CHAPTER 4
DEMAND CAPACITY / FACILITY REQUIREMENTS

AIRFIELD DEMAND CAPACITY ANALYSIS

Demand/capacity analysis is important to determine if the existing airfield configuration can accommodate future demand. By comparing the theoretical operational capacity with projected operations levels, the type and timing of airfield capacity improvements can be estimated.

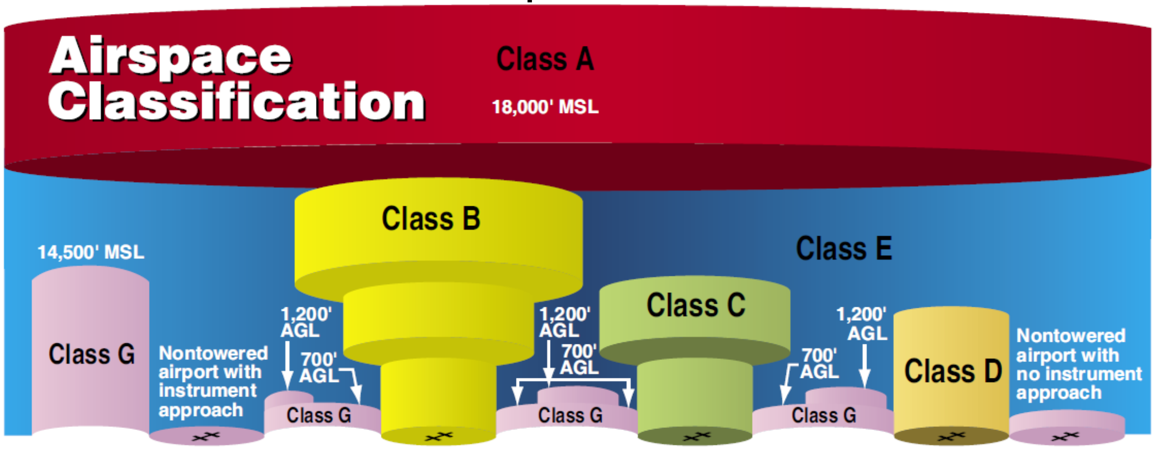
Airport capacity is defined by the Federal Aviation Administration (FAA) as an estimate of the number of aircraft that can be processed through the airfield system during a specific period, with acceptable levels of delay. Estimates of existing airfield capacity at COI were developed in accordance with the methods presented in **FAA Advisory Circular (AC) 150/5060-5**, *Airport Capacity and Delay*. This methodology does not account for every possible situation at an airport, but rather the most common situations observed at U.S. airports when this AC was adopted.

The capacity AC provides a methodology for determining the hourly runway capacity, the annual service volume (ASV) and average expected delays. Each of these factors was calculated for existing conditions and for key years over the 20-year planning period. An airport's hourly runway capacity expresses the maximum number of aircraft that can be accommodated under conditions of continuous demand during a one-hour period. It should be noted that the hourly capacity cannot be sustained for long periods or an airport will experience substantial increases in delay. The ASV estimates the annual number of operations that the airfield configuration should be capable of handling with minimal delays. The ASV considers that over a 12-month period a variety of conditions are experienced, including periods of high volume and low volume activity. The average anticipated delay was based on a ratio of the forecast demand to the calculated ASV. These calculations were based upon the airfield configuration as well as operational and meteorological characteristics, which are described in detail within the following sections.

Airspace Capacity

Airspace capacity is an essential element of any airport, especially with respect to maintaining existing and proposed operational characteristics. As noted in **Chapter 2**, *Inventory of Existing Conditions*, the airspace surrounding COI is Class G. Class G airspace extends from the airport surface to 700 feet above ground level (AGL). Class E airspace covers an area outside of the Class D with a floor elevation of 700 feet above ground level (AGL) and continues upward until it meets Class A airspace as shown in **Figure 4-1**.

Figure 4-1
U.S. Airspace Classes



Source: FAA Pilot's Handbook of Aeronautical Knowledge, 2008.

The airspace surrounding COI is complex due to restricted airspace (R2935, R2932 and R2933, as shown in **Chapter 2**, Figure 2-7) associated with Kennedy Space Center operations to the north, as well as Class D airspace adjacent to COI related to busy civilian and military facilities north, south and west of the airport. Further, during launch operations at Kennedy Space Center, civil flight operations within the airspace are temporarily restricted in the periods prior to, during, and immediately after shuttle launch and landing operations.

COI lies within the service area of the Orlando Terminal Radar Approach Control (MCO TRACON). The main function of a TRACON is to control the airspace around airports with high traffic density. The TRACON area of coverage is approximately 35-mile radius from the airport. The Jacksonville Air Route Traffic Control Center (JAX ARTCC) controls all air traffic enroute to or from the Titusville Cocoa Beach area. Since the last Master Plan Update, the capacity of the airspace surrounding COI has remained unchanged. Unless the level and type of operations changes, it is anticipated that current airspace capacity will continue to accommodate operations at COI throughout the 20-year planning period. Consideration of surrounding airspace complexity and potential obstructions will require careful coordination with FAA in order to implement additional instrument approaches at COI. This was addressed within **Chapter 5**, *Airport Alternatives.*

Airfield Capacity Methodology

The primary determinant of airport capacity is the airfield configuration. Runways are used for aircraft to arrive and depart from the airport, while taxiways enable aircraft to maneuver to and from runways and landside facilities, such as hangars and apron areas. The number of operations that an airport can accommodate is dependent upon how quickly aircraft can move to or from active runways. The runway and taxiway configuration at COI is further discussed within the following sections.

Airfield Characteristics

In addition to the aviation activity forecasts, identification of existing and future airfield characteristics and operational conditions are required to accurately determine airport annual service volume for the twenty-year planning period. Elements that affect an airfield's capacity include:

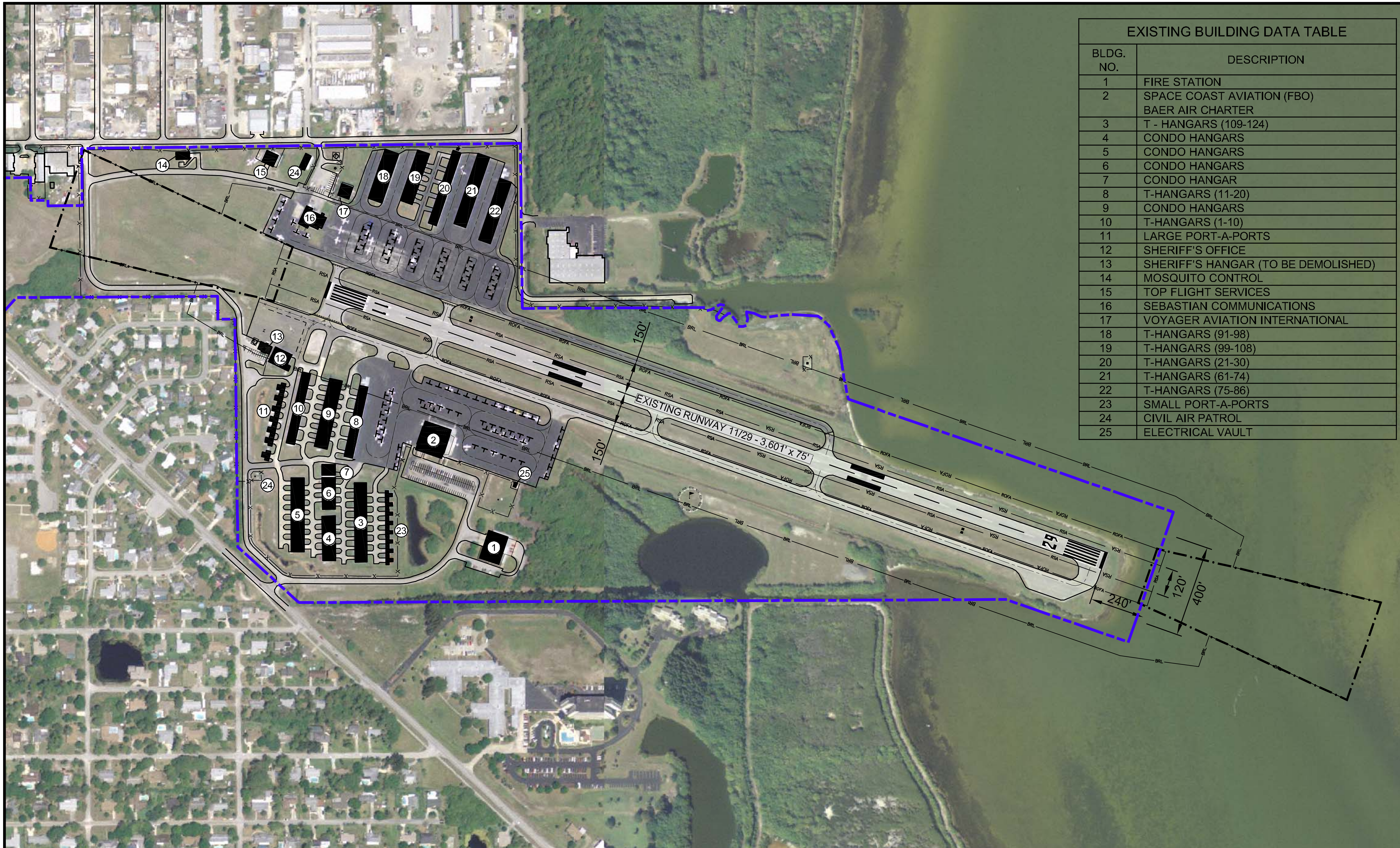
- Runway configuration;
- Taxiway configuration;
- Aircraft mix index; and
- Operational characteristics.

Runway Configuration and Utilization

As noted in **Chapter 2**, COI is equipped with a single asphalt runway, designated as Runway 11-29, which is 3,601 feet in length and 75 feet in width. Runway 11-29 is equipped with Precision Approach Path Indicator, 2-box lighting system (PAPI-2) on each end and Medium Intensity Runway Lighting (MIRLs). Runway 11 has two published non-precision approaches: Global Positioning System (GPS) Area Navigation (RNAV) and Non-Directional Beacon (NDB), which have visibility limits of 1-statute mile. Runway 29 is limited to a visual approach only, which requires a cloud ceiling at or above 1,000 feet AGL and visibility of three miles or greater at the airport. **Figure 4-2** provides a graphical depiction of the current airfield layout.

A single runway airport – small aircraft only configuration as shown in Figure 4-26 (7) of **FAA AC 150/5060-5,** *Airport Capacity and Delay,* was used to calculate the appropriate capacity levels based upon existing and forecast operations. The runway configuration from Figure 4-26 was applied based upon the following criteria:

- COI is part of a system of airports;
- The airport is not equipped with an ILS approach, but has approved approach procedures;
- The airport is used almost exclusively by Class A and B (small) aircraft (see Figure 4-3); and
- The airport has equal arrival and departure operations.



EXISTING BUILDING DATA TABLE

BLDG. NO.	DESCRIPTION
1	FIRE STATION
2	SPACE COAST AVIATION (FBO) BAER AIR CHARTER
3	T - HANGARS (109-124)
4	CONDO HANGARS
5	CONDO HANGARS
6	CONDO HANGARS
7	CONDO HANGAR
8	T-HANGARS (11-20)
9	CONDO HANGARS
10	T-HANGARS (1-10)
11	LARGE PORT-A-PORTS
12	SHERIFF'S OFFICE
13	SHERIFF'S HANGAR (TO BE DEMOLISHED)
14	MOSQUITO CONTROL
15	TOP FLIGHT SERVICES
16	SEBASTIAN COMMUNICATIONS
17	VOYAGER AVIATION INTERNATIONAL
18	T-HANGARS (91-98)
19	T-HANGARS (99-108)
20	T-HANGARS (21-30)
21	T-HANGARS (61-74)
22	T-HANGARS (75-86)
23	SMALL PORT-A-PORTS
24	CIVIL AIR PATROL
25	ELECTRICAL VAULT

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Merritt Island Airport
Master Plan Update

EXISTING AIRFIELD

0' 200' 400'
SCALE: 1" = 400'

DATE
04/27/2008

4-2
FIGURE NO.

