CHAPTER 4 - DEMAND CAPACITY & FACILITY REQUIREMENTS

INTRODUCTION

This section compares the capacity of all airport infrastructure and facilities to accommodate existing and forecasted demand. The future requirements serve to determine which airport facilities will become inadequate to meet demand and at what projected time through the course of the 20 year planning period. This information will be the basis of the next step in the planning process: the definition and evaluation of development alternatives, which are presented later in Chapter 5 (starting on page 108).

Any calculated shortfall in facilities provides a "glimpse" of the degree of facility expansion needed in 20 years, as well as the improvements needed before then. While certain facilities may be needed, at what demand level they actually are implemented is often a matter of airport policy and funding availability. This policy is often based on prioritization of need, development costs, and engineering and environmental feasibility. In the case of an apron expansion for example, the calculated need increases over time with growth, but that does not mean very small expansions are needed every year. Providing a facility before it is needed is not financially prudent and may not receive environmental approvals (if required) due to inadequate justification based on purpose and need. Providing a facility late, however, causes unnecessary congestion and delay, inconveniencing airport management and users. Late development of facilities is also more expensive and time consuming, tying up airport funds that could be used for other capital projects.

Facility requirements were calculated for existing conditions (year 2010) and the forecast years of 2015, 2020, and 2030 (end of the short, intermediate, and long-terms respectively) by applying the forecasts presented in Chapter 3. The forecasts are summarized in Table 4.1 (next page). The timing of the need for the identified improvements is driven by the projections of future aviation activity or trigger points.[1] For example, the need for a larger aircraft apron is triggered by a growth in based and/or itinerant aircraft, now or at a future date.

The facility requirements analysis is presented for the major elements of land use at Groton-New London:

- Airside Facilities.....Page 75
- Landside Facilities.....Page 86
- Support Facilities.....Page 91
- Navigation Facilities .....Page 94
- Airport Security.....Page 102

[1] Change in a condition or value that represents crossing a threshold and actuates or initiates a need for a change in the airport's infrastructure.

Table 4.1 - Groton-New London Demand Forecast Summary

Activity	2010	2015	2020	2030
Local Operations	11,676	11,700	12,870	15,444
Itinerant Operations	26,561	26,500	29,150	34,980
Total Annual Operations	38,237	38,200	42,020	50,424
PMAD Operations [Note 1]	191.2	191.0	210.1	252.1
PH Operations [Note 2]	38	38	42	50
Based Aircraft [Note 3]	50	54	59	71
Passenger Enplanements	35,800	38,800	42,800	52,200
Peak Hour Passengers	36	39	43	52

[1] For planning purposes, Peak-Month/Average Day (PMAD) is calculated as 15% of annual operations divided by 30.

[2] Peak-Hour (PH) is 20% of PMAD

[3] The based aircraft numbers reflect an increase over those presented in Chapter 2, Inventory and Chapter 3, Forecasts

AIRPORT DESIGN STANDARDS

As addressed in Chapter 2, *Inventory of Existing Conditions*, airport design standards are based on the airport's critical design aircraft, where the size and speed of this aircraft is translated to the airport reference code, or ARC, which in turn established the airport's design standards. As a review, the current and forecasted critical design aircraft is the Cessna 650 Citation VIII and the ARC is C-II.[2] This ARC is not applicable to the airport as a whole, but primarily the airport's main runway, Runway 5-23. The crosswind runway, 15-33, has a different ARC (B-II) because of its shorter length and use by smaller and less demanding aircraft in terms of size and landing/takeoff distances requirements. In addition, small aircraft parking areas used exclusively by single and light twin piston aircraft have an even less demanding A-1 ARC. The reason for the different designations is to ensure airport facilities are properly sized and positioned based on their most demanding planned uses. This equates to savings in terms of maintenance and construction costs and does not "oversize" airfield design requirements and related set-back distances thus potentially preserving additional land for compatible development.

AIRSIDE FACILITIES

This section contains the demand/capacity analysis for the existing airfield facilities as well as future airfield requirements. For reference, the existing airfield is shown earlier in Chapter 2 on Figure 2.6 (page 10).

[2] See Critical Design Airplane, Page 11.

AIRFIELD CAPACITY

The purpose of this analysis is to determine the level of aircraft activity, as defined by hourly or annual aircraft operations that can be accommodated by the existing airfield system at an acceptable level of delay. The methodology used is derived from AC 150/5060-5, *Airport Capacity and Delay*.

ASSUMPTIONS

The inputs required for the analysis, include existing and forecast demand, runway configuration, and the taxiway system.

The demand levels used to test the airfield system were derived from the forecasts of aviation demand. Calculations were made for the airfield at the existing 2010 level of demand, as well as for the 2012, 2017, and 2027 activity levels. Table 4.1 presented on the previous page shows the projected annual airport demand for each planning year.

RUNWAY CONFIGURATION

As shown in the previous chapter, there are two runways at Groton-New London, configured in a crossing design. Runway 5-23 is 5,000 feet long by 150 feet wide and is the preferred runway for most operations, particularly when wind conditions require. Runway 15-33 is 4,000 feet long by 100 feet wide and is used primarily by small category aircraft[3] when crosswind conditions prevent the use of the longer, primary runway. However, most aircraft currently using Groton-New London can operate from the shorter strip depending on wind, temperature, and operating weight and speed.

Based on findings contained in AC 150/5060-5, it is important to note that the crosswind runway (15-33) does not provide much additional airfield capacity. This is because the crosswind runway cannot be operated independently of the main runway (5-23) due to the intersection of the two runways. Arrivals and departures on Runway 5-23 must take place in coordination with operations on Runway 15-33. For example, when an aircraft is landing or departing on Runway 5 or 23, arriving or departing aircraft on Runway 15 or 33 must wait until the Runway 5-23 aircraft has passed the intersection of the runways. In addition, if a large aircraft is operating on one runway, aircraft using the crossing runway may have to wait even longer to protect against wake turbulence. As a result of this coordination and inherent delay factor, the capacity of the two runways together is not significantly higher than a single runway.

It is important, however, to understand the purpose of a crosswind runway, which is not to increase capacity, but rather to compensate primary runways that provide less than the

[3] Gross takeoff weight of 12,500 pounds or less.

FAA recommended 95 percent wind coverage. A review of the 1999 master plan indicates wind favors the primary runway (5-23) 94.6% of the time at 15 miles per hour, or mph (equal to 13 knots) and 88.2% of the time at 12 mph (10.5 knots). The slower speed at 12 miles per hour (10.5 knots) is applicable to smaller aircraft, while the higher speed (15 mph/13 knots) applies to larger aircraft. Combined, both runways provide 97.2% coverage at 12 mph/10.5 knots and 99.36% at 15 mph/13 knots. Because the coverage for the predominant smaller aircraft on the primary runway is well below the 95% threshold, a crosswind runway is essential for both safety and operational viability of the airport; that is, it makes the airport available during most wind conditions for all aircraft, at a higher level of safety.

TAXIWAY CONFIGURATION

For the purposes of airport capacity calculations at Groton-New London, the current taxiway configuration does not create an inherent delay situation. The full parallel taxiways along both runways, combined with the connecting taxiways provides for optimum flow of traffic in all runway operating configurations.

ANNUAL SERVICE VOLUME

Annual service volume is used by the FAA as a quantifiable measure of an airport's operating capacity. The annual service volume is defined as the maximum level of annual aircraft operations that can take place at an airport (i.e. it does not consider levels of delay). Annual service volume can be used as a reference point for the general planning of capacity-related improvements. As actual annual operations approach the annual service volume of an airport, annual aircraft delays increase rapidly, with relatively small increases in the number of operations served. As a general rule, when demand at an airport reaches 60 percent of its capacity, delays become noticeable during portions of the day and new airfield facilities (i.e. runways) should be planned. When airport activity reaches 80 percent of operational capacity, new airfield facilities should be constructed.

The annual service volume at Groton-New London was calculated to be 230,000 operations. The 60 and 80 percent ratio were applied to Groton-New London's annual service volume to determine if new airfield facilities would be required. The annual service volume methodology indicates that the airport is currently operating well below its operational capacity levels (17 percent or 38,237[4]). This methodology also indicates that delays of any significance will not occur until the annual service volume reaches 138,000. New runway facilities will not be required until the airport is operating at 80 percent of its annual service volume, or 184,000 operations. Demand is projected to reach 27 percent of the airfield's annual service volume by 2030, when annual operations are projected to reach 63,000.

[4] Total operations in the base year (2010).

SUMMARY

The results of the airfield demand/capacity analysis indicate that Groton-New London will not reach critical capacity levels during the master planning horizon. There are improvements that could be made regardless of this capacity analysis, including new technology and improvements to the taxiway lighting system that would provide a small measure of increased safety and possible operating cost reductions such as LED lights, and these improvements are addressed in subsequent sections in this chapter. Nonetheless, additional airfield infrastructure (either runways or taxiways) will not be required through the planning period to address any capacity concerns.

