flights to various sunspots. Tour operators have publicly stated their intent to increase service out of T. F. Green.

In line with the recent international charter trial runs at the airport, the annual rate of international charter passenger growth is expected to increase (at a pace roughly equal to 560 passengers per year) based on the following assumptions:

- Tour operators will add markets to T. F. Green only after a trial basis is concluded (roughly four roundtrips).
- Recent analysis of T. F. Green air travel patterns indicates that the airport could support weekly seasonal charter flights of up to nine sunspot destinations and destinations of interest to regional heritages (e.g. Portuguese-American passengers to the Azores) using low gauge Boeing 737 to Boeing 757 aircraft (169 - 215 seats).
- The evolution of charter service at T. F. Green will occur steadily and at a constant rate over time.
- As Boston Logan becomes increasingly strained, pressure (political and economic) may force some charter operations to the secondary regional airports,

including T. F. Green. However, the forecasts assume no systematic or large-scale migration of charter service from Boston Logan to T. F. Green.

- Primary growth in charter service will occur to the Caribbean. Charter service over the Atlantic have stagnated. No growth to other international/domestic destinations is predicted.
- The international charter operations will operate at an approximate load factor of 90 percent, which is standard for the industry.

Table II.3-9 provides the international charter forecast assumptions used in this analysis. **Table III.3-10** gives international charter passenger and operations forecasts. By 2020, there are expected to be 27,900 annual international charter passengers and 88 annual operations.

Table II.3-9
INTERNATIONAL CHARTER FORECAST ASSUMPTIONS
T. F. Green Airport

	Azores	Caribbean/Mexico
Aircraft Capacity Seats:	215	172
Load Factor:	90%	90%
Passengers:	194	154
Season:	**June – August**	**December - May**
	Service peaks at 10 flights per season	Services peak at 10 flights per season for proven markets, initial services begin at 3-4 flights per season

Table II.3-10
INTERNATIONAL CHARTER FORECASTS
T. F. Green Airport

Passenger Forecasts	**2005**	**2010**	**2020**
Caribbean/Mexico	7,200	12,900	24,100
Azores	3,900	3,800	3,800
Total	**11,100**	**16,700**	**27,900**
Operations Forecasts	**2005**	**2010**	**2020**
Boeing 737-800 (Caribbean/Mexico)	23	42	78
Boeing 757-200 (Azores)	10	10	10
Total	**33**	**52**	**88**

International Scheduled Passenger Forecasts

The only current scheduled international service at T. F. Green consists of Air Ontario's three daily weekday flights to Toronto using Dash 8 aircraft with 37 seats. The Existing Role forecasts assume this route will be the only international commercial service throughout the planning period. However, it is assumed that traffic will continue to grow at rates in line with U.S.-Canada average growth rates as forecast by the FAA. As passenger demand grows, it is assumed that Air Ontario and its parent company will add frequency and increase aircraft size to accommodate demand.

Table II.3-11 shows passenger and operations forecast predictions. Canadian traffic at T. F. Green is expected to increase from 33,817 passengers to 68,900 in 2020 (an average increase of 3.6 percent per year). Canadian operations are forecast to increase from 2,400 to 3,870 in 2020.

Table II.3-11
SCHEDULED INTERNATIONAL FORECASTS
T. F. Green Airport

Forecast Year	Total Passengers	Operations
2000	33,817	2,400
2005	40,300	2,850
2010	48,200	3,220
2015	57,600	3,530
2020	68,900	3,870
Average Annual Compound Growth Rate		
2000-2005	3.6%	3.5%
2005-2010	3.6%	2.5%
2010-2015	3.6%	1.9%
2015-2020	3.6%	2.4%
2000-2020	3.6%	2.4%

Total Passenger Forecasts

Table II.3-12 presents a summary of the passenger forecasts for the Medium, High, and Low cases for T. F. Green Airport. The airport's combined domestic, international charter, and international scheduled passengers are forecast to approximately double from 5.4 million in 2000, to 11.0 in 2020 in the Medium growth case. This represents an average annual growth rate of 3.6 percent. The High forecast predicts total passengers will grow to 12.5 million by 2020 while the Low case shows total passengers increasing to 9.1 million in the same year.

Table II.3-12
TOTAL PASSENGER FORECASTS
T. F. Green Airport

MEDIUM CASE				
Forecast Year	Domestic	International Charter	International Scheduled	Total
2000	5,397,121	0	33,817	5,430,938
2005	6,086,700	11,100	40,300	6,138,100
2010	7,463,100	16,700	48,200	7,528,000
2015	9,031,600	21,600	57,600	9,110,800
2020	10,882,400	27,900	68,900	10,979,200
Average Annual Compound Growth Rate				
2000-2005	2.4%	N/A	3.6%	2.5%
2005-2010	4.2%	8.5%	3.6%	4.2%
2010-2015	3.9%	5.3%	3.6%	3.9%
2015-2020	3.8%	5.3%	3.6%	3.8%
2000-2020	3.6%	N/A	3.6%	3.6%

HIGH CASE				
Forecast Year	Domestic	International Charter	International Scheduled	Total
2000	5,397,121	0	33,817	5,430,938
2005	6,649,000	11,100	40,300	6,700,400
2010	8,284,000	16,700	48,200	8,348,900
2015	10,157,500	21,600	57,600	10,236,700
2020	12,382,800	27,900	68,900	12,479,600
Average Annual Compound Growth Rate				
2000-2005	4.3%	N/A	3.6%	4.3%
2005-2010	4.5%	8.5%	3.6%	4.5%
2010-2015	4.2%	5.3%	3.6%	4.2%
2015-2020	4.0%	5.3%	3.6%	4.0%
2000-2020	4.2%	N/A	3.6%	4.2%

LOW CASE				
Forecast Year	Domestic	International Charter	International Scheduled	Total
2000	5,397,121	0	33,817	5,430,938
2005	5,495,500	11,100	40,300	5,546,900
2010	6,525,100	16,700	48,200	6,590,000
2015	7,690,100	21,600	57,600	7,769,300
2020	9,030,500	27,900	68,900	9,127,300
Average Annual Compound Growth Rate				
2000-2005	0.4%	N/A	3.6%	0.4%
2005-2010	3.5%	8.5%	3.6%	3.5%
2010-2015	3.3%	5.3%	3.6%	3.3%
2015-2020	3.3%	5.3%	3.6%	3.3%
2000-2020	2.6%	N/A	3.6%	2.6%