\\Tpa-data1\tampa\Planning\COI - Merritt Island\COI AMPU\Figures\Chapter 4\Fig 4-2_Existing Airfield.dwg April 27 2009-15:21

According to weather data obtained from the National Oceanic and Atmospheric Administration (NOAA) National Data Centers[1] and operational data obtained from airport operations, historic runway utilization was:

- 60 percent VFR operations on Runway 11;
- 40 percent VFR operations on Runway 29;
- >90 percent of IFR activity occurs on Runway 11 because of published non-precision approaches (GPS/RNAV and NDB);
- <9 percent of IFR activity occurs on Runway 29 since this runway does not have a published instrument approach. However, during IFR conditions when winds favor Runway 29, a circling approach from Runway 11 is used; and
- Meteorological conditions are below operating minima approximately 0.5 percent annually at which point the airport is officially closed.

Taxiway Exits

The distance between taxiway locations and runway ends contributes to airfield and aircraft delays. The longer an aircraft occupies the runway, the more delay will be created for aircraft waiting to land or depart. Additional taxiway connectors allow landing aircraft to clear the runway quicker. Conventional taxiways have a 90° angle to the runway and require slower aircraft speeds to access, while high-speed connectors form an acute angle with the runway thus decreasing runway occupancy by allowing aircraft to continue roll out onto the taxiway without having to slow to less than 20 knots. High-speed taxiways are used primarily at commercial service airports with total available runway length of 8,000 feet or greater, and to expedite aircraft turning off the runway at ground speeds up to 40 knots. However, according to FAA Southern Region, the overall cost, runway-to-taxiway separation as well as aircraft operational requirements do not justify the installation of high speed taxiways at GA airports and are, therefore, not recommended or federally funded.[2]

COI currently is equipped with two taxiways. Taxiway A to the south provides full parallel access to Runway 11-29, whereas Taxiway B provides partial parallel access to facilities to the north. Taxiway exit locations are provided in **Table 4-1**.

[1] Station: NASA Space Shuttle Facility (FL/NASA Sp Shuttle (747946), Period: 01/01/1994-12/31/2007, NOAA National Climatic Center, May 2008.
[2] High-speed taxiways according to FAA Southern Region should be used for commercial airports only since the cost and operational requirements are not justified for general aviation airports.

Table 4-1
Taxiway Exits

Taxiways	Approximate Distance from Runway 11 Threshold (in Feet)	Approximate Distance from Runway 29 Threshold (in Feet)
A-1	48	3,553
A-2	510	3,091
A-3	1,541	2,060
A-4	2,292	1,309
A-5	3,546	55
B	10	3,591
B-1	510	3,091
B-2	2,293	1,308

Source: The LPA Group Incorporated, 2008

Mix Index

The mix index is calculated with the following formula: %(C+3D), where Class C represents aircraft with certified Maximum Takeoff Weight (MTOW) ranging from 12,500 to 300,000 pounds and Class D represents aircraft with MTOW greater than 300,000 pounds. Aircraft operating at COI consist of Class A and B only, which represent small aircraft with MTOW of 12,500 pounds or less (see **Figure 4-3).** The turboprop and very light jet aircraft projected in **Chapter 3**, *Forecasts of Aviation Activity*, are expected to be Class A and B aircraft only. Therefore, since the mix index is based upon the percent of Class C and D aircraft, the mix index for COI over the 20-year planning period will remain at zero percent.

Figure 4-3
Aircraft Classifications

Source: The LPA Group Incorporated, 2008

Operational Characteristics

The operational characteristics that can affect an airfield capacity include percentage of aircraft arrivals, sequencing of aircraft departures, and percentage of touch–and-go operations.

Percentage of Aircraft Arrivals

The percentage of aircraft arrivals is the ratio of landing operations to the total operations of the airport. Arriving aircraft require greater runway occupancy time than departing aircraft. For general planning purposes, 50 percent of arrivals were utilized as an estimate to determine the capacity at COI.

Percentage of Touch-and-Go Operations

Touch-and-go operations are aircraft that land and, without stopping on the runway, take off again on the remaining runway. Touch-and-go operations are counted as one landing and one takeoff (i.e., two operations) and are normally associated with flight training activities. FAA guidelines for calculating ASV require an estimate of the percentage of touch-and-go operations occurring at the airport. Based upon discussions with Space Coast Aviation and Voyager Aviation, who both provide flight training at COI, touch-and-go operations represent approximately 35 to 40 percent of total operations. This percentage was utilized in the calculation of the ASV and was anticipated to remain consistent throughout the planning period.

Runway Utilization Percentage

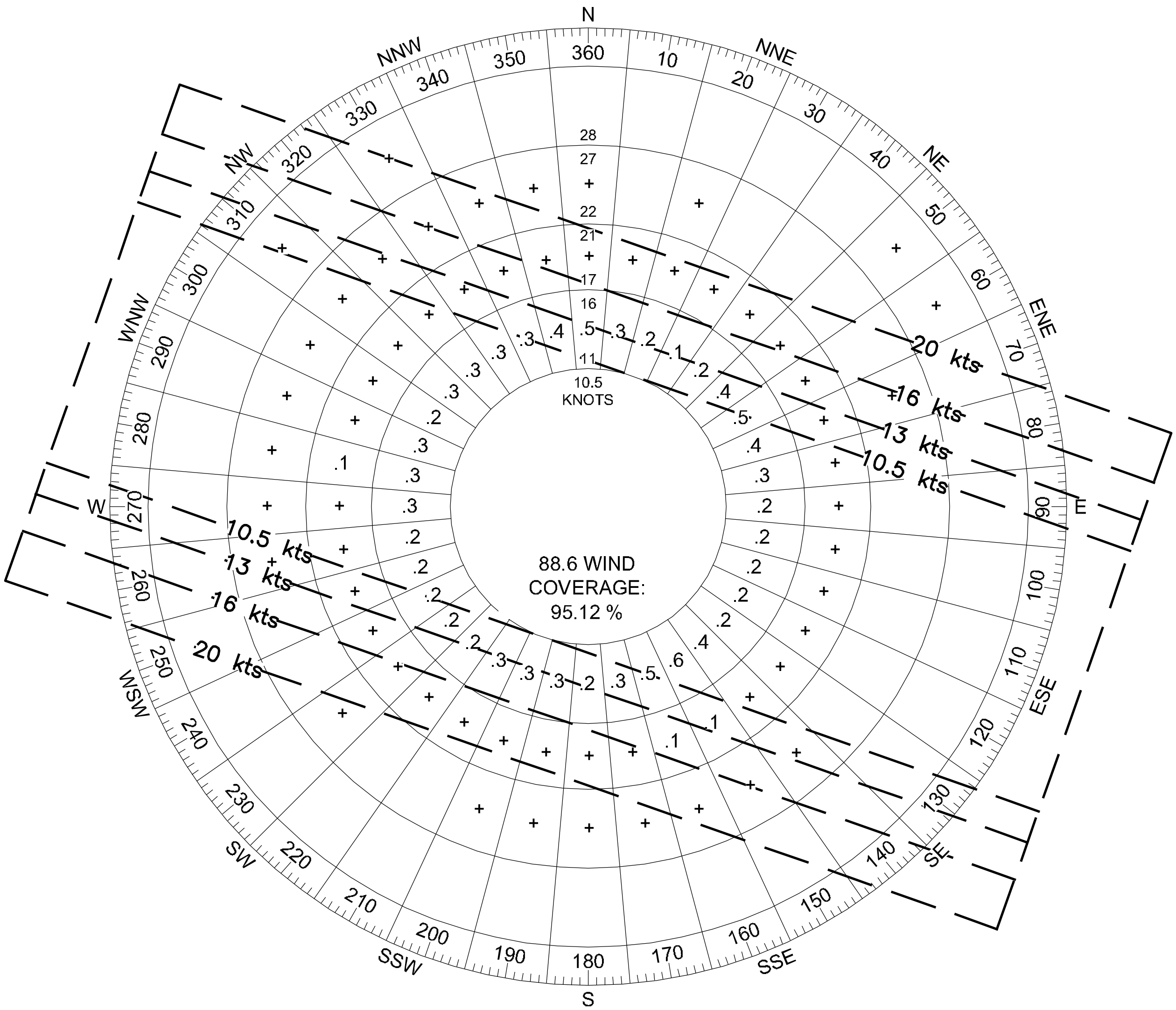
The existing airfield consists of a single runway (Runway 11-29), of which 60 percent of VFR traffic occurs on Runway 11 and 40 percent utilize Runway 29. The airport experiences IFR conditions only 2 percent of the time, during which 90 percent of operations occur on Runway 11, and 9.5 percent of operations utilize the circling approach to Runway 29. The remaining 0.5 percent of the time, the airport experiences weather minimums below IFR capabilities when aircraft traffic is unable to operate at the airport.

Meteorological Conditions

Meteorological conditions influence the capacity for the airfield. Runway utilization at airports typically is determined by wind conditions, as aircraft must land and take off into the wind for optimal aircraft performance, while cloud ceiling and forward visibility dictates approach spacing requirements. The following operational conditions are an element of calculating airport capacity:

- Visual Flight Rules (VFR) – Cloud ceiling is greater than 1,000 feet above ground level (AGL) and the visibility is at least three statute miles;
- Instrument Flight Rules (IFR) – Cloud ceiling is at least 600 feet AGL but less than 1,000 feet AGL and/or the visibility is at least half a statute mile but less than three statute miles; and
- Poor Visibility and Ceiling (PVC) – Cloud ceiling is less than 500 feet AGL and/or the visibility is less than half a statute mile.

VFR, IFR and All Weather wind roses are provided in **Figures 4-4** through **4-6**, respectively.



Wind Data Source:
National Climatic Data Center
Station - NASA Space Shuttle Facility (KTTS) (WMO:747946), Florida
Years (1994 - 2007)

Notes

Wind Roses generated using FAA Airport Design 4.2d.

	Wind Coverage %
Crosswind Component (kts)	Runway 11/29
10.5	95.12%
13	97.70%
16	99.64%
20	99.95%

Brevard County - Merritt Island Airport Master Plan Update

VFR WINDROSE

DATE 10/22/2008

4-4

FIGURE NO.