RUNWAY LENGTH ANALYSIS

The purpose of a runway length analysis is to determine if the lengths of the existing runways are adequate, and to determine the needed length for the existing and any future requirements. This analysis does not include the geometric design standards provided by the FAA including the Runways Safety Area (RSA) and Runway Protection Zone (RPZ). These two key standards are discussed later in this chapter (see *Airport Design Standards*, page 83).

Runway length requirements were identified for two aircraft groups (large and small category aircraft)[5], in addition to landing and takeoff runway length requirements for the airport's critical design airplanes. In the analysis, various runway length requirements were identified in order to provide as much information as possible for future planning.

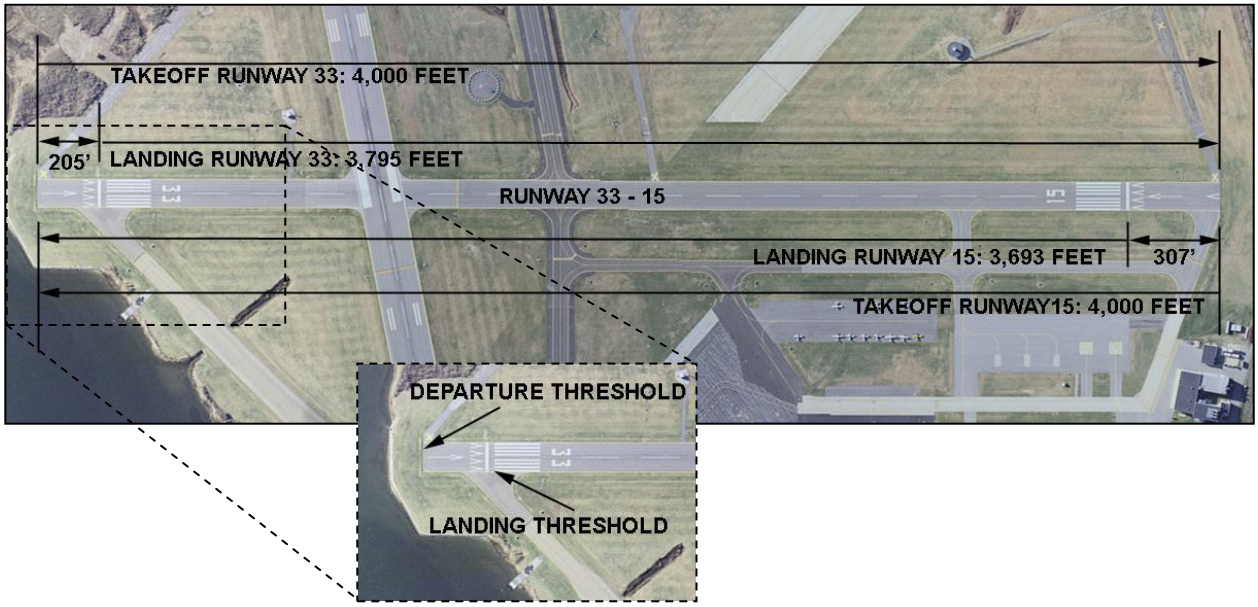
The runway length requirements were calculated using AC 150/5325-4B, *Runway Length Requirements for Airport Design*, and charts published in the aircraft manufacturers' aircraft performance manuals. Requirements were calculated by taking into consideration the airport elevation and average temperature, runway conditions, and the performance characteristics and operating weight of each aircraft. The operating weight of an aircraft is dependent on the amount of fuel needed to reach the destination and the amount of payload (passengers, baggage, and cargo). Although this analysis utilized the individual aircraft manufacturers' manuals, individual aircraft operators, will typically have their own runway length requirements. These requirements are sometimes more stringent than those presented in the aircraft design manuals and are based upon additional safety and insurance requirements.

[5] Small category aircraft are those weighing 12,500 pounds or less, and large aircraft weight more than 12,500 pounds up to and including 60,000 pounds. Aircraft weighing more than 60,000 fall into the transport category.

EXISTING RUNWAY LENGTH

Runway 5-23 is 5,000 feet long and is the primary arrival and departure runway for most commercial operations. Runway 15-33 is 4,000 feet long and is used primarily by small general aviation aircraft in good weather conditions. Two of the runway ends operate with a displaced threshold. A displaced threshold represents a point on the runway other than the physical beginning of the runway and is marked for arriving aircraft to touch down. This limits the landing length available to arriving aircraft. The physical beginning of the runway is used by departing aircraft, which typically require more runway length than arriving aircraft. Displaced thresholds are used when there are obstructions that an arriving aircraft cannot clear when using the physical beginning of the runway. Runway 15-33 operates with a displaced threshold of 307 feet for Runway 15 and 205 feet for Runway 33. The displaced threshold only reduces the available runway length during landings. As a result, Runway 15 arrivals have 3,693 feet of runway available, and Runway 33 arrivals have 3,795 feet of landing length available. Figure 4.1 illustrates the displaced threshold effect on Runway 15-33 operations; it shows the available runway for departures and arrivals from both runway ends. The inset in this figure shows where an aircraft can begin takeoff roll and the earliest point an aircraft can touchdown on landing approach.

Figure 4.1 – Displaced Threshold Effect on Runway 15-33
Effect of Displaced Threshold



TAKEOFF RUNWAY LENGTH REQUIREMENTS

This section discusses the takeoff runway length requirements for the aircraft currently using or projected to be in operation at Groton-New London over the planning horizon.

Large Aircraft Requirements

The design procedure for this airplane weight category requires the following information: airport elevation above mean sea level, mean daily maximum temperature of the hottest month at the airport, the critical design airplanes under evaluation with their respective useful loads. Another factor considered is the percentage of the existing fleet considered. One calculation considers 75 percent of the fleet, and the second calculation considers 100 percent of the fleet in this weight class; both calculations also factor useful load at both 60 and 90 percent.[6]

As shown on Figure 4.2 (next page)**,** 100 percent of the fleet at 60 and 90 percent useful load require the most runway length (5,000 to 7,400 feet). (Although it should be noted that pilots and operators may insist on longer lengths as the required length for regular use.) Calculations for 75 percent of the fleet require 4,700 to 6,000 feet of runway length at 60 and 90 percent useful load respectively. All aircraft in this weight class can be accommodated with a 7,400-foot runway.