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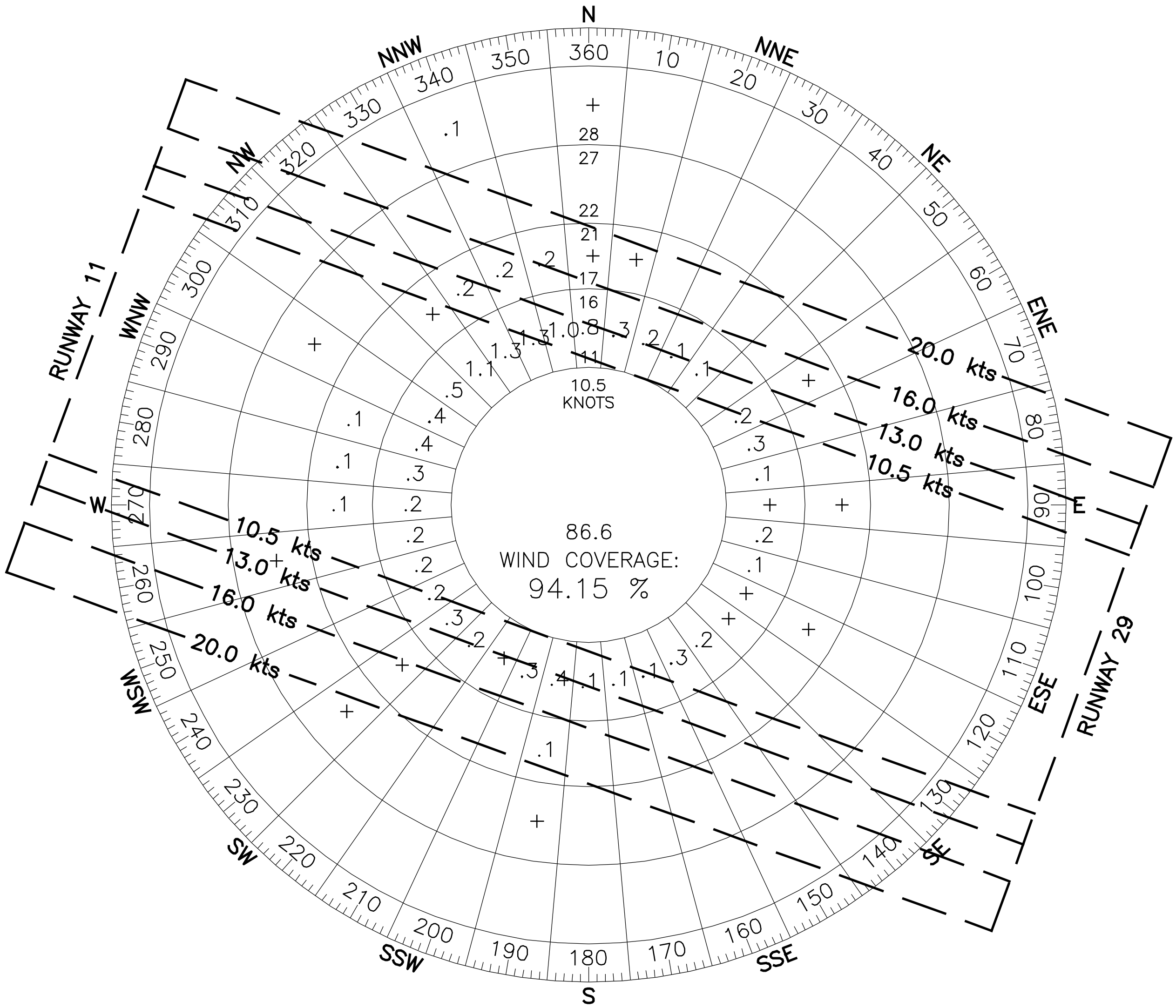

Wind Data Source:
National Climatic Data Center
Station - NASA Space Shuttle Facility (KTTS) (WMO:747946), Florida
Years (1994 - 2007)

Notes

Wind Roses generated using FAA Airport Design 4.2d.

	Wind Coverage %
Crosswind Component (kts)	Runway 11/29
10.5	94.25%
13	97.20%
16	99.33%
20	99.75%

Brevard County -
Merritt Island Airport
Master Plan Update

IFR WINDROSE

DATE
10/22/2008

4-5

FIGURE NO.

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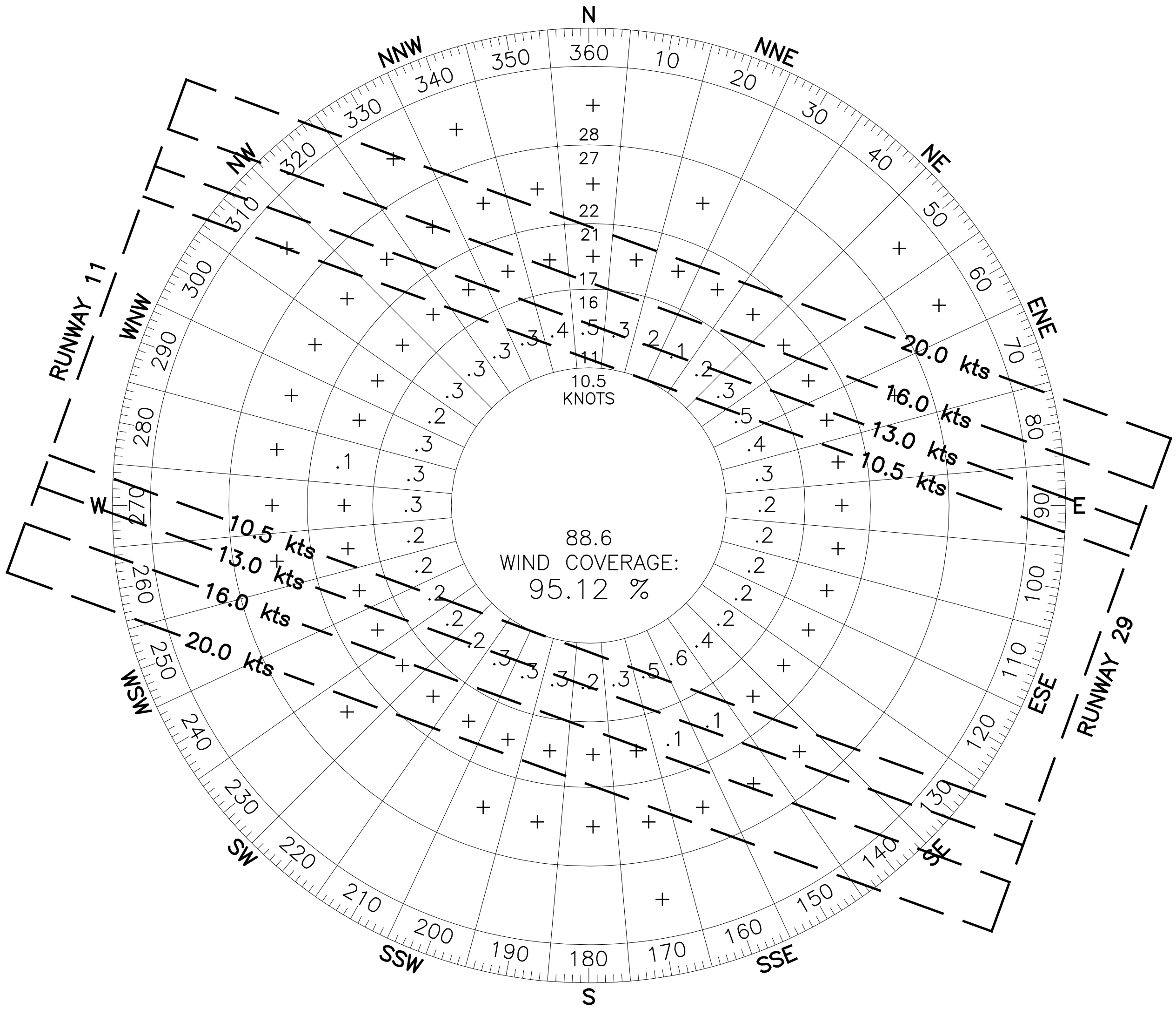

Wind Data Source:
National Climatic Data Center
Station - NASA Space Shuttle Facility (KTTS) (WMO:747946), Florida
Years (1994 - 2007)

Notes

Wind Roses generated using FAA Airport Design 4.2d.

All wind coverages were calculated using the runway's true bearing.

	Wind Coverage %
Crosswind Component (kts)	Runway 11/29
10.5	95.14%
13	97.71%
16	99.64%
20	99.95%

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Brevard County - Merritt Island Airport Master Plan Update

ALL WEATHER WINDROSE

DATE 10/22/2008

4-6

FIGURE NO.

COI has an NDB and RNAV/GPS published instrument approaches. The NDB approach to Runway 11 has a minimum descent altitude (MDA) of 860 feet AGL and 1-mile visibility (1 ¼ miles for Approach Category B aircraft). Runway 11's GPS/RNAV approach allows for LPV Descent Altitude (DA) minima of 300 feet AGL and LNAV MDA of 600 feet AGL, both with forward visibility of one mile. According to NOAA Weather Data obtained for the area, COI experiences VFR conditions approximately 97.5 percent of the time, IFR 2.0 percent and below IFR minimums 0.5 percent of the time. When the meteorological conditions are below these minimums, aircraft are unable to depart or land.

Airfield Capacity Analysis

The preceding airfield characteristics were used in conjunction with the methodology outlined in **FAA AC 150/5060-5** to determine airfield capacity. As mentioned previously, this FAA methodology generates the hourly capacity of runways and the annual service volume for measuring airfield capacity.

In the case of COI, special applications as outlined in Chapter 4, Section 4.5, of the **FAA AC 150/5060-5**, *Airport Capacity and Delay*, were applied to determine airport capacity calculations related to special conditions. In reviewing the AC's Figure 4-26, it was determined that Figure 7 represented the existing and future configuration of the airport over the twenty year planning period. Based upon this airfield configuration, VFR and IFR hourly capacity was determined from the information provided in Chapter 3 of **FAA AC 150/5060-5**.

Hourly Capacity of Runway

Hourly runway capacity measures the maximum number of aircraft operations that can be accommodated by the runway configuration in one hour. Based on the FAA methodology, hourly capacity for runways is calculated by analyzing the appropriate VFR and IFR figures for the airport's runway configuration. From these figures, the aircraft mix index and percent of aircraft arrivals are utilized to calculate the hourly capacity base. A touch and go factor is also determined based on the percentage of touch and go operations combined with the aircraft mix index. These figures also consider the taxiway exit factor.

For both VFR and IFR conditions, the hourly capacity for runways is calculated by multiplying the hourly capacity base, touch-and-go factor, and taxiway exit factor. This equation is:

$$\text{Hourly Capacity} = C^* \times T \times E$$

where:
- C^* = hourly capacity base
- T = touch and go factor
- E = exit factor

A single-runway airport configuration was selected as the model that best represents the airfield configuration and utilization at COI. Its hourly capacity base is 105 VFR operations per hour or 60 IFR operations per hour as shown in **Table 4-2**. Since no physical changes are expected to be made to the runway configuration over the planning period, this configuration is used for the hourly capacity calculations throughout the entire planning period.

The mix index for this runway configuration is zero since Class C and D aircraft are not anticipated to use this airport throughout the planning period. The hourly capacity for the key years of the planning period is shown in **Table 4-3**. The weighted hourly capacities shown were calculated using the percentages that these conditions occurred at the airport.

Table 4-2
Hourly Capacity of Runway Component Calculation Matrix

Runway Use Condition	Hourly Capacity Base (C*)	Touch and Go Factor (T)	Exit Rating (E)	Hourly Capacity	Weight Factor (W)	Percentage Use (VFR)	Percentage Use (IFR)
11 VFR	105	1.31	0.94	129.3	1	60.0%	
11 IFR	60	1	0.99	59.4	1		90.5%
29 VFR	105	1.31	0.94	129.3	1	40.0%	
29 IFR	60	1	0.99	59.4	1		9.0%
Closed	0	0	0	0	4		0.5%
Total						100.00%	100.0%

Source: The LPA Group Incorporated, 2008.
Notes:
Touch and Go factor is based upon 31-40 percent.
Runway 11 is equipped with non-precision approach equipment (RNAV/GPS and NDB), thus IFR operations unless under weather minima or wind favors Runway 29 are performed on Runway 11.

Table 4-3
Calculation of Weighted Hourly Capacity

Year	VFR Operations/Hour	IFR Operations/Hour	Weighted Hourly Capacity (C_w)
Base Year			
2007	129.3	59.4	93.5
Forecast			
2012	129.3	59.4	93.5
2017	129.3	59.4	93.5
2022	129.3	59.4	93.5
2027	129.3	59.4	93.5

Source: The LPA Group Incorporated, 2008.

Hourly capacity is expected to remain constant over the planning period with the assumption that no improvements to the airfield or runway system will occur.

Annual Service Volume (ASV)

The most important value to be computed in order to evaluate the throughput at an airport is the ASV. ASV represents an estimate of the number of annual operations that the airport can support without undue delay. ASV is not an absolute capacity limit for the airport, but an average based on one year's worth of meteorological conditions and operational conditions. ASV is calculated by multiplying the weighted hourly capacity for each runway configuration, C_W, with average daily demand during the peak month, *D*, and average peak hour demand during the peak month, *H*., as follows:

$$\text{Annual Service Volume} = C_w \times D \times H$$

where:
- C_w = weighted hourly capacity
- D = ratio of annual operations to average daily operations during the peak month
- H = ratio of average daily operations to average peak hour operations during the peak month

The ASV was calculated to be approximately 196,634 annual operations through 2027. Accordingly, subsequent recommendations for facility requirements considered this calculation as well as demand outlined within the forecast chapter in the development of airside improvements. The average peak month operations were determined to be approximately 15.19 percent of total annual operations. The demand ratio components used in the calculation of ASV are reflected in **Table 4-4.**

Table 4-4
Calculation of Demand Ratios

	2007	2012	2017	2022	2027
Annual Operations	113,500	121,072	129,149	137,765	146,956
Average Peak Month Operations	15,596	18,385	19,612	20,920	22,316
Average Daily Operations – Peak Month	513	604	645	688	734
Daily Demand Ratio (D)	221.3818	200.3251	200.3251	200.3251	200.3251
Average Peak Hour – Peak Month	49	58	61	66	70
Hourly Demand Ratio (H)	10.49825	10.49825	10.49825	10.49825	10.49825

Source: The LPA Group Incorporated 2008

The final ASV calculations are reflected in **Table 4-5**. These values were compared to the existing and forecast level of annual operations for Merritt Island Airport. Using the FAA methodology, demand that approaches the calculated ASV likely will result in airfield delays. Several projects that would increase the capacity at an airport are eligible for funding from the FAA. According to FAA **Order 5090.3C**, *Field Formulation of the*

National Plan of Integrated Airport Systems (NPIAS), this eligibility is achieved once the airfield has reached 60 percent of its current capacity. This allows improvements to be planned and made before demand levels exceed the capacity of the facility thereby avoiding lengthy delays. Future capacity levels for the airport were calculated based on the forecast annual operations and the calculated ASV. These levels are depicted in **Table 4-5** and are shown graphically in **Figure 4-7**.

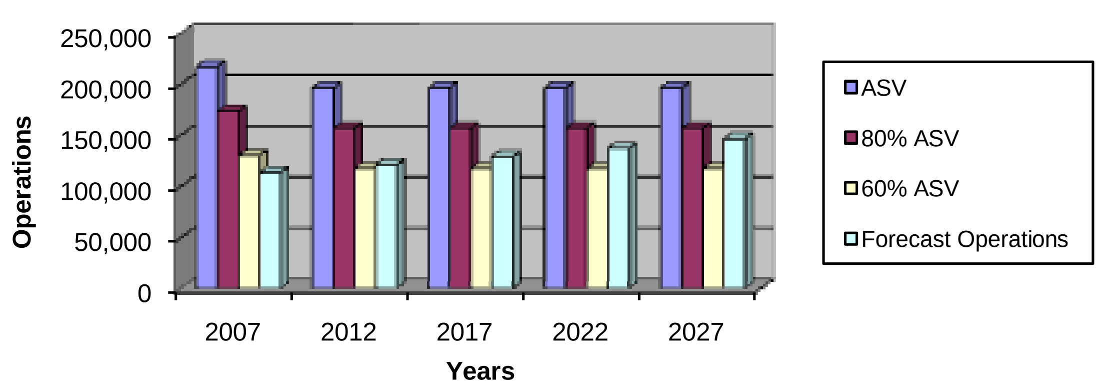
Table 4-5
Annual Service Volume

Year	Annual Operations	Annual Service Volume	Capacity Level
Base Year			
2007	113,500	217,302	52.23%
Forecast			
2012	121,072	196,634	61.57%
2017	129,149	196,634	65.68%
2022	137,765	196,634	70.06%
2027	146,956	196,634	74.74%

Source: The LPA Group Incorporated 2008

The capacity level increases from 52.23 percent in 2007 to 74.74 percent by 2027. This increase is attributed to forecast growth in aircraft operations without any changes to airfield configuration and capacity. Based on capacity levels as presented in **Table 4-5**, the airfield capacity at COI is not expected to exceed the ASV throughout the twenty-year planning period. However, since capacity after 2012 exceeds the 60 percent threshold, airport management should begin to plan for long-term capacity improvements. Since COI's property boundary is constrained and is sensitive to community goodwill, any additional capacity projects will relate closely to preserving and enhancing existing airfield infrastructure elements. **Chapter 5**, *Alternatives Analysis*, will outline in more detail projects that are associated with enhancing airfield and hangar capacity at COI.

Figure 4-7
Long Term Airfield Annual Service Volume



Source: The LPA Group Incorporated 2008

Annual Aircraft Delay

The average anticipated delay is based upon a ratio of the forecasted demand to the calculated ASV. This ratio is used as a guide for planning future airfield improvements. The FAA acknowledges in **FAA AC 150/5060-5** that the level of delay that is acceptable to a particular airport may differ from the level deemed acceptable at a similar airport. It is important to note that it is not only the delay time that determines acceptability, but also the frequency of these delays.

Several methods exist for estimating anticipated delay levels. One method involves using a variety of charts in **FAA AC 150/5060-5** to estimate the average delay per aircraft based upon the ratio of annual demand to ASV. This delay per aircraft would then be used to calculate the annual delay for all operations. Another method utilizes software developed by the FAA (*Airport Design Software, Version 4.2d*) to determine the projected delay values. For this study, the anticipated delay, presented in **Table 4-6,** was determined using the FAA software. The increase in anticipated delay is related to the increasing number of operations throughout the planning period.

Table 4-6
Annual Aircraft Delay

Year	Average Delay per Aircraft (Minutes)	Total Annual Delay (Hours)
Base Year		
2007	0.20 (low) .50 (high)	23 (low) 57 (high)
Forecast		
2012	0.20 (low) .60 (high)	24 (low) 73 (high)
2017	0.20 (low) .60 (high)	26 (low) 77 (high)
2022	0.20 (low) .80 (high)	28 (low) 110 (high)
2027	0.20 (low) .80 (high)	29 (low) 118 (high)

Source: The LPA Group Incorporated, 2008

As indicated in **Table 4-6**, the average delays per aircraft remain relatively low throughout the planning period. However, the delay projection at COI considers an average delay based on hours the airport is operationally capable to accommodate aircraft, but may not reflect delay imposed to arriving and departing aircraft during peak periods, thus high and low delay factors are shown to illustrate the potential range variation. Peak delay per aircraft operating during these times may be significantly higher, up to four minutes. The impact that increasing delay imposes upon the airport is such that constraints, both on the ground and in the air, are compounded with increasing operational activity. Arrival and departure delays can be mitigated by decreasing aircraft runway occupancy time, by constructing additional taxiway exits at critical points along the runway. When aircraft are required to continue taxiing down the runway for the next available taxiway exit, runway occupancy time is increased and thus, hourly throughput capability of the runway is decreased. A more detailed analysis of potential resolutions will be further presented in **Chapter 5** of this report.

Summary

In estimating the capacity of the existing COI operational areas, the primary elements of airfield capacity were examined to determine the airport's ability to accommodate anticipated levels of aviation activity. The results indicate that:

- Projected operations as a percent of total airfield capacity will grow from 52 percent to 75 percent over the planning period, indicating that the airfield has constrained capacity to handle future operations;
- Airspace in the vicinity of the airport does have limitations for additional instrument approach procedures, but likely will accommodate future aviation activity through coordination among local military facility authorities, the FAA, and the surrounding community;
- Based upon wind data obtained from NCDC, the current runway orientation of 11-29 provides the FAA-required 95 percent wind coverage during 13 knot crosswind conditions; and
- The taxiway system likely will be constrained and peak operational delay may occur without airfield improvements; therefore, additional connector taxiways will be required in the future.

Table 4-7
Summary of Airfield Capacity Analysis

	2007	2012	2017	2022	2027
Hourly Runway Capacity					
VFR Capacity Base (Operations/Hour)	129.3	129.3	129.3	129.3	129.3
IFR Capacity Base (Operations/Hour)	59.4	59.4	59.4	59.4	59.4
Weighted Hourly Capacity	93.5	93.5	93.5	93.5	93.5
Annual Airfield Capacity					
Annual Operations	113,500	121,072	129,149	137,765	146,956
Annual Service Volume	217,302	196,634	196,634	196,634	196,634
Capacity Level	52.23%	61.57%	65.68%	70.06%	74.74%

Source: The LPA Group Incorporated , 2008

Capacity and demand requirements have been determined for all aspects of COI's operations. These calculations, which are based on various components, should be regarded as generalized planning tools, which assume attainment of forecast levels as described in **Chapter 3** as well as demand associated with potential general aviation and limited air charter operations. Should the forecasts prove conservative, proposed development recommended as a result of the demand/capacity analysis should be advanced in schedule. Likewise, if traffic growth materializes at a slower rate than forecast, deferral of expansion would be prudent. Operations and aircraft delay should be monitored by airport staff to ensure demand is met appropriately.

FACILITY REQUIREMENTS

This section of the Master Plan Update identifies the airside and landside facility requirements for Merritt Island Airport. Airside facilities include runways, taxiways, navigational aids, airfield lighting, markings, signage, and are related to the arrival, departure, and ground movement of aircraft. Landside facilities provide an interface between the air and ground transportation methods and include general aviation terminal facilities, aircraft hangars, aircraft parking aprons, automobile parking and access as well as various airport support facilities.

The facility requirements herein were developed in accordance with FAA and FDOT planning guidelines and are a result of on-site inspections and discussions with personnel from the Titusville-Cocoa Airport Authority (TICO Authority) and airport tenants. Whenever possible, the requirements were based upon forecasts of operational and based aircraft activity presented in **Chapter 3**, *Forecasts of Aviation Activity*, of this report. Facility surpluses and deficits were identified for the base year 2007, and subsequently for every five years thereafter throughout the 20-year planning period (i.e., 2012, 2017, 2022, and 2027).

Airport Role and Service Level

COI is included in the National Plan of Integrated Airport System (NPIAS), which is published by the U.S. Department of Transportation. In the NPIAS, the FAA establishes the role of those public airports defined as essential to meet the needs of civil aviation and to support the Department of Defense and Postal Service. In the NPIAS, the role for each airport is identified as one of four basic service levels (Primary, Commercial Service, Reliever and General Aviation). These levels describe the type of service that the airport is expected to provide the community during the NPIAS five-year planning period. It also represents the funding categories set up by Congress to assist in airport development.

Approximately 3,431 airports within the current US aviation system are eligible to receive grants under the Federal Aviation Administration Airport Improvement Program (FAA AIP). Airports are designated within the NPIAS by the number of enplanements, operations and based aircraft. General aviation airports, including relievers, are categorized as non-primary airports within the NPIAS System. COI is designated as a general aviation airport. Based upon FAA forecast demand and historic master plan and 2007 Florida Aviation System Plan proposed development, approximately $2,442,105 of the $41.2 billion FAA AIP budget over the five year timeframe (2007-2011) will be required. Anticipated development includes rehabilitation of runway pavement, obstruction removal, runway safety area improvements, facility requirement standardization, security improvements as well as hangar and fuel facility improvements which are eligible for funding under the Vision 100 Program.

The Florida Department of Transportation also categorizes airports within their Aviation System Plan as commercial, reliever or general aviation. According to the Florida Aviation System Plan (FASP), COI is designated as a general aviation airport. As part of the Titusville-Cocoa Beach Airport System, the airport should continue to focus on serving the needs of the general aviation community. The airport currently is home to two flight training operations, the Brevard County Sheriff's flight operations and several other aviation related businesses in addition to providing facilities to recreational aviation operators. According to the FASP, operations associated with flight training, sport flying and business are anticipated to continue to increase. However, future development is somewhat limited due to environmental, manmade, financial and community relations considerations. According to the FASP, 60 percent of the airport's annual operations are associated with flight training. General aviation operations by corporate and business users are also present at the airport, but represent less than 5 percent of total aircraft operations.