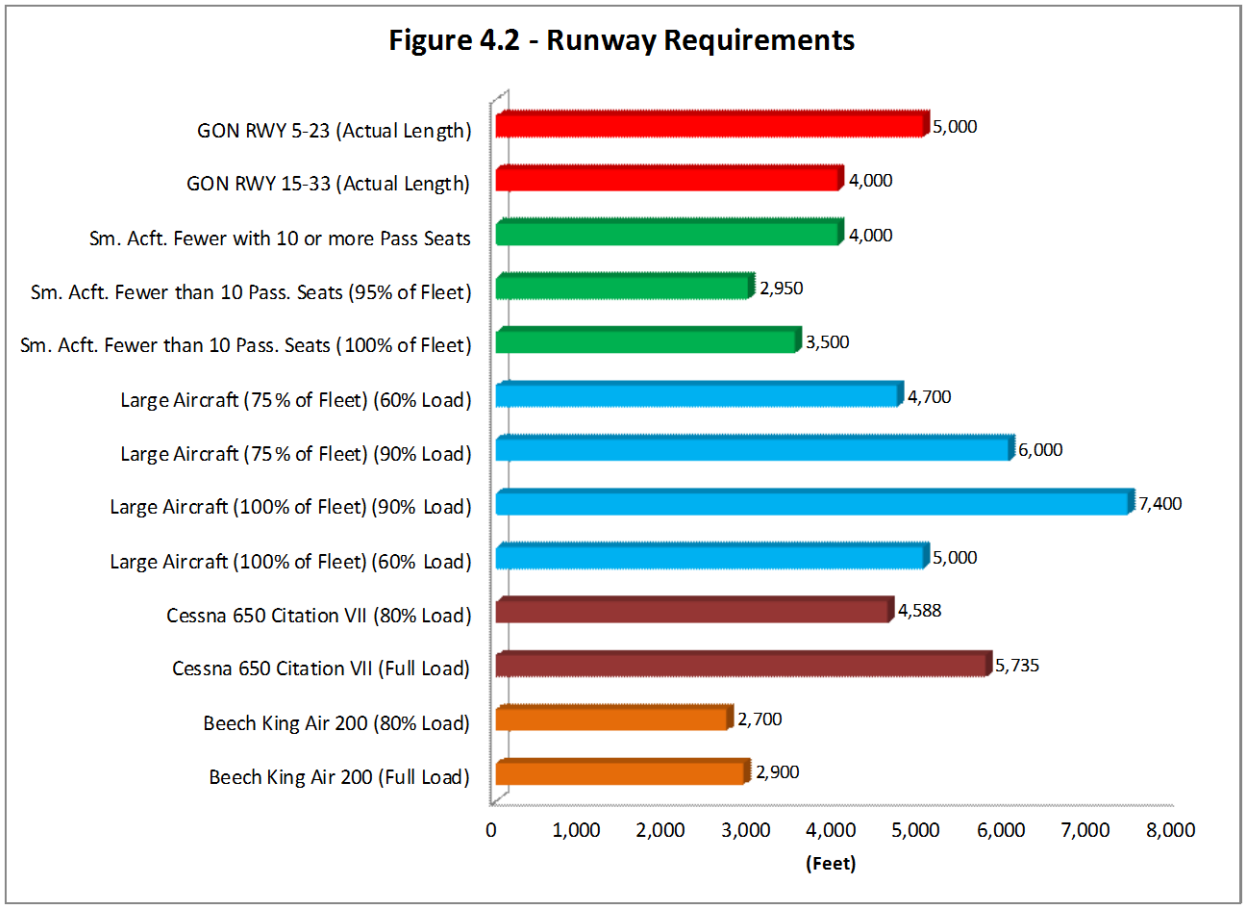
Small Aircraft Requirements

Runway lengths for small airplanes with a maximum certificated takeoff weight of 12,500 pounds or less were calculated using the same analysis as large aircraft. The design procedure requires the following information: the critical design airplanes under evaluation, approach speed in knots, number of passenger seats, airport elevation above mean sea level, and the mean daily maximum temperature of the hottest month at the airport.

Three separate calculations were made: small airplanes with fewer than 10 passenger seats, with calculations for 95 and 100 percent of the fleet, and for small airplanes with 10 or more passenger seats (no breakout for fleet percent).

[6] AC 5325-4B, Chapter 3.

Small aircraft with 10 or more passenger seats require the most runway length at 4,000 feet (Figure 4.2). Calculations for small aircraft with less than 10 passenger seats require between 2,950 and 3,500 feet for 95 and 100 percent of the fleet respectively.



Critical Design Aircraft

A separate calculation was performed for the airport's two design aircraft, the Embraer 135 and Beech King Air 200. The Cessna 650 Citation VII requires 5,150 feet of runway at sea level under standard atmospheric conditions.[7] At Groton-New London this distance increases to 5,735 feet with a full load, and 4590 at 80 percent load. The King Air 200

[7] International Standard Atmosphere (ISA) is an atmospheric model of how the pressure, temperature, density, and viscosity of the Earth's atmosphere change over a wide range of altitudes. The ISA at sea level is 59°F (15°C) and with a pressure of 29.92 inches (1013.25 millibars). As the pressure and temperature changes, the operating performance of aircraft change as well. In general, the higher the temperature and the lower the pressure from ISA, the more runway pavement aircraft require for both takeoff and landings.

requires 2,600 feet at sea level under standard conditions. The runway length increases to 2,900 at Groton-New London with a full load, and 1,800 to 2,700 at 60 and 90 percent load factors respectively.

CROSSWIND RUNWAYS

Crosswind runways are generally designed at approximately 80 percent of the identified primary departure runway length requirement.[8] A crosswind runway length that is shorter that the primary runway is usually acceptable at most airports for two reasons. First, the added lift from increased head-on wind speeds under conditions where the crosswind runway is in use, somewhat reduces takeoff length requirements. In addition, at many airports, the occurrences of winds that require the use of the crosswind do not occur frequently enough to make runway length-caused operational restrictions an issue.

Since a 5,000 to 7,400-foot runway is recommended for the primary departure runway at Groton-New London, 4,000 to 5,900 feet would be the recommended crosswind runway length (based on the 80 percent guideline) for planning purposes. At 5,900 feet, the crosswind runway would be capable of providing operational flexibility as a backup runway during maintenance, snow removal, or favorable wind conditions.

SUMMARY

The preceding analysis identified runway length scenarios for two aircraft weight classes under various conditions (fleet percent and load factors), and for the two critical design aircraft at Groton-New London. It is important to note that these requirements do not imply that several different runways are needed to serve different aircraft groups, or that a longer runway is required. For certain aircraft under certain conditions, a longer runway is always desirable or required. Meeting that demand is not an obligation, but rather a balance between purpose and need.

While preserving all options must be considered, and theoretically there may be a need for longer runways at Groton-New London, the need does not exist today at a level of use that justifies the cost. Certainly some aircraft must operate with a reduced fuel/cargo load, or use another airport; however the majority of aircraft do not. Given there is no commercial airline service at Groton-New London, no reasonable justification can be made to expand the existing runway surfaces for the following reasons.

[8] When possible, crosswind runways are generally designed at approximately 80 percent of the identified primary departure runway length requirements; however, 80 percent is a general planning and design guideline recommended by the FAA, not a regulation or rule. If it is determined that lengthening the crosswind runway to 80 percent of the primary runway length requirement is not feasible or practical due to environmental impacts (i.e. wetlands/hydrological issues) and/or exorbitant costs (i.e. costs more than the benefit gained), etc., then a lesser length will be considered adequate. Again, this is a FAA "rule-of-thumb" planning/design guideline.

- No need for most operations
- No available land for expansion
- Major environmental issues. A runway extension automatically triggers the needs for an Environmental Assessment, if not an Environmental Impact Statement. Given the airport's location along Poquonnock River and Baker Cove, any runway extension to Runway 33 would require relocating an active railroad line, and an extension to Runways 5, 23, or 15 would require filling portions of one or both bodies of water; an environmental obstacle that would take years to navigate, with a high probability of a finding of significant impacts in one or more categories (wetlands, wildlife, etc.).
- The cost of design and construction alone may not outweigh any benefits achieved.

Given the above, it is recommended that no further study of a runway extension be pursued in this document.

RUNWAY WIDTH ANALYSIS

Runway 05-23 is 150 feet wide and Runway 15-33 is 100 feet wide. Under current design standard, Runway 05-23 should be at least 100 feet wide and Runway 15-33 needs to be at least 75 feet wide. It is recommended, however, that the runway widths remain at 150 and 100 feet, respectively at least until each strip is scheduled for reconstruction; at which time the required width should be readdressed and adjusted accordingly.

Although the likelihood of the ARC increasing to Group IV in this planning period is remote, it is possible, which would dictate a wider runway infrastructure. Regardless, the runway width can be reevaluated when the next major reconstruction project of the runway(s) is due. Reducing the width for the sake of meeting current design standards is expensive and would serve no operational purpose.

In fact, the wider runway adds an immeasurable safety element to flight operations: it offers pilots of all experience levels a greater margin of error, particularly during strong wind conditions. In addition, a wider runway provides an increased margin of safety during low visibility operations by offering pilots a wider target or aim point in the final phase of approach. It also provides a greater safety margin when runways are subjected to snow removal and ice control operations (November to April).

It is therefore recommended, that the runway widths remain at 150 and 100 feet, respectively during the study period.

AIRPORT DESIGN STANDARDS

As determined in Chapter 2 (see *Critical Design Airplane*, page 11), the airport is currently an ARC C-II facility. The C-II ARC is applicable to the airport as a whole, but principally to the primary runway, which means that all airport geometric standards, except Runway 15-33 and small aircraft parking areas will be based on an aircraft with a wingspan up to 79 feet and an aircraft approach speed of 141 knots or less. Runway 15-33 is designed to ARC B-II standards because it is used primarily by small category aircraft with a slower approach speed and shorter wingspan, however, large category aircraft do use this runway.

RUNWAY SAFETY AREA

The definition and purpose of RSAs is defined in Appendix 1. GON runway design prescribes separate standards of ARC C-II for Runway 05-23 and ARC B-II for Runway 15-33. Table 2.1, *Airport Design Surfaces* (presented earlier on page 13) lists the required and actual RSA dimensions along with the nonconforming issues. The airport undertook a safety-area study that identified issues, and in 2011, EMAS was installed on both ends of Runway 5-23.

OBJECT-FREE AREA

Like RSA, the OFA extends around the runway, creating an area that must meet FAA clearing standards. Objects nonessential for air navigation or aircraft ground maneuvering must not be placed in the OFA, including parked aircraft. The size of the OFAs at Groton-New London meets design criteria. Table 2.1 (page 13) also lists the required and actual OFA dimensions along with the nonconforming issues.

RUNWAY PROTECTION ZONES

The RPZ is an area off the end of a runway provided to enhance the protection of people and property on the ground. Control of this trapezoid shaped area is achieved through airport owner control over RPZs. Such control includes clearing (and maintaining them clear) of incompatible objects and activities. Land uses prohibited from the RPZ are residences and places of public assembly. Figure 2.6 (page 10) shows the location of the four runway zones and Table 2.1 (page 13) lists the RPZ dimensions (see Inventory Section, page 10 and 14 respectively).