According to the FASP, COI will continue to provide "flight training, recreational/sport (experimental/ultralights), business/recreational (banner towing, sightseeing, fire fighting, charter, coastal patrol and rescue, medical flights), Corporate, and Tourism services," and is best suited for providing recreational/sport and tourism services. It is anticipated that the long-term role of the airport within the TICO Authority system will not change over the planning period since the runway length and lack of air traffic control tower makes it unsuitable for heavy corporate traffic. In addition, its use by very light jets (VLJs) for air taxi operations would also be limited

Airport Reference Code and Critical Aircraft

A key element in defining facility needs is establishing development guidelines that are directly associated with the size and type of aircraft activity that the airport currently and will be expected to serve during the planning period. A critical aircraft for facility planning and design purposes

The critical aircraft may be a single aircraft or a composite of the most demanding characteristics of several aircraft. The critical aircraft (or composite aircraft) is used to identify the appropriate Airport Reference Code (ARC) for airport design criteria as contained in **AC 150/5300-13**. More than one critical aircraft (most demanding) may control the design of any specific airport's different facility features, such as runway length, strength of paved areas, or lateral separations in airfield layout. For instance, pavement strength and layout are frequently dependent upon different aircraft. It is also often necessary to design certain areas on an airport to a higher design standard than the rest of the airport in order to accommodate certain operations. Airport dimensional standards, such as runway length, width, separation standards, surface gradients, etc.) should be selected which are appropriate for the critical aircraft that will make substantial use of the airport in the planning period. Substantial use means either 500 or more itinerant operations or scheduled service.[3] Itinerant operations are defined as flights originating at the airport and flying to a facility a minimum of 20 miles away or those operations terminating at the airport from an airport more than 20 miles away.

Once the critical aircraft has been determined, an ARC is established based on specific characteristics of aircraft operating at the airport. The two characteristics defining the ARC are aircraft approach speed and aircraft wingspan. The ARC is identified using an alphanumeric designation; the letter designator is used to identify the Approach Category and the Roman numeral designates the Design Group of the critical aircraft in terms of wingspan and tail height. **Tables 4-8 and 4-9** delineate the criteria used in defining Aircraft Approach Categories and Aircraft Design Groups according to **FAA Advisory Circular (AC) 150/5300-13**, *Airport Design*.

Table 4-8
Aircraft Approach Categories

Category	Approach Speed (knots)
A	<91
B	91-<121
C	121-<141
D	141-<166
E	>166

Source: FAA AC 150-5300-13

Table 4-9
Airplane Design Group

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

Source: FAA AC 150/5300-13

The previous Master Plan Update (1993) designated the ARC for COI as a B-I. Currently, however, all aircraft operating at COI have MTOW of 12,500 pounds or less. The FAA prescribes separate design criteria for airports that serve light aircraft exclusively, referred to as ARC B-I light. Therefore a review of the FAA Enhanced Traffic Management System Counts (ETMSC)[4] records for 2007, and FAA-approved

[3] Source: Airport Improvement Program Handbook, Order 5100.38C – June 28, 2005, Pages 56-57, FAA Order 5090.3C, Field Formulation of NPIAS, and FAA AC 150/5325-4B, Runway Length Requirements for Airport Design.
[4] ***Enhance Traffic Management System Counts (ETMSC)*** is designed to provide information on traffic counts by airport or by city pair for various data groupings such as aircraft type or by hour of the day. Information on oceanic flights, fractional ownership flights or business jet activity is also maintained.

forecast fleet mix information, was conducted to determine the most demanding aircraft or family of aircraft currently operating at COI (i.e., the critical aircraft). While the ETMSC records showed operations by larger ARC B-II aircraft, such as the Beech King Air 90 turboprop, operations by those aircraft are expected to permanently decline at COI by the end of 2008, specifically because Baer Air is relocating their charter aircraft operation to Flagler County Airport. Furthermore, since it is highly infeasible to upgrade COI to ARC B-II design standards from environmental, financial, and available property standpoints (e.g., impacts to existing airport facilities), the FAA has suggested that the TICO Authority attempt to curb operations of ARC B-II aircraft at COI by relocating them to Space Coast Regional Airport (one of the three TICO Authority-owned airports in Brevard County).

According to the ETMSC records, COI experienced 60 operations by the Piper Seminole, 238 operations by the Piper Seneca, and 259 operations by the Piper Navajo in 2007, all of which are multi-engine piston aircraft classified as ARC B-I light. Since multi-engine piston aircraft (ARC B-I light aircraft) exceeded 500 itinerant operations in 2007, they are classified as the critical aircraft for COI, and are used throughout the remainder of this report to determine the design standard criteria for the airport. It is noted, however, that while larger aircraft are not restricted from operating at COI, the FAA recommends that aircraft larger than ARC B-I light[5] utilize caution when operating at COI due to insufficient wingtip clearances; the FAA may publish warnings (e.g., NOTAMs) advising larger aircraft against such operations.

RUNWAY SYSTEM REQUIREMENTS

The most important element of the airfield is the runway. The runway must be of the proper length, width, and strength to safely accommodate the design aircraft. **FAA AC 150/5300-13**, *Airport Design*, identifies the runway design and separation standards according to the approach speed and wingspan of the runway's design aircraft.

At COI, Runway 11-29 is a single asphalt runway that measures 3,601 feet long by 75 feet wide, and has a weight bearing capacity of 22,000 pounds for aircraft in a single-wheel landing gear configuration. The critical aircraft for COI was previously identified as an ARC B-I light multi-engine piston, such as the Piper Seneca shown in **Figure 4-8**.

[5] This recommendations would apply to aircraft weighing more than 12,500 pounds, with wingspans ≥ 49 feet and approach speeds ≥ 121 knots

Figure 4-8
Piper Seneca V

Source: www.newpiper.com, 2008

Runway Length Analysis

In determining the recommended runway length for COI, the procedure and rationale as outlined in **FAA AC 150/5325-4**, *Runway Length Requirements for Airport Design*, was used. Several characteristics of the design aircraft were needed to conduct the runway length analysis including MTOW, approach speed, and number of passenger seats. Based on a review of manufacturer data, typical configurations of the Piper Seneca were found to have a MTOW of less than 12,500 pounds, approach speed of greater than 50 knots, and less than ten passenger seats. As such, the Piper Seneca is defined as a small aircraft by FAA criteria, meaning that is has a MTOW of 12,500 pounds or less.

The procedure for determining the runway length recommendation for small aircraft is outlined in **Chapter 2** of **FAA AC 150/5325-4B**, *Runway Length Requirements for Airport Design*. Following the FAA methodology for small aircraft with approach speeds of 50 knots or more with maximum certificated takeoff weight of 12,500 pounds or less, the FAA guidance provides two family groupings based upon "percent of fleet", which represents 95 to 100 percent of the theoretical civil aviation fleet of small aircraft. The difference between the two categories is based upon the airport's location and existing or planned aviation activity.

Selection of the 95 or 100 percent recommendation is dependent on the following criteria:

- 95 Percent of Fleet – This category applies to airports that are primarily intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities.
- 100 Percent of Fleet – This type of airport is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area.

Subsequently, due to COI's high number of based aircraft, operations and proximity to popular tourist venues, the runway length requirement for accommodating 100 percent of small aircraft with less than ten passenger seats was selected. By applying the airport's elevation of six feet above mean sea level and mean maximum temperature for the hottest month (July) of 91 degrees Fahrenheit to the base runway length curves in **FAA AC 150/5325-4B**, the recommended runway lengths presented in **Table 4-10** were determined. **Figure 4-9** displays the runway length curves for the airport (shown in blue).

Table 4-10
Recommended Runway Lengths

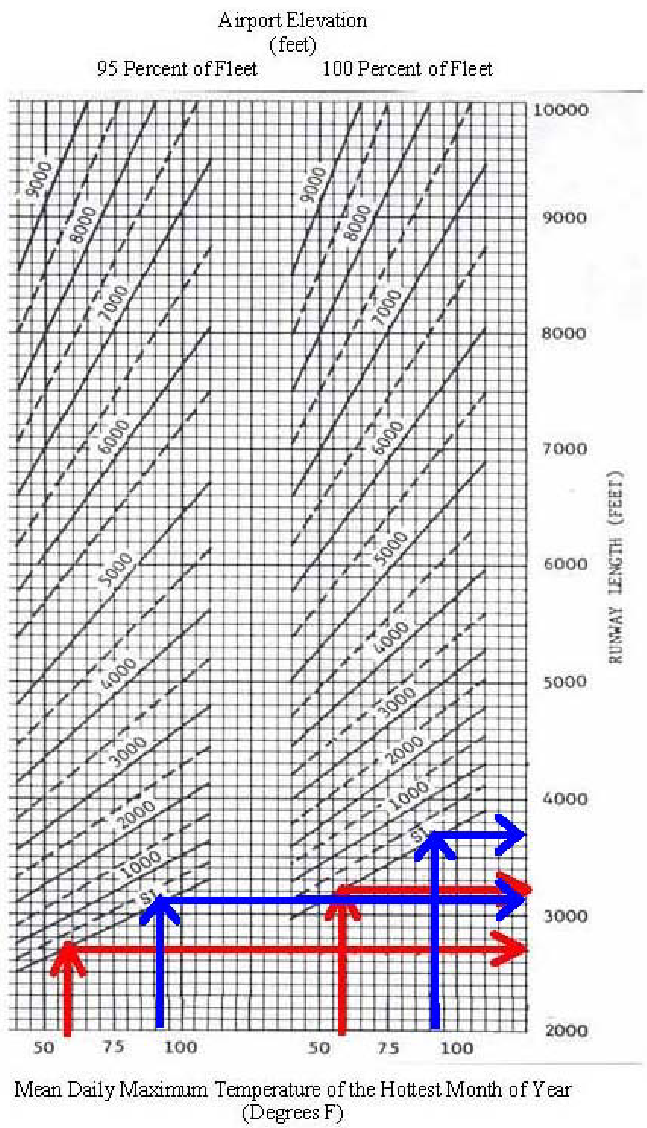
Aircraft Category	Recommended Runway Length
Small airplanes with approach speeds of less than 30 knots[1]	300 feet
Small airplanes with approach speeds of less than 50 knots[2]	800 feet
Small airplanes with less than 10 passenger seats	
95 percent of these small airplanes[3]	3,100 feet
100 percent of these small airplanes (selected)[4]	3,700 feet
Small airplanes with 10 or more passenger seats[5]	4,400 feet

Notes:
[1]Runways located above mean sea level should be increased at the rate of 0.03 x airport elevation above mean sea level + 300 feet to obtain the recommended runway length at that elevation.
[2]Runway lengths above mean sea level should be increased at the rate of 0.08 x airport elevation above mean sea level + 800 feet to obtain the recommended runway length at that elevation.
[3]Runway length determined using Figure 2-1 at 95%
[4]Runway length determined using Figure 2-1 at 100%
[5]Runway length determined using Figure 2-2

Source: AC 150/5325-4B – Chapter 2 (Figure 2-1)

The findings of this analysis indicate that a runway length of 3,700 feet, or a 99-foot extension to Runway 11-29, would be required to support 100 percent of small aircraft operations at COI. However, since Runway 11-29 in its current configuration accommodates over 95 percent of existing and forecast operations, federal funding for such a project is unlikely to be provided. According to current FAA funding guidance, if the runway accommodates more than a 60 percent load factor at its current length then funding is unlikely to be obtained. Further, an extension of Runway 11-29 may not feasible due to environmental issues, property availability, and cost. It is recommended that a runway extension not be pursued at this time, and, therefore, will not be considered as part of this Master Plan Update. If changes in operations and critical aircraft use warrant an extension, it should be considered in the next Master Plan Update estimated to occur in 2013.

Figure 4-9
Runway Length Curves for Small Aircraft



95 Percent of Small Aircraft Fleet *100 Percent of Small Aircraft Fleet*

Sources: FAA Advisory Circular 150/5325-4B, Figure 2-1 and The LPA Group Incorporated, 2008.
Inputs: Mean Maximum Temperature – 91 Degrees Fahrenheit; Elevation – 6 Feet above Mean Sea Level.

Runway Width

As mentioned earlier, Runway 11-29 currently has a width of 75 feet. **FAA AC 150/5300-13,** *Airport Design*, indicates that a runway width of 60 feet is required for ARC B-I light airports. Therefore, the width of Runway 11-29 exceeds FAA standards and should remain unchanged. Furthermore, the added runway width provides increased safety for aircraft flying the published non-precision approaches to Runway 11, and is consistent with recent lighting, signage, and electrical projects conducted at COI.

Runway Pavement Strength

An important feature of airfield pavement is the ability to withstand repeated use by aircraft of significant weight. At COI, aircraft range in size from small single-engine aircraft to very light jets (VLJs) with MTOWs of 12,500 pounds or less. According to FAA 5010 data, Runway 11-29 has a single-wheel loading strength of 22,000 pounds and no published dual-wheel loading strength. Therefore, the existing pavement strength of Runway 11-29 will be sufficient to accommodate the demands of all current and future airport users throughout the 20-year planning period.

RUNWAY SAFETY DIMENSIONAL REQUIREMENTS

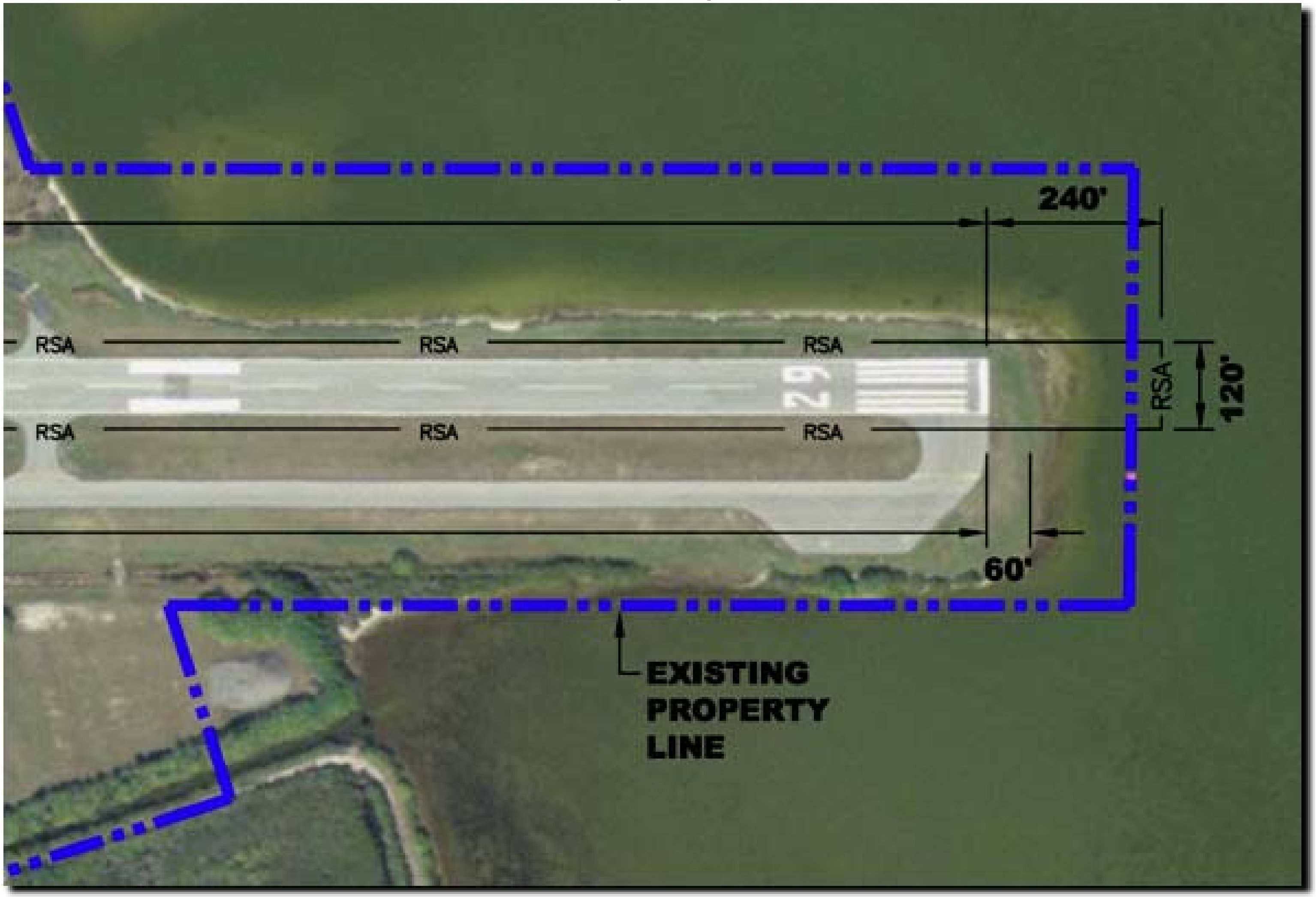
The runway dimensional criteria consist of the areas around the runway ends and sides designed to protect aircraft landing, departing, or operating on the runway. These areas consist of the Runway Safety Area (RSA), Runway Object Free Area (ROFA), and Runway Protection Zone (RPZ). **Table 4-11** presents the FAA standard dimensions for these areas as well as COI's existing dimensions and identified deficiencies. A RSA determination study is provided in **Appendix E** of this report. **Figure 4-10** depicts the existing safety area criteria for the airport to facilitate the discussions in this section.

Table 4-11
Runway Safety Area Dimensions

Design Standard	Runway 11		Runway 29	
	FAA B-I Light Standard	Existing Condition	FAA B-I Light Standard	Existing* Condition
RSA				
Width	120'	120'	120'	120'
Length (Beyond Runway end)	240'	240'	240'	60'
OFA				
Width	250'	250'	250'	250'
Length (Beyond Runway end)	240'	240'	240'	240'
RPZ (1-mile visibility)				
Inner Width	250'	250'	250'	250'
Outer Width	450'	450'	450'	450'
Length	1,000'	1,000'	1,000'	1,000'

**RPZ for Runway 29 is completely over water*
Sources: AC 150/5300-13 and The LPA Group Incorporated, 2008.

Figure 4-10
Runway Safety Area



Source: The LPA Group Incorporated, 2008.

In addition to RSA improvements, reinforcement of the seawalls surrounding the airfield contiguous to Runway 29 and Taxiway A is also needed. This project and associated costs is discussed in greater detail within **Chapter 5**, *Airport Alternatives.*

Runway Safety Area (RSA)

The RSA is centered on the runway centerline and is a FAA-mandated surface that shall be: (a) cleared and graded and have no potentially hazardous ruts, humps, depressions, or surface variation; (b) drained by grading or storm sewers to prevent water accumulation; (c) capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of an aircraft without causing structural damage. The RSA must be free of objects, except for those that need to be located in the safety area because of their function. RSA deficiencies cannot be modified or waived similar to other airport standards.

At COI, the southeastern half of Runway 11-29 is surrounded on three sides by the Intracoastal Waterway (Newfound Harbor). While the RSA beyond Runway 11 meets FAA standards, coastal erosion has and continues to occur beyond Runway 29. This has reduced the functional length of the RSA to approximately 60 feet as shown in **Figure 4-10**, although the functional length may be less during high tide conditions. Furthermore, no boat launch ramp is provided for appropriate access to the RSA beyond Runway 29, as per the recommendation of **FAA AC 150/5300-13**, *Airport Design,* regarding rescue and firefighting access within the RSA and RPZ. Alternatives must, therefore, be considered to correct this RSA deficiency.

Using **FAA Order 5200.8**, *Runway Safety Area Program*, guidance, several alternatives, as illustrated below, were evaluated as part of the RSA analysis (**Appendix E**) including standardizing the RSA using fill to meet grading requirements.

1. Relocation, shifting, or realignment of the runway.
2. Reduction in runway length where the existing runway length exceeds that which is required for the existing or projected design aircraft.
3. A combination of runway relocation, shifting, grading, realignment, or reduction.
4. Declared distances.
5. Engineered Materials Arresting System (EMAS).

The environmental impacts and costs associated with providing standard RSA beyond Runway 29 may limit the feasibility of undertaking such a project under the current runway configuration. Therefore, consideration of a combination of the alternative categories above may be needed to correct the existing RSA shortfall, which was considered as part of the alternatives analysis provided in **Chapter 5** of this report.

Runway Object Free Area (ROFA)

The ROFA is centered on the runway centerline. Standards for the ROFA require clearing the area of all ground objects protruding above the RSA edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the ROFA. Objects, which are non-essential for air navigation or aircraft ground maneuvering purposes, should not to be placed in the ROFA. This includes parked airplanes and agricultural operations. Based on an evaluation of the ROFA for Runway 11-29 in comparison to FAA standards for ARC B-I light requirements, no deficiencies were identified for the ROFA at COI.

Runway Protection Zone (RPZ)

A RPZ, or clear zone, is a two-dimensional trapezoidal shaped area beginning 200 feet from the runway threshold. The primary function of this area is to preserve and enhance the protection of people and property on the ground. The size or dimension of the RPZ is dictated by approach visibility minimums and guidelines set forth in **FAA AC 150/5300-13**, *Airport Design*. Airports are required to maintain control of each runway's RPZ. Such control includes keeping the area clear of incompatible objects and activities. While not required, this control is much easier to achieve and maintain through the acquisition of sufficient property interests in the RPZs. At airports where the RPZs extend over a body of water, it is recommended that boat launch ramps with appropriate access roads be provided.

At COI, the existing RPZs beyond both runway ends extend off the airport property and, therefore, the TICO Authority does not currently control the property. Since the RPZ beyond Runway 29 extends off the airport property and over the Intracoastal Waterway (Newfound Harbor), no development or obstruction issues are anticipated in that area. However, a boat launch ramp should be considered to allow sufficient response to emergency situations. Subsequently the RPZ beyond Runway 11 extends off the airport property and onto a small portion of commercial property. It is recommended that the TICO Authority either purchase or obtain avigation easements on those portions of contiguous property located within the airport RPZ. This will allow the airport to maintain control of the approach surface, and avoid the installation of incompatible development.

TAXIWAY SYSTEM REQUIREMENTS

An efficient taxiway system is designed to provide safe and efficient aircraft movement to and from the runways and the aviation landside facilities. Taxiway systems include entrance and exit taxiways, taxiway run-up areas, apron taxiways, and taxilanes. **FAA AC 150/5300-13**, *Airport Design*, dictates the runway and taxiway design standards for airports. The standards are based on the runway's design aircraft, which was previously identified as a B-I light aircraft for COI. In the sections that follow, major taxiways and their related connectors are analyzed for safety and compliance to FAA design standards.

Taxiway A

Taxiway A is a full-length parallel taxiway located on the south side of Runway 11-29. Since its primary function is to accommodate aircraft movements to and from the runway, it should be designed to the requirements of ARC B-I light standards. The FAA design standards require a taxiway serving B-I light aircraft to maintain a runway centerline to taxiway centerline separation of 150 feet and a taxiway width of 25 feet. The safety and clearance criteria for Taxiway A include a safety area width of 49 feet and an object free area with a width of 89 feet. Both of these widths are centered about the taxiway centerline. The last inspection revealed that a majority of Taxiway A pavement is in good condition.

Based on the FAA's design standard criteria for B-I light airports described above, the runway centerline to parallel taxiway centerline separation at Merritt Island Airport is standard for Taxiway A. Additionally, the 35 foot width of Taxiway A exceeds FAA criteria for B-I light airports and should remain unchanged, since it is consistent with recent lighting, signage, and electrical projects conducted at COI and supports occasional use by larger aircraft.

Taxiway B

The northwestern portion of Runway 11-29 is served by a partial-parallel taxiway, Taxiway B, which is 2,300 feet long by 35 feet wide. The taxiway does not extend to the Runway 29 threshold because of the location of the Intracoastal Waterway (Newfound Harbor). The current runway centerline to parallel taxiway centerline separation is 150 feet, and accommodates ARC B-I light requirements.

Taxiway Connectors

The airport is equipped with a number of taxiway connectors, which allow aircraft to access various points on the airfield. However, since no straight access is provided from Runway 11-29 to the south apron, a new or modified taxiway connector should be considered for that area. All of the taxiway connectors have a minimum width of 35 feet, which exceeds ARC B-I light design standards but should remain unchanged. As mentioned in the airfield capacity analysis, aircraft circulation areas via the taxiway system will likely be constrained without modifications; therefore, as part of development additional taxiway connectors will be required in the future.