All four RPZs rest at least partially off airport property with no controlling interests in the portions that overlie private property. Property interests should be in the form of airport ownership, an easement, or zoning controls. Methods of obtaining this control are addressed in Chapter 4, *Alternatives*.

TAXIWAY REQUIREMENTS

For the purpose of airport capacity calculations Groton-New London has sufficient full-length parallel taxiways and runway entrance/exit taxiways and no taxiway/runway crossing problems. The two runways are currently served with a full parallel taxiway and there are sufficient runway exits along both Runways 5-23 and 15-33.

The minimum pavement widths, curve radii, and separations associated with airplane movement areas and airplane physical characteristics of the airports critical design aircraft are consistent with FAA design standards. The role of the taxiway system is to function as the transitional facility between the two runways and the aircraft parking areas. The taxiway system requires no adjustments given the airports current role.

LIGHTING, MARKINGS AND SIGNS

All aeronautical lights, markings, and signs are consistent with FAA guidelines and Part 139 standards.

RUNWAY LIGHTS

The existing runway-edge light system consists of high intensity runway edge lights (HIRL). Other than routine maintenance and replacement of damaged or worn components, no change in lighting is recommended at this time other than switching to LED lights when and if the technology becomes available.

APPROACH LIGHTS

A 2,400 foot medium intensity approach lighting system with runway alignment indicator lights (MALSR) is installed on Runway 5. This configuration and length is appropriate for the Airport and runway end (with an ILS). No additional approach lighting systems are recommended at this time.

RUNWAY END IDENTIFIER LIGHTS

Runway End Identifier Lights (REILs) are currently installed on Runway 23 and 33 only. Adding a REILs system to Runway 15, combined with the existing ALS on Runway 5, would provide total airport coverage. The addition of REILs would provide pilots with added safety and security during night operations.

VERTICAL GUIDANCE LIGHTS

A Vertical Glideslope Indicator (VGLI) consists primarily of VASI and PAPI systems and is designed to provide pilots with visual descent guidance information during the approach to a runway during both day and night conditions (see section 1.5.1.6, page 13). The existing VGLI consists of a four-light PAPI on the left side of Runway 5 and 33. There is a four-box VASI on the left side of Runway 23, and Runway 15 has no VGSL. It is recommended that a four-light PAPI be installed on Runway 15 and the Runway 23 VASI be replaced with a four-light PAPI.

TAXIWAY LIGHTS

All taxiway lights are currently equipped with Medium-Intensity Taxiway Lights (MITLs). No changes are recommended other than to transition to LED lights when the existing systems are due for replacement. Any change to LED lighting should include individual heaters for each fixture. The heating system keeps the globe clear of ice and snow and is required in northern climates because unlike incandescent lights, the LED does not give off heat.

MARKINGS AND SIGNS

Current runway markings are satisfactory and meet current design requirements. The markings are in good condition. In the fall of 2005 the majority of the markings were repainted due to construction projects and FAA mandates for new runway holding position markings. Airport signage, during an airfield inspection in February 2009 for this AMPU were in good condition, function according to design and also meet FAA standards.

LANDSIDE FACILITIES

This section addresses issues related to landside facility capacity and recommended changes.

AIRCRAFT STORAGE AND PARKING

The first assumption that must be made is how the mix of aircraft that park on the various aprons and those in hangars will change during the planning period. Currently, the mix is not divided equally between hangars and ramp tie down spaces. There are 50-based civil aircraft (2010 inventory). Of these, approximately 19 percent, or 8 aircraft are parked in the open on aprons; the remaining 44 (88 percent) are parked in one of several hangars. It is anticipated that this ratio will remain fairly constant throughout the planning years (for planning purposes we use 20 percent apron and 80 percent hangar). Given this, the need

for open apron space will grow from the current 8 aircraft to 14 and hangar demand will increase from the current 44 to 57 by year 2030.

Conventional-hangar capacity is difficult to judge because aircraft size is difficult to determine. The larger the aircraft the fewer aircraft a conventional hangar can hold. Also, most conventional hangars are not strictly used for long-term storage purposes but rather are maintenance facilities. There are a total of nine hangars at Groton-New London, three are t-hangar buildings, and all remaining hangars are conventional units. The TASMG hangar is a maintenance facility. All hangars are metal construction and in excellent condition. Our assessment in early February 2008 indicates a surplus of space both in the conventional and t-hangars.

Like any other project, hangars and (new apron space) should be developed only in concert with demand. The key is timing the market to ensure that adequate space is available, which is generally left to private developers to assess market conditions and the need for more hangar space. The airport must work closely with developers, usually the FBO, to ensure adequate space is available and lease agreements are in place in a timely manner.

BASED AIRCRAFT APRON REQUIREMENTS

Aircraft aprons/ ramps consist of seven specific parking areas joined by continuous pavement that extends throughout the airport's entire northern quadrant, from the approach end of Runway 15 to the end of Runway 23. The seven aprons, some of which are combined, consist of approximately 547,000 square feet of paved space, of which all but 10,000 is available for non-military use. The aprons are generally in excellent shape; well-marked with lead in taxiway and taxilane markings, as well as designated vehicular roadway that extends along the entire outer perimeter of the apron, from Runway 23 to Runway 15.

Based aircraft pavement requirements are generally calculated using approximately 2,700 square feet per aircraft. This number can be adjusted on the average size of aircraft. For example, the Cessna 650 Citation VII, with an overall length of 56 feet and a wingspan of 53 feet has a 3,000 square foot footprint, and clearly requires more space than a Cessna Skyhawk with a 945 square foot footprint (length 27 feet and 35 foot wingspan). However, the majority of aircraft requiring parking space at Groton-New London have an average size closer to the Skyhawk than the Citation VII. Neither number accounts for maneuvering space. However, for planning purposes the 2,700 square foot per aircraft rule will apply, with the understanding that ample room will be available for the larger aircraft on both FBO aprons and the terminal apron.

Based aircraft apron requirements are calculated based on the percentage of aircraft on apron space versus the percentage in hangars. The existing ratio is 80% hangar / 20% apron (for based aircraft), a proportion that will be used throughout the 20-year planning

cycle. Given this, the estimated area required for based aircraft is 27,000 square feet today, expanding to slight over 38,000 in 2020. Table 4.2 (next page) shows the existing and

Table 4.2 - Based Aircraft Apron Demand

Calculations	Year			
	2010	2015	2020	2030
Based Aircraft	50	54	59	71
Percent Aircraft in Hangars	80%	80%	80%	80%
Percent Aircraft on Aprons	20%	20%	20%	20%
Aircraft Apron Demand	10.0	10.8	11.8	14.2
Allowance per Aircraft (s.f.)	2,700	2,700	2,700	2,700
Apron Area Required (s.f.)	**27,000**	**29,160**	**31,860**	**38,340**

future calculations.

ITINERANT AIRCRAFT APRON REQUIREMENTS

Itinerant-aircraft apron space is determined by using itinerant aircraft peak activity levels (Peak-Month/Average Day, or PMAD)[9] and applying them to the standard planning space of 3,240 square feet per aircraft.[10] Based on FAA guidelines, parking requirements are determined from itinerant PMAD calculations. PMAD is the average number of operations that occur on the average day during the busiest month of the year. PMAD was presented earlier in Table 3.10 (page 73). PMAD is adjusted to determine apron size based on an industry accepted formula. Table 4.3 presents the formula along with calculations for existing and well as planning demand for the next 20 years. As shown, the existing

Table 4.3 - Itinerant Aircraft Apron Demand

Calculations	Year			
	2010	2015	2020	2030
PMAD	191.2	191.0	210.1	252.1
Operational Demand = 110% of PMAD	210.3	210.1	231.1	277.3
Aircraft Arrivals = 50% of Operational Demand	105.2	105.1	115.6	138.7
Parking Demand = 75% of Aircraft Arrivals	78.9	78.8	86.7	104.0
Allowance per Aircraft (s.f.)	3,240	3,240	3,240	3,240
Apron Area Required (s.f.)	**255,519**	**255,272**	**280,799**	**336,958**

[9] See Chapter 3, Peak Operations, on page 64.
[10] Generally, itinerant aircraft require slightly more space than based aircraft because of they tend to be slightly larger than based aircraft, which are easier to account for. Consequently, transient (itinerant) aircraft are afforded slightly more space (360 s.y. versus 300 s.y. for based aircraft.

itinerant apron demand is 255,500 s.y., decreasing slightly to 255,000 in 2015, than increasing to nearly 281,000 in 2020, and 337,000 in 2030 (all numbers rounded).[11]

TOTAL APRON REQUIREMENTS

Total apron requirements are a combination of based and itinerant-aircraft parking needs space for servicing and maintenance, and other aircraft infrastructure needs, such as maintenance vehicles (aircraft tugs, deicers, etc.) and other essential movement and parking needs. Table 4.4 shows the total apron requirements for parking aircraft throughout the planning period, as well as the current and future demand/capacity. As noted, while the growth in based and itinerant aircraft will be reserved, available apron space will approach a deficit by the end of the planning cycle. Plans to expand apron space should start when existing demand reaches 90 percent of available capacity, which will not be reached during this 20-year planning cycle.