Additionally, it should be noted that the current Taxiway A markings and associated lighting extend northward onto the Brevard County Sheriff's apron. Based upon discussions with Sheriff's personnel, this has negatively impacted their operations especially during emergency procedures. Therefore, as part of the alternative analysis, alternatives to relocate general aviation use from this apron will be evaluated.

APPROACH AND NAVIGATIONAL AIDS

Navigational facilities and equipment help to provide safe aircraft operations at COI. In this portion of the facility requirements discussion, various components of the airfield were examined individually and evaluated in comparison to FAA criteria to identify safety deficiencies and substandard facilities. Additionally, improvements and upgrades that could improve service or that may benefit the airport were also identified.

Instrument Approach Facilities

As previously illustrated in **Figures 2-4** and **2-5**, two non-precision instrument approaches are currently published for Runway 11. The existing approaches to Runway 11 include: RNAV/GPS approach that provides visibility minimums as low as 1-mile; NDB approach that also provides visibility minimums as low as 1-mile.

There are no published approaches to Runway 29 because of NASA restricted airspace that exists beyond the runway end, as previously illustrated in **Figure 2-7**. However, a review of wind data from the NASA Shuttle Landing Facility (years 1994-2007) indicated that Runway 29 at COI provides substantially better wind coverage for approaches during IFR conditions compared to Runway 11. Therefore, a non-precision GPS instrument approach will be considered as part of the alternatives analysis. However, the final decision will be at the discretion of the FAA.

Visual Landing Aids

The airport is equipped with a rotating beacon, segmented circle, lighted wind cone, and both runway end are supported by a two-box PAPI. The PAPIs provides visual cues to pilots in approaching aircraft which identify the appropriate glide path to the runway. The airport is further equipped with a rotating beacon which is primarily used to help pilots identify the airport while in flight by emitting a rotating white and green light. The rotating beacon is located on a tower in the northwestern portion of the airport property and provides the standard configuration.

In addition to the PAPIs and rotating beacon, a segmented circle and lighted wind cone is located near the midpoint of the runway, and an additional lighted wind cone is located near the approach to Runway 11. The wind cones provide a visual means for pilots to determine the direction and velocity of the wind. Subsequently, the PAPIs, rotating beacon, and wind cones at COI were found to be in good condition and are therefore sufficient at this time.

Weather Reporting

COI is also equipped with an AWOS-3, located on the point in the northeast corner of the airport property (overlooking the Intracoastal Waterway). An AWOS-3 provides pilots with an accurate assessment of airport conditions for both departing and arriving aircraft via a designated radio frequency. This weather reporting technology is particularly important for FAR Part 135 charter operations as well as all other airport users. Therefore, no additional weather reporting equipment is required for COI at this time. However relocation of the AWOS may ultimately be necessary in order to allow for future development, such as a restaurant and boat docks, in that vicinity of the airport property.

AIRFIELD LIGHTING, SIGNAGE, AND PAVEMENT MARKINGS

Runway Lighting

Runway 11/29 has MIRLs installed along the runway pavement edges, and both ends are equipped with threshold lights. Threshold lighting is often multidirectional, providing green light from the approach end and red to indicate end of the runway. Because an ATCT does not exist at COI, pilots can operate the runway lighting through Common Traffic Advisory Frequency (CTAF). Runway lighting was found to be in good condition, and upgrades or modifications are not anticipated in the short-term.

According to **Appendix 16 of AC 150/5300-13**, *Airport Design*, runway end identifier lights (REILs) are recommended for runway ends with published non-precision instrument approaches. Since non-precision approaches are published for Runway 11, the installation of REILs is recommended. This will allow enhanced visibility during nighttime or low-visibility conditions. Consideration should also be given to the installation of REILs on Runway 29 even if a non-precision approach cannot be implemented. This would provide enhanced visibility and additional safety due to the over water approach.

Taxiway Lighting

The parallel taxiway and taxiway connectors at COI are all equipped with Medium Intensity Taxiway Lights (MITLs). The existing taxiway lights are in good condition and, therefore, require no modification at this time.

Airfield Signage

As described in Chapter 2, a project was recently conducted at COI which upgraded the airfield signage. The airfield signage consists of standard red runway hold position signs and yellow taxiway guidance signs. Therefore, no improvements to the existing airfield signage are required. However, any future improvements to the airfield should include standard signage as applicable.

Pavement Markings

Airport pavements are marked with reflective painted lines and numbers in order to aid in the identification of the runways from the air and to provide information to the pilot during approach phase of flight. The existing runway markings at COI are non-precision, which consist of runway designation markers, a centerline stripe, and threshold markings. The airport’s runway markings are in fair condition and may, therefore, require restriping within five years. All of the other pavement markings are standard at COI including the runway holding positions and taxiway centerline.

AIRCRAFT APRONS AND TIE-DOWNS

Aircraft parking demand is used to identify the need for improved or expanded apron facilities to accommodate both tie-down and transient (itinerant) parking over the 20-year planning period. COI currently has approximately 45,000 square yards of apron area available for based and transient aircraft parking.

The unconstrained forecasts of aircraft apron and tie-down parking demand were determined for both based and transient aircraft at COI in **Chapter 3**, *Aviation Activity Forecasts* (**Table 3-19**). **FAA AC 150/5300-13**, *Airport Design*, specifies that 300 square yards of space should be allocated for each based aircraft and that 360 square yards of space should be allocated for each transient aircraft. Accordingly, the forecasts of based and transient aircraft parking demand were applied to these space requirement factors to calculate long-term apron parking demand as presented in **Table 4-12**.

Table 4-12
Apron And Tie-Down Parking Requirement

Year	Based Tie-Down Demand	Based Apron Requirement (SY)	Itinerant Tie-Down Demand	Transient Apron Requirement	Total Apron Requirement	Existing Apron	Surplus/(Deficit) (SY)
2007	50	15,000	11	3,960	18,960	45,000	26,040
2008	50	15,000	12	4,320	19,320	45,000	25,680
2012	50	15,000	13	4,680	19,680	45,000	25,320
2017	53	15,900	14	5,040	20,940	45,000	24,060
2022	56	16,800	15	5,400	22,200	45,000	22,800
2027	59	17,700	16	5,760	23,460	45,000	21,540

Sources: Airport Records and The LPA Group Incorporated, 2008

Based on the unconstrained forecasts of based and transient aircraft apron demand, a surplus of apron space will exist throughout the remainder of the planning period. However, as described in the aircraft hangars discussion below, a hangar storage deficit may require more aircraft to park on the apron than shown in **Table 4-13**. Therefore, it should not be assumed that new hangars can simply be constructed on the surplus apron space.

AIRCRAFT HANGARS

As described in **Chapter 3**, *Aviation Activity Forecasts*, a large percentage of based aircraft are stored in hangars, which is typical for most Florida airports. This is further evidenced by the airport's extensive waiting list for hangar space with over 100 individuals at the time of this writing (**Appendix D**). Using the aircraft demand identified in **Table 3-19** as a base, storage hangar requirements were determined. In order to calculate the hangar storage requirements for both T-hangars and conventional hangars, it was necessary to first determine the current utilization of these facilities at COI, as summarized below.

- <u>T-hangar Utilization</u> – There are currently 145 T-hangar bays at COI which are fully occupied. Since the total hangared aircraft demand was previously determined to be 167 aircraft in 2007, it can be assumed that 87 percent of the hangared aircraft demand during the planning period must be accommodated in

T-hangar bays **(Hangared Aircraft Demand of 167 Aircraft ÷ 145 Existing T-hangar Bays = T-hangar Utilization of 87 percent)**.

- Conventional Hangar Utilization – There are currently five conventional hangars at COI which are occupied by 22 aircraft consisting of rotorcraft, multi-engine piston and turboprop aircraft. Therefore, approximately 4.4 aircraft occupy each conventional hangar **(22 Aircraft in Conventional Hangars ÷ 5 Existing Conventional Hangars = Average of 4.4 Aircraft per Conventional Hangar)**. In addition, since the total hangared aircraft demand was previously determined to be 167 aircraft in 2007, it can be assumed that 13 percent of the hangared aircraft demand during the planning period must be accommodated in conventional hangars **(Hangared Aircraft Demand of 167 Aircraft ÷ 22 Aircraft in Conventional Hangars = Conventional Hangar Utilization of 13 percent)**.

By applying these T-hangar and conventional hangar utilizations to the long-term hangared aircraft demand previously identified in **Chapter 3**, *Aviation Activity Forecasts*, the hangar storage requirements for Merritt Island Airport were calculated as presented in **Table 4-13**.

Table 4-13
Unconstrained Aircraft Storage Demand

Year	Hangared Aircraft Demand	T-hangar Requirement (87%)	Existing T-hangars	T-hangar Surplus/(Deficit)	Conventional Hangar Requirement (13%)	Conventional Hangar Demand (÷ 4.4)	Existing Conventional	Conventional Hangar Surplus/(Deficit)
2007	167	145	145	0	22	5	5	0
2008	170	147	145	-2	22	5	5	0
2012	207	180	145	-35	27	6	5	-1
2017	207	180	145	-35	27	6	5	-1
2022	218	189	145	-44	29	7	5	-2
2027	229	198	145	-53	30	7	5	-2

Sources: Airport Records and The LPA Group Incorporated, 2008.

To determine hangar size requirements based upon forecast aircraft demand for the 20-year planning period, it was determined that single engine and multi-engine piston hangared aircraft would be stored in T-hangar facilities. Forecast turboprop, larger multi-engine piston, very light jets and helicopters would likely be stored in corporate/conventional hangars, which historically was and is the case at COI. Therefore, based upon anticipated demand, 1,400 SF T-hangar bays[7] and 15,500 SF conventional hangars were recommended as illustrated in **Table 4-14**.

[7] Small aircraft T-hangar bays typically range in size from 1,200 SF to 1,600 SF, so the average was used for this analysis.

Table 4-14
Unconstrained Aircraft Storage Area Demand

Year	Hangared Aircraft Demand	T-hangar Requirement (87%)	T-hangar Surplus/(Deficit)	Additional T-hangar Area Required (SF)	Conventional Hangar Requirement (13%)	Conventional Hangar Demand (÷ 4.4)	Conventional Hangar Surplus/(Deficit)	Additional Conventional Hangar Demand (SF)
2007	167	145	0	0	22	5	0	0
2008	170	147	-2	2,800	22	5	0	0
2012	207	180	-35	49,000	27	6	-1	15,500
2017	207	180	-35	49,000	27	6	-1	15,500
2022	218	189	-44	61,600	29	7	-2	31,000
2027	229	198	-53	74,200	30	7	-2	31,000

Sources: Airport Records and The LPA Group Incorporated, 2008.

Conventional hangar size was based upon the storage requirements for the Piper Seneca multiplied by the average number of aircraft per hangar. Depending upon owner needs and requirements, conventional/corporate hangar facilities may be more or less than the 15,500 SF average. Proposed hangar development and viable locations are discussed in detail within **Chapter 5**, *Alternatives Analysis.*

AIRCRAFT FUEL STORAGE

As described in **Chapter 2**, *Inventory of Existing Conditions*, two underground fuel tanks provide storage for both 100 LL and Jet-A fuel. The fuel is delivered to aircraft via fuel trucks which are owned and operated by Space Coast Aviation. However, due to recent changes in federal environmental regulations, the underground fuel tanks must be removed and replaced with aboveground tanks. Therefore, the purpose of the analysis is to determine what the storage capacities of the replacement aboveground fuel tanks based upon a peak two week demand.

In accordance with the FDOT's *Guidebook for Airport Master Planning*, the FBO fuel storage requirements for COI were determined based upon maintaining a two-week supply of fuel during an average month. To begin the analysis, the forecast of operations by aircraft type were grouped according to their associated fuel usage as shown in **Table 4-15**. For example, all single-engine pistons, multi-engine pistons, and experimental aircraft use 100 LL fuel, and all turboprops, jets, and helicopters[8] use Jet-A fuel. Since the Brevard County Sherriff's Department has their own 10,000 gallon aboveground Jet-A fuel storage tank for their helicopter operations, only one-half of all helicopter operations were considered in the analysis of FBO fuel storage requirements.