Table 4.4 - Itinerant Aircraft Apron Demand

Requirements	Year			
	2010	2015	2020	2030
Based Aircraft Apron (from Table 4.2)	27,000	29,160	31,860	38,340
Itinerant Aircraft Apron (from Table 4.3)	255,519	255,272	280,799	336,958
Total Demand (s.f).	282,519	284,432	312,659	375,298
Current Apron (Capacity)	547,000	547,000	547,000	547,000
Surplus (Deficit)	264,481	262,569	234,341	171,702
Demand/Capacity Ratio	52%	52%	57%	69%

HANGAR REQUIREMENTS

There are nine hangars at the airport, of which eight are privately owned; the ninth is owned and operated by TASMG. The eight private hangars include a single jet pod on the airport's southwest side between TASMG and the terminal, two t-units located on the airport's north side close to Runway 23, and five conventional units, which serve as both maintenance and storage facilities for the two FBOs. The total storage capacity of the eight private hangars is between 60 and 70 aircraft depending on size. This includes eight spaces in the jet pod, 36 combined in the two t-units, and the remaining 16-26 in the five conventional hangars.

Current hangar demand accounts for 80 percent of based aircraft (44 of 55 total civil aircraft). For planning purposes hangar demand will remain at 80 percent of total based

[11] Apron demand decreases over the next five years as projected operations decrease a corresponding amount.

aircraft. Thus, the demand for hangar parking will increase to 64 aircraft by the end of the planning period. The current and projected demand by hangar type is shown in Table 4.4 (next page), along with the demand/capacity ratio.

It is important to remember when reviewing this table that the number of aircraft capable of parking inside conventional hangars is totally dependent on the size of aircraft, which is an unknown variable that changes on a regular basis; therefore, the numbers projected are based solely on the forecast increase in total based aircraft. In addition, the numbers do not reflect the need for short-term itinerant aircraft parking. Given these projections with a long-term surplus of only seven aircraft spaces, it is reasonable to plan for added hangar space, particularly individual jet-pods and t-hangar units, and planning should be well underway when the demand/capacity ratio reaches 90% (bottom row of Table 4.5). In addition, hangars are a valuable source of revenue for airports. They produce land lease income, plus occupied hangars produced additional revenue in the form of fuel sales and other operating costs often spent at the home based airport.

Table 4.5 - Hangar Requirements

Hangar Unit (Number) Owner	Current Capacity	Existing Capacity		Short-Term		Intermediate-Term		Long-Term	
		Demand	Surplus/ (Deficit)	Demand	Surplus/ (Deficit)	Demand	Surplus/ (Deficit)	Demand	Surplus/ (Deficit)
Conventional Hangar (151) Lanmar	7	4	3	4	3	4	3	5	2
Conventional Hangar (175) Columbia	2	1	1	1	1	1	1	2	0
Conventional Hangar (185) Columbia	5	2	3	2	3	2	3	4	1
Conventional Hangar (201) Columbia	5	2	3	2	3	2	3	4	1
Conventional Hangar (255) Lanmar	8	4	4	4	4	4	4	5	3
Jet Pod (147) Lanmar	8	5	3	5	3	6	2	8	0
T-Hangars (275 & 285) Lanmar	36	26	10	30	6	33	3	36	0
Total	**71**	**44**	**27**	**48**	**23**	**52**	**19**	**64**	**7**
Demand/Capacity Ratio		**62%**		**68%**		**73%**		**90%**	

TERMINAL BUILDING REQUIREMENTS

The terminal building, located in the central part of the airport, is 45 years old. It is located in the central portion of the airport and is relatively unchanged since the last AMPU in 1999. As addressed in Chapter 2 (page 19), approximately 90 percent of the building is

available for commercial use, and about 50 percent of the lower floor is not being used. This number changes periodically because of the restaurant, which has undergone several changes in ownership during the past few years, but as of today is vacant.

With no commercial air carrier service, and the remote chance of it returning, the need for the terminal in its current service and size is questionable. However, today's market changes with little warning. For this reason it is recommended that the airport keep its options open. Until there is a quantifiable demand for terminal space, the terminal should be maintained in a high state of availability, in sound working order and cleanliness. Should commercial air carrier service return to Groton-New London, the airport should undertake a terminal study to assess existing and future needs.

Groton-New London may want to explore other alternatives, such as expanding commercial leasing of empty space. As discussed in Chapter 2 (page 19), 90 percent of the building's 10,593 s.f. is available for commercial use, and only 50 percent is being used. It is estimated that a small airline operation would need all of the available unused space (approximately 4,500 s.f.). However, a short-term lease of this space would produce added revenue and give the building an "occupied" appearance. Long-term leasing may not be viable because it would "lock out" potential airline use.

SUPPORT FACILITIES

Support or ancillary facilities play a vital role in the operations and maintenance of Groton-New London Airport. The sizing, location, and phasing of any proposed improvements to these facilities must provide flexibility to accommodate the dynamic aviation industry. Short-term actions and recommendations should not preclude long-term planning options. The requirements contained herein provide general planning parameters and are based on the forecasts of aviation demand and the existing or anticipated conditions at Groton-New London.

AIRFIELD MAINTENANCE/SNOW REMOVAL EQUIPMENT (SRE) FACILITIES

Assessing the need for SRE and storage buildings requires an understanding of the airport's role, number of operations, average annual snowfall, and the size of primary clearing areas.

- Airport's role.....General aviation[12]
- Number of operations .....53,500, increasing to 63,000 in 2020
- Average Annual Snowfall .....33 inches[13]

[12] For snow clearing purposes, Groton-New London is classified as a general aviation airport because there is no air carrier service (see AC 150/5220-20, paragraph 38-39.
[13] Average of Bridgeport, CT and Providence, RI (source: Northeast Regional Climate Center - http://met-www.cit.cornell.edu/ccd/avgsnf98.html).

- Size of primary clearing areas.....1,300,000 square feet[14]

Based on this data, Groton-New London requires the equipment shown in Table 4.6. It should be noted that acquisition of this equipment is eligible under the Airport Improvement Program.

Table 4.6 - Snow Removal Equipment Inventory and Requirements

Equipment	Existing	Required
Class II Rotary Blower	1	1
Minimum Capacity = 805 tons/hour		
Minimum Casting Distance = 75 feet		
Carrier Vehicle for Rotary Snow Plow	1	1
GVW (including blower and accessories) of 20,000 pounds or 10 tons and a general HP rating for carrier vehicle of 200		
Displacement Plows with 23' Actual Blade Length	2	0
Displacement Plows with 15' Actual Blade Length	3	2
Carrier Vehicle for Displacement Plow	4	2
250 bhp to accommodate 15' plow blades		
Truck Mounted Hopper/Spreader	2	1
Self-Propelled High Speed Sweeper (7-12' swath)	1	1
Front-End Loader	0	1
8-12 CY Bucket	0	1
1-2 CY Bucket	0	1

Source: Stantec Analysis using AC 150/5220-20, *Airport Snow and Ice Control Equipment*

The existing maintenance/snow removal equipment building, as discussed in Chapter 2 is a 7,000 square foot facility. The vehicle side, which is a large open bay with 16 foot eave height, occupies three-quarters of the building, with five storage bays. The vehicle side also contains a maintenance shop, wash and steam clean bay, and storage areas. The personnel side is a two story facility that contains a lounge, bunk room, kitchen, bathrooms (with showers) and miscellaneous storage areas. An analysis of the size building required at Groton-New London was performed using current FAA criteria. This analysis considers airport size, a factor of paved runway. Unlike the equipment analysis, paved runway includes both runways, not just the primary runway. The total paved runway at Groton-

[14] Primary runway (5-23) primary taxiways (serving primary runway) primary ramp, ARFF and NAVAID access.

New London equals 1,150,000 square feet.[15] This area equates to a 'large airport' classification for the purposes of sizing SRE buildings.

Total space allocation is based on three separate areas within the building. These are areas for storage of equipment, which includes clearance for equipment safety zones (room for maneuvering, support, etc.), support areas (people), and special equipment areas (HVAC, generators, etc.). As Table 4.7 shows, the airport has a 4,000 square foot space deficit based on current and forecasted needs. Expansion capabilities will be addressed in Chapter 5, Alternatives.

Table 4.7 - Snow Removal Equipment/Maintenance Building Requirements

Area	Square Feet Required
Equipment Bay	2,500
Snow Desk	200
Supervisor's Office	140
Mechanic's Office	150
Administrative Area	400
Training Room	400
Lunch Room	400
Kitchen	200
Rest Room/Lavatory	700
Lockers	700
Sleeping Quarters	200
Parts Area	1,000
Lubrication, Oil, Grease Storage	150
Welding Area	400
Recycled Oil and Used Antifreeze Storage	200
Mechanics Bench Area	400
Repair Bay	1,000
Cleaning Bay	1,000
Emergency First Aid Room	75
HVAC Area	300
Emergency Power Generator	200
Hydraulic Lift, Vacuum Pumps, Air Compresor	150
Major/Large Power Tools	150
Total Area Requirements	11,015
Existing Area	7,000
Surplus (Deficit)	-4,015

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

The primary responsibility of the ARFF equipment at Groton-New London is to provide emergency response services to aircraft incidents. The airport ARFF personnel assist the local fire department on all airport structural fires. .

The current ARFF station is located northeast of the intersection of Runway 5 and 15. It houses all airport firefighting equipment, emergency vehicles, as well as personnel and support facilities. The 3,600 square foot facility was built circa 1980 to accommodate four vehicles and a small staff. The current equipment inventory exceeds this service level, however one vehicle (Rescue 2) is now 40 years old and at the end of its service life and is being replaced with a Rapid Intervention Vehicle as a backup to Rescue 1. The airport's primary vehicle (Rescue 1) is a 1998 P-101 Titan meets and exceeds Index A requirements.

[15] Runway 5-23 at 5,000 by 150 feet, or 750,000 square feet, and Runway 15-33 at 4,000 by 100 feet, or 400,000 square feet.

Airport firefighting and rescue equipment requirements depend on aircraft rescue and firefighting (ARFF) index, which is based on the length of the most demanding aircraft with at least five daily departures. The ARFF index specifies the quantity of water and foam required to be carried and the number and type of ARFF vehicles required. Groton-New London is Index A, which is based on an aircraft length less than 90 feet. If the airport's design aircraft changes appreciably to one larger than 90 feet in length, then an increase in the ARFF index and supporting equipment may be justified. However, there is no current requirement or plans to increase the ARFF Index.

FUEL STORAGE AND DISPENSING

The airport's fuel storage and dispensing system consists of two separate systems; a self-service terminal used primarily by small general aviation aircraft, and a truck fueler system.

The self-service terminal (Figure 4.3), owned and operated by Lanmar Aviation, provides only aviation gas (100LL). The 8,000 gallon tank is supported by a credit-card reader and as the name implies, is operated by pilots who service their own aircraft. This system is centrally located on the general aviation ramp northwest of the terminal building.

Truck fueling is provided by FBOs, Columbia Air Services and Lanmar Aviation. Each operator provides full-service jet fuel and aviation gas via truck. Each operates a fuel storage facility.

All facilities comply with National Fire Protection Association (NFPA) for the design, operation, maintenance, location of fuel storage areas, and aircraft fueling devices. The facilities are properly located away from occupied buildings, are grounded, have properly inspected fire extinguishers, and in general appear to be well maintained. Each facility is inspected annually during FAA Part 139 Safety Inspection.

Figure 4.3 – Self-Service Fuel System

As required by 14 CFR Part 139.321(e)(1), the airport has written regulations covering fuel handling procedures, including the need to complete company training for fuel handling, with documentation on file with airport management. In addition, airport regulations specify the use of fuel servicing vehicles, restrictions on where aircraft can and cannot be fueled, and procedures for lightning and spills. In summary, the airport is in compliance with all federal regulations.

Because fuel service is privately owned and operated, the two FBOs are also saliently responsible for maintaining adequate fuel supplies. Since this is a private matter, the businesses responsible are compelled to ensure their customers are satisfied. This includes not only maintaining their equipment in a high state of maintenance, but also providing customer support as a profit motive. In addition, each FBO is responsible for ensuring an adequate supply of fuel is maintained. While the current storage capacity appears satisfactory, the FBOs are the first line in determining if and when increased capacity is needed. The Airport must ensure the FBOs have ample space for expansion when needed. Both existing storage facilities have room for expansion.

NAVIGATION FACILITIES

This section describes the Groton-New London navigation facilities and procedures, including a discussion of the Airport's navigation facilities and instrument approach procedures, VOR, and TERPS.

INSTRUMENT APPROACH PROCEDURES

The Groton-New London Airport is served with a variety of ground-based electronic and visual landing. Key data associated with each facility as it relates to its navigation use is presented in Table 4.8 (next page).

Table 4.8 highlights several features worth noting and that may have implications for the future improvement of the Airport. These include:

- The Category I ILS[16] offers the lowest approach minimums that can be authorized for this type of instrument procedure (200 foot ceiling and ½ mile visibility). The satellite-based RNAV[17] (GPS) LPV[18] procedure to Runway 5 offers a viable alternative in those instances when the ILS is out of service for maintenance or other reasons. However, the approach minimums increase to 284-½. It would be useful to identify the cause for the higher ceiling minimum, as mitigation may be applicable and appropriate.

[16] There are three categories of instrument landing system (ILS) approaches, each with a different minimum decision height. Category I (200 feet), Category II (100 feet), and Category III (0 feet).
[17] Area Navigation (RNAV) is a method of air navigation that allows an aircraft to choose any course within a network of navigation aids, such as a VOR, rather than navigating directly to and from the aids.
[18] Localizer Performance with Vertical guidance (LPV) are the highest precision GPS aviation instrument approach procedures currently available without specialized aircrew training requirements. Landing minima are similar to the Instrument Landing System (ILS), that is, 200 feet decision altitude and 1/2 mile visibility. The aircraft avionics must support LPV.

- The approach minimums associated with the Localizer procedure to Runway 5 and the VOR/DME approaches to that runway end and Runway 23 are significantly higher than the lowest that could be authorized (250-½ in the case of Runway 5 and 250-1 for Runway 23).[19]

Table 4.8 - Electronic and Visual Landing Aids - Technical Factors

Landing Aid	Runway End	Glide Path Angle	Threshold Crossing Height	Runway Alignment	Lowest Authorized Approach Minimums (1)	Comments
Electronic						
ILS Glide Slope	5	3.00°	42'	NA	200-1 / 200-1	Unrestricted
Localizer	5	NA	NA	Straight-in	493-½ / 493-¾	Unrestricted
ILS DME	5	NA	NA	NA	NA	Unrestricted
VOR / DME	5	3.09°	42'	Offset 21°W	493-½ / 493-¾	VOR unusable 241-019° below 5,000' MSL
	23	3.48°	50'	Offset 14°E	572-1 / 572-1½	DME unusable 355-019° below 3,000' MSL
Visual						
MALSR	5	NA	NA	NA	NA	Pilot controlled lighting (PCL)
PAPI-4	5	3.00°	40.1'	NA	NA	Operational / PCL
	23	3.00°	49.1'	NA	NA	Operational / PCL
	33	3.75°	33.5'	NA	NA	Unusable beyond 7° right of approach due to trees / PCL
Runway Edge Lighting	5-23	NA	NA	NA	NA	High intensity / PCL
	15-33	NA	NA	NA	NA	High intensity / PCL
Taxiway Edge Lighting	All	NA	NA	NA	NA	Medium intensity / PCL

Note (1) - Height Above Touchdown (HAT) in feet AGL and visibility in statute miles for Approach Category B & C aircraft.
Source: QED Associates with data provide by FAA

[19] The reason for the higher than permitted minimums are because of obstructions. At the time of this writing the data for the obstruction analysis was not available, but should be before this study is complete. At such time this section will be updated to reflect the actual reason and source.

- The VOR/DME is not usable within certain quadrants and below certain altitudes. Although these limitations do not affect the use of the existing instrument approach procedures or en route navigation, they diminish the ultimate potential use of the facility and may serve as one reason for its relocation or possible removal. In those instances, instrument approach procedures to the Airport or other area airports that rely on the use of the VOR/DME can be replaced with satellite-based navigation. En route navigation can be redirected using other area ground-based aids and/or satellite-based waypoints.

- RNAV (GPS) procedures are low-cost means to improve the utilization of runways and possibly reduce approach minimums that are dependent on the use of conventional ground-based navigational aids. These options are evaluated in a subsequent section of this report and include RNAV (GPS) LPV to Runways 15, 23 and 33; and an RNAV (GPS) LNAV to Runway 15. However, this is a preliminary assessment and does not imply that Runway 15-33 will qualify. Airport geometric implications and potential obstructions must be analyzed and corrected before instrument procedures can be developed to this runway.

- The glidepath angles and threshold crossing heights that are specified for the instrument approach procedures and the PAPI's differ but are appropriate for the design of each specific procedure. Although it is desirable that they be the same by runway end, this is not a requirement. The trees that restrict the use of the PAPI-4 serving Runway 33 should be analyzed to determine if this restriction could be eliminated.[20] PAPI systems are regarded as effective safety features that aid pilots in the approach to a landing. The potential installation of a PAPI-4 on Runway 15 should be explored.