[8] All helicopters, at the time of this writing, were operated by the Brevard County Sheriff, which use Jet-A fuel.

Table 4-15
Annual Aircraft Operations by Fuel Usage

Year	100 LL Operations				Jet-A Operations			
	Single-Engine Piston	Multi-Engine Piston	Experimental	Total 100 LL	Turboprop	Jet	50% Helicopter	Total Jet-A
2007	92,578	12,553	1,569	106,700	4,184	0	1,308	5,492
2012	99,190	12,325	1,575	113,090	4,375	828	1,390	6,593
2017	106,045	12,101	1,581	119,727	4,574	1,895	1,476	7,945
2022	113,117	11,882	1,587	126,586	4,782	3,260	1,569	9,611
2027	120,504	11,666	1,593	133,763	5,000	4,860	1,667	11,527

Sources: Airport Records and The LPA Group Incorporated, 2008.

Thereafter, using historic fuel data provided by Space Coast Aviation and the previous FBO, Atlas Aviation, a gallons/operations ratio was calculated for the baseline 2007 year. These ratios were applied to the 100 LL and Jet-A operations forecasts in **Table 4-15** to determine the required aboveground fuel storage capacities for COI for an average two-week period as shown in **Table 4-16.**

- ✈ Jet-A Ratio = 2007 Annual Flowage (76,788) ÷ 2007 Annual Operations (5,492) = **13.98**
- ✈ 100 LL Ratio = 2007 Annual Flowage (127,402) ÷ 2007 Annual Operations (106,700) = **1.19**

Table 4-16
Fuel Storage Requirement

Year	100 LL Gallons		Jet-A Gallons	
	Annual Requirement	Two Week Requirement	Annual Requirement	Two-Week Requirement
2007	127,402	4,900	76,778	2,953
2012	135,032	5,194	92,171	3,545
2017	142,957	5,498	111,081	4,272
2022	151,146	5,813	134,367	5,168
2027	159,716	6,143	161,155	6,198

Sources: The LPA Group Incorporated, 2008.

Based upon this methodology, approximately 6,200 gallons each of both 100 LL and Jet-A fuel storage are required to provide an average two-week supply of fuel at COI by the end of the planning period. However, to accommodate full shipments by fuel tankers, which typically hold 9,000 gallons, and subsequently reduce fuel costs, the new aboveground fuel tanks should have a minimum capacity of 10,000 gallons each. In addition, to avoid the need for fuel to be delivered to aircraft by truck and to provide equal access to fuel by all airport businesses, a self-serve fueling system should be considered. Alternatively, airport tenants may elect to purchase and install their own fuel tanks to support their own aircraft. However, permission must be obtained from the Airport Authority prior to the installation of a private fuel facility[9].

FIXED BASE OPERATOR (FBO) TERMINAL FACILITIES

Terminal facilities are required to support the high frequency of General Aviation (GA) operations as they provide a variety of amenities and services for based and itinerant GA passengers and pilots. The airport's FBO, Space Coast Aviation, currently provides approximately 12,000 square feet of terminal space for GA passengers and pilots, and has an attached 9,000 square foot hangar. This value incorporates all functions of a full-service GA terminal building including FBO counter, waiting area, snack room, pilot's lounge, classrooms, restrooms, etc.

According to FDOT's *Guidebook for Airport Master Planning*, terminal space requirements should be determined by multiplying the number of peak hour pilots and passengers by a demand factor of between 40 and 100 square feet per peak hour pilot and passenger, depending on the specific nature of the airport. Due to the high levels of flight training and transient aircraft activity at COI, a demand factor of 75 square feet per peak hour pilot and passenger was used for the airport. Accordingly, the forecast of total peak hour passengers from **Chapter 3**, *Aviation Activity Forecasts* (**Table 3-20**), was multiplied by this demand factor to determine the long-term terminal requirements for COI as presented in **Table 4-17**.

Table 4-17
FBO Terminal Facility Requirements

Year	Total Peak Hour Passengers	Terminal Requirement	Terminal Available	Surplus/(Deficit)
2007	93	6,975	12,000	5,025
2008	105	7,875	12,000	4,125
2012	109	8,175	12,000	3,825
2017	118	8,850	12,000	3,150
2022	125	9,375	12,000	2,625
2027	130	9,750	12,000	2,250

Source: The LPA Group Incorporated, 2008.

Based upon this methodology, no additional terminal space will be required over the 20-year planning period.

9 Only the FBO is permitted to sell fuel at COI. Thus, if permitted by the TICO Authority, airport tenants may elect to purchase and install their own fuel tanks for use in their own aircraft, provided that an accessible and feasible fuel tank site can be identified.

AUTOMOBILE PARKING

The peak hour automobile parking demand for COI was determined in **Chapter 3**, *Aviation Activity Forecasts* (**Table 3-21**). As described, peak hour automobile parking demand was calculated by multiplying total peak hour passengers by a coefficient of 1.5 (or approximately 40 square yards) as denoted in the Transportation Research Board publication, *Measuring Airport Landside Capacity*. Alternatively, the analysis in this chapter compares the previously determined automobile parking demand to the existing availability at COI (approximately 99 spaces or 3,960 square yards) to identify any surpluses or deficits in automobile parking during the planning period. **Table 4-18** presents the automobile parking requirement analysis for COI.

Table 4-18
Automobile Parking Requirement

Year	Peak Hour Parking Space Demand	Parking Spaces Available	Surplus/(Deficit)	Peak Hour Parking Area Demand	Parking Area Available (SY)	Surplus/(Deficit) (SY)
2007	140	99	-41	5,600	3,960	-1,640
2008	158	99	-59	6,320	3,960	-2,360
2012	164	99	-65	6,560	3,960	-2,600
2017	177	99	-78	7,080	3,960	-3,120
2022	188	99	-89	7,520	3,960	-3,560
2027	195	99	-96	7,800	3,960	-3,840

Source: The LPA Group Incorporated, 2008.

Using the methodology described above, the airport currently has a deficit of 41 public automobile parking spaces, which is expected to increase to 96 by the end of the planning period. However, as described in **Chapter 2**, *Inventory of Existing Conditions*, a large portion of the parking deficit is offset by aircraft owners parking their automobiles in T-hangars of conventional hangars.

GROUND ACCESS

As described in **Chapter 2**, *Inventory of Existing Conditions*, and illustrated in **Figure 2-8**, COI is located adjacent to State Route 3, also known as South Courtenay Parkway. This two lane road runs north and south and connects the southern portion of Merritt Island to State Route 520, which runs east-west and connects to Highway A1A, US-1, and Interstate 95. The south side of the airport is directly accessible via the South Courtenay Parkway to Airport Road. The north side of the airport is also accessible via the South Courtenay Parkway by turning east on Cone Road and then south for one block on Gladiola Street. Subsequently, both the north and south side of the airport are easily accessible from a major road, South Courtenay Parkway, and do not require traversing through any of the surrounding residential neighborhoods. As such, the existing ground access to COI is sufficient.

However, circulation improvements around the airport should be considered to provide access on the airport property between the north and south development areas. Automobile use of Airport Road is not considered acceptable because of its location within the RPZ. Therefore, alternative access routes on the airport property should be considered to provide improved circulation if a feasible alternative can be identified.

AIRPORT SECURITY AND FENCING

While COI does not have a Transportation Security Administration (TSA) presence from the commercial service/passenger screening perspective, the TSA is still the governing body for general aviation security. The TSA has developed guidelines for general GA airports in an effort to enhance security. Some of the items recommended by the TSA for airports such as COI include:

- Security Signage
- Documented Security Procedures
- Positive Passenger/Cargo/Baggage ID
- All Aircraft Securely Stored
- Community Watch Program
- Contact List

In addition, lighting can significantly improve safety and security at GA airports. Examples of enhanced lighting for COI would be in the form of motion detected lighting, which primarily enhances security, or flood lights that are continuously illuminated when dark, which would improve security as well as safety. These lights would primarily benefit the areas adjacent to the FBO such as access the gates and fuel farm.

The airport is encompassed by a six-foot tall chain-link perimeter fence with three strands of barbed wire in most areas, no fencing is provided adjacent to the Intracoastal Waterway (Newfound Harbor). This level of fencing exceeds federal security requirements, though it meets FAA wildlife recommendations.

AIRPORT RESCUE AND FIRE FIGHTING

Merritt Island Airport is a General Aviation Airport and is not required to be certificated under FAR Part 139 for air carrier operations. Non Part 139 airports are not required to provide on-site airport rescue and fire fighting (ARFF) protection. The Merritt Island Airport is fortunate to have a fire station located adjacent to the airport to respond to any on-airport incidents or accidents. The fire station is located just south of the FBO hangar along the access road. In addition to fire protection, the Brevard County Sherriff Aviation Unit is located at the airport. This level of fire protection and law enforcement access is uncommon, but positive, presence at smaller general aviation airports such as COI. There are no further recommendations for fire protection or law enforcement for the airport.

STORMWATER DRAINAGE

The existing stormwater drainage facilities at COI consist of a series of ditches, swales, and retention basins. These facilities are used to divert runoff away form the paved areas of the airport. On both the north and south sides of the airfield, airfield runoff drains into retention ponds and drainage swells before emptying into Intracoastal Waterway (Newfound Harbor). The airport is also surrounded by designated wetland areas and habitats, mangroves and seagrass. Due to the moderate permeable characteristics of the soil, standing water is usually found following a heavy rain. Overall, the existing drainage system adequately meets capacity for the level of development currently on the airport.

Future improvements will likely increase the areas of impervious surfaces on the airport, and, thus, will require additional treatment areas to accommodate the extra runoff. As part of any future development, an evaluation of stormwater discharge and containment will need to be evaluated in order to limit any potential impacts to environmentally sensitive habitat around the airport. Further, existing drainage basins may need to be relocated to accommodate future airfield expansion. Proposed improvements to airfield drainage are outlined in **Chapter 5** of this report.

LAND ACQUISITION

Airport property consists of approximately 139.6 acres of land (a portion of which is underwater). If runway improvements, such as Runway Safety Area Improvements or extensions, and other facility improvements are programmed, additional land may need to be acquired. This land will be necessary to gain compliance with FAA directives and avoid the development of incompatible land uses within the vicinity of COI.

SUMMARY

Table 4-19 provides a summary of the facility requirements based upon anticipated demand presented within this study. The order in which these improvements are listed is not meant to imply a priority or phasing of these projects. Essentially, this table includes the minimum facility requirements over the 20-year planning period based on the projected demand. The alternatives analysis provided in **Chapter 5** will evaluate potential development options including those that may exceed the minimum levels identified within this analysis. This will be considered the ultimate development scenario. Looking beyond these minimum requirements should provide airport management with information in order to make appropriate decisions if growth in one activity area increases faster than projected.

Table 4-19
Summary of Facility Requirements

Runways and Taxiways	1. Conduct routine pavement maintenance on all runways and taxiways. 2. Install Runway Safety Area improvements. 3. Install/improve seawall. 4. Remove taxiway markings and associated lighting on Sheriff's Apron. 5. Add additional connector taxiways to improve traffic flow.
General Aviation	1. Construct at least 53 additional T-hangar units (~74,200 SF). 2. Construct at least 2 additional Corporate/Conventional Hangars. 3. Construct at least 24,442 SY of additional aircraft storage apron.
Airport Support Facilities	1. Close underground fuel tanks and replace and relocate fuel farm to above ground facility. 2. Identify locations for potential seaplane ramp, apron, and hangar development. 3. Identify locations for potential restaurant development. 4. Upgrade security fencing, and incorporate FDOT Security Requirements.
Documentation	1. Develop Pavement Condition Report. 2. Update GA Airport Security and Contingency Plan per FDOT/FAA Requirements.