- The high intensity edge lighting for Runway 5-23 is appropriate for the type of instrument approach procedures to this runway end. Runway 15-33 requires the use of medium-intensity edge lighting; however, the provision of high intensity lights is permissible.

- All the taxiways at the Airport are lighted with medium-intensity edge lights, which are appropriate for the use of these aircraft movement areas.

- Pilot-controlled lighting of the MALSR and the edge lights for both runways is a useful service feature when the air traffic control tower is closed. Extension of this capability to the PAPI's would be an attractive capability.

[20] Data for this analysis was not available at the time this draft report was prepared. This section will be modified when this data is made available.

VOR ANALYSIS

The GON VOR/DME is used as a navigational aid to define instrument approach and missed approach procedures at the Airport as well as other airports in the vicinity. As discussed in Chapter 2, the GON VOR provides terminal coverage providing instrument approach guidance to GON, as well as Westerly State Airport, Montauk Airport, and Elizabeth Field.

The GON VOR/DME is also used for low and high en route flight navigation. Radials from the GON VOR/DME define Victor and Jet Routes that link other terminal navigational aids or define intersection fixes. Victor airways are Class E airspace that extends from 1,200 feet above ground level up to but not including 18,000 feet above mean sea level. These are a system of established routes that link VOR facilities with one another and create a means of defining an aircraft routing. The width of the Victor airway is 4 nautical miles on either side of the centerline when the distance between navigational aids is less than 102 nautical miles and increases at larger distances. Victor airways are prefixed with the letter "V". Jet routes are similar in use and function but are designated for flight at altitudes from 18,000' MSL to and including 45,000' MSL and carry a "J" prefix.

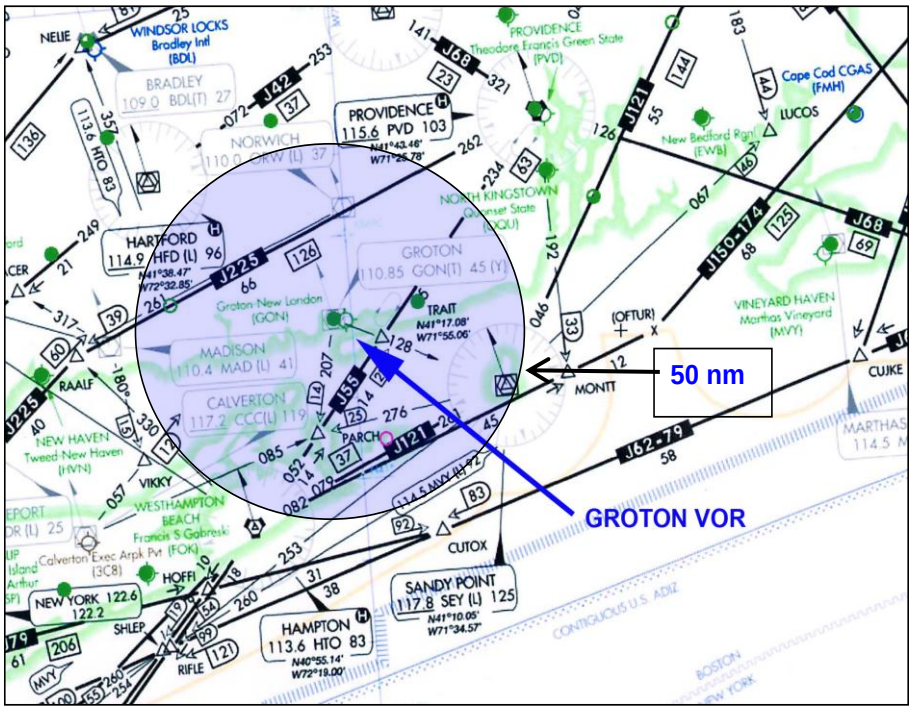


Figure 4.4 – GON VOR Jet Route Structure

Figure 4.4 (previous page) shows the high altitude Jet Route structure around the GON VOR. Jet Routes (labeled "J") serve aircraft operations between 18,000 and 45,000 feet.

Figure 4.5 shows the low altitude airway structure (labeled "V"), which serves flight operations below 18,000 feet.

There are seven low altitude Victor airways that are based on radials from the GON VOR/DME. When aircraft are operating along Jet routes, the GON VOR/DME is used to define the TRAIT and PARCH fixes that are associated with J55.[21]

As noted above, the GON VOR portion of the VOR/DME is unusable between 241º and 265º below 5,000' MSL. This can potentially impact on the use of V451 that links the GON VOR/DME with the CREAM intersection some 24 nautical miles to the southwest. The DME is unusable between the 355º and 019º radials below 3,000' MSL. However, there are no designated Victor airways within those headings.

Aircraft are not required to fly along the designated airways. Pilots operating under VFR have flexibility in their flight planning and might seek to avoid Victor airways simply to minimize their potential interaction with other en route aircraft. Therefore, the unusable features of the GON VOR/DME can impact the use of the facility for navigation by VFR pilots, who frequently operate at altitudes below 5,000' MSL. Pilots that file IFR flight plans will be assigned to Victor airways or Jet routes depending on

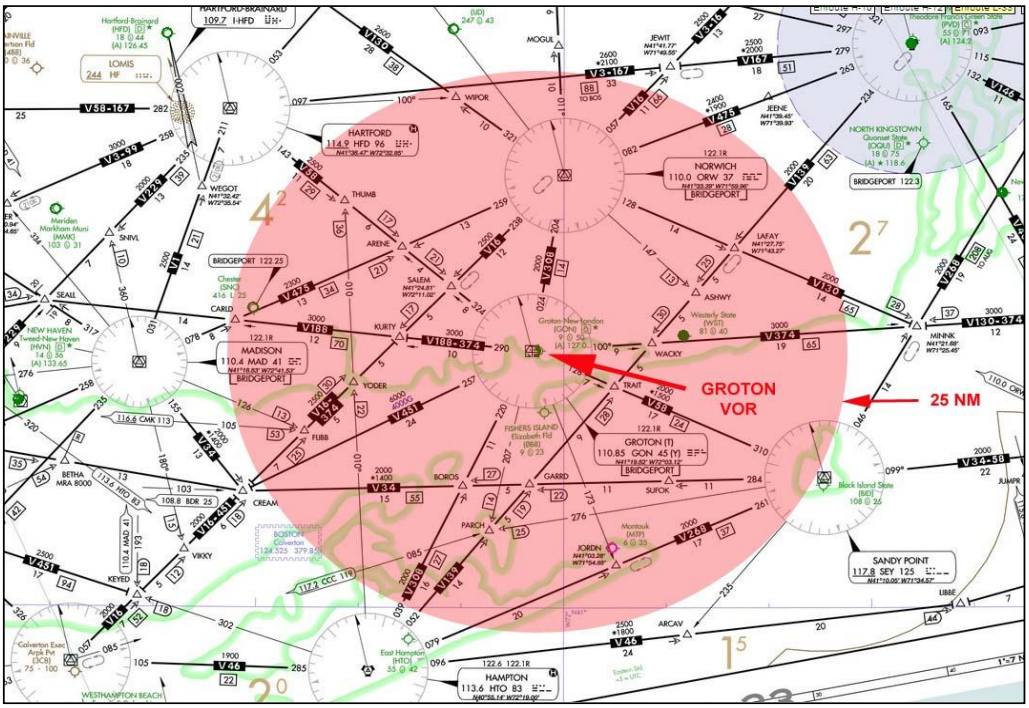


Figure 4.5 – GON VOR Low Altitude Airway Structure

[21] TRAIT and PARCH are names assigned by the FAA to identify two enroute air traffic fixes in the vicinity of the Airport. This type of fix is a geographical position determined by one or more radio navigation aids. The names TRAIT and PARCH are not abbreviations, but rather computer generated names that identify the fix to pilots and air traffic control personnel. Both are shown in Exhibit 3.6.A.

their planned altitudes, or they may be assigned radar vectors to a specific navigational aid or fix/waypoint by air traffic controllers.

There are seven VOR/DME and one VORTAC facilities within a 40-nautical mile radius of the Groton-New London Airport. These facilities, with the exception of the New Haven VOR/DME, are currently used to define low altitude (Victor airways) and high altitude (Jet routes) routings. The New Haven VOR is a "terminal" facility meaning it is not used to define an airway or jet route. All of the facilities are also incorporated into instrument approach and missed approach procedures and standard terminal arrival routes to one or more airports in the region. All but one facility (Norwich VOR/DME) have use restrictions on the VOR and/or DME component of their signals, and all are owned, operated and maintained by the Federal Aviation Administration. Due to their relative close spacing, it is possible that the loss of one or possibly more of these ground-based navigational aids could be compensated by creating new or utilizing existing Victor airways and Jet routes to define requisite area routings and instrument approach procedures. Victor airways and Jet routes can be re-routed through the application of area navigation (RNAV) waypoints that have been developed by the FAA for several years. Instrument approach and missed approach procedures and standard terminal arrival routes based on VOR/DME and VORTAC facilities can be replaced through the use of satellite-based RNAV (GPS) procedures that are being developed for airport runways across the country.

The GON VOR/DME is an active waypoint and also serves as a convenient means of locating the Groton-New London Airport, which speaks for its retention in the air navigation system. Discussions with the Air Traffic Organization Systems Support Center in New Haven, which has responsibility for maintaining and operating the GON VOR/DME, indicate there are no current plans to decommission the facility. Additionally, the equipment shelter for the GON VOR/DME also houses radio equipment and external antennas that service the Providence TRACON. The GON VOR/DME and the equipment servicing the Providence TRACON may be relocated if found to be mutually beneficial to the Airport and airspace use and management. The possible relocation is subject to an extensive airspace analysis that can be initiated through the filing of FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, with the FAA Air Traffic Organization.

Notwithstanding the above, as the FAA continues to move forward with a satellite-based navigation system over the next 20 years, there is the possibility that the GON VOR/DME will be decommissioned. The use restrictions on the GON VOR/DME and the proximity of similar ground-based navigational aids that can be included as part of a skeletal backup system to satellite-based navigation are other factors that can lead to the decommissioning of the GON VOR/DME. The closure of the facility may also be impacted sooner dependent on the availability of maintenance resources both in terms of supplies and manpower. This Chapter has not identified a need for additional land for either airside or landside use. However, should a higher use of the land that is controlled by the GON VOR/DME critical area be determined at some point in the future, it would be prudent to involve the FAA

early on in the process. This will offer resolution as to the potential relocation of the GON VOR/DME or perhaps its decommissioning.

TERMINAL INSTRUMENT PROCEDURES (TERPS) ANALYSIS

The potential of establishing new instrument approach procedures, including Localizer with Vertical Performance (LPV) GPS procedures is addressed in Appendix 4. Summary of recommendations are addressed at the end of this chapter starting on Page 105.

AIRPORT SECURITY

This section provides a brief overview of existing security measures at Groton-New London and recommendations.

REGULATIONS AND GUIDANCE

While Groton-New London is officially listed as an FAA commercial service airport, its primary role is in support of general aviation operations. While general aviation airports are not subject to federal security rules, consistent with the airport's commercial status under 14 CFR Part 139, the Groton-New London Airport maintains a higher level of security then required at a general aviation facility. This elevated security requires compliance with rules established by the Transportation Security Administration (TSA) for civil aviation security under Title 49 CFR, Chapter XII, Subchapter C. A more narrow focus under this statute at Groton-New London includes compliance with several parts, either directly, or indirectly. These include:

- Part 1540—Civil Aviation Security: General Rules;
- Part 1542—Airport Security;
- Part 1550—Aircraft Security Under General Operating and Flight Rules; and
- Part 1552—Flight Schools.

In addition, Lanmar Marine and Aviation, Inc. operate charter service under the TSA security 12-5 Rule.

Of primary concern to Groton-New London is Part 1542, which requires airport operators to adopt and carry out a security program approved by TSA. It describes requirements for security programs, including establishing secured areas, air operations areas (AOA), security identification display areas (SIDA), and access control systems. This part also contains requirements for fingerprint-based criminal history record checks of specified individuals. The Airport complies with this Part, as well as Parts 1540, and 1550 as outlined in two documents: the Airport Certification Manual and the Airport's Ramp Rules & Regulations Handbook. Of a lesser, but important extent are Parts 1540, 1550, and 1552.

Part 1540 contains rules that cover all segments of civil aviation security. It contains definitions that apply to Subchapter C, and it contains rules that apply to passengers, aviation employees, and other individuals and persons related to civil aviation security, including airport operators, aircraft operators, and foreign air carriers. The airport operator component, §1540.105, *Security Responsibilities of Employees and other persons*, is directly applicable to airport management's role at Groton-New London. Specifically, this subpart protects management through the adoption of rules that prohibit tampering or interfere with, compromise, modify, attempt to circumvent, or cause a person to tamper or interfere with, compromise, modify, or attempt to circumvent any security system, measure, or procedures. In addition, this subpart provides regulatory control over various airport security areas, such as secured areas, AOA, SIDA or sterile areas.

Part 1550 applies to the operation of aircraft for which there are no security requirements in other parts of this statute, which for Groton-New applies to certain aircraft operations conducted in an aircraft with a maximum certificated takeoff weight of 12,500 pounds or more. Compliance oversight is not a direct responsibility of airport management, but rather aircraft operators, and to a lesser extent the two FBO's that supports the majority of these operations. Airport management does maintain awareness of the requirements and works with operators to ensure compliance.

Finally, §1552, *Flight Schools*, prohibits a flight school from providing flight training to aliens and other individuals designated by TSA (candidates) unless the flight school or the candidate submits certain information to TSA, the candidate remits the specified fee to TSA, and TSA determines that the candidate is not a threat to aviation or national security. This rule also requires flight schools to provide security awareness training to personnel. Again, like §1552, airport management does not have a direct role in enforcing this rule, but does monitor compliance.

The Airport maintains a well-defined security program, which is fully addressed in written directives. Inclusive in the Groton-New London Ramp Rules & Regulations Handbook are procedures covering all Part 139 and TSA regulations, including:

- General Rules and Regulations,
- Vehicle Operator Procedures,
- Vehicle Condition and Markings,
- Required Security Identification,
- Fuel Handling,
- Escorting Procedures, and
- Enforcement Procedures.

It is important to note that the airport's current security system is sound and well maintained. The airport has an established CCTV and electronic identification system for

airfield access, and one that includes testing and the issuance of an identification card, which contains a full-face image, the individual's full name, the airport's name, the individual's employer, the scope of the individual's access and movement privileges, and identification number, and a 2 year expiration date meeting TSA regulations, and a one year expiration date for vehicle drivers per FAA regulations. Use of a card is electronically tracked during all card usage until it expires or is revoked, whichever comes first, after which access to the airfield is not possible.

In summary, the airport has a well-defined security system in place. Personnel are well trained, procedures are well documented, and personnel who must operate on the airport airside are trained, badged, and operate within prescribed areas without exception.

SECURITY FENCING

Security fencing at Groton-New London provides coverage along the airport's landside, but does not cover the areas bounded by the Poquonnock River and Baker Cove. Access gates, both manual and electric, for both pedestrians and vehicles are strategically located along the entire fence line. The fence and gates are in excellent condition and serve the purpose of providing a barrier between non-secure and aircraft operating areas.

The primary deterrence relies on employees of both the airport and its tenants. The two FBOs as well as TASMG have strict measures in place that control access onto aircraft operating areas. This is the systems strong point and weakness. Strength in terms of human intervention and control, particularly at the two ends of the airport's landside; the FBOs and TASMG. All three organizations monitor and control access. This strength is also the weak link in the system because once on the ramp, there is not direct monitoring of activity. In addition, the airport does not have a state-of-art access or surveillance system. In essence, to a certain extent, like most airports, the honor system prevails.

RECOMMENDATIONS

Four specific recommendations are offered; however, before numbers 2, 3 and 4 are considered, the airport should implement action Recommendation #1 first. This proposed working group should then study the remaining issues, as well as others as adopted by the committee, and make specific recommendations to airport management.

RECOMMENDATION #1: DEVELOP A LOCAL AVIATION SECURITY ADVISORY COMMITTEE (ASAC)

The Groton-New London ASAC's mission would be to examine areas of civil aviation security at Groton-New London Airport with the aim of developing recommendations for the improvement of civil aviation security methods, equipment, and procedures. This

working group, which can be part of an existing airport committee, or stand alone group, must include airport management, and all airport tenants, including ATC, and local pilot and aircraft owner organizations. However, it is important that airport management not lead this group, but rather participates and uses it as a tool to develop a broad view of all issues and sides of the security equation. The reason for this is to ensure airport management does not sway or otherwise influence the decision making process of the ASAC.

It is further recommended that this committee obtain and use the TSA Security Guidelines for General Aviation Airports[22], as well as TSA regulations as a means of formulating a broad airport security program. These Guidelines are in use now. In addition, the Airport Security Plan of 2004 is in process of being revised to meet TSA's Supporting Airport Security Program for Cat IV Airports in time for the charter service start-up June 2009.

RECOMMENDATION #2: DEVELOP ENHANCED IDENTIFICATION AND SURVEILLANCE SYSTEM.

The current identification system, while adequate, does not offer state-of-the-art enhancements available in today's security conscious market. Advanced smart card systems would permit or prevent access of individuals to aircraft operating areas. This system reduces, if not totally eliminates direct human interface at key access points, such as the terminal building, or each FBO, as well as access gates between buildings.

RECOMMENDATION #3: SECURITY FENCE

The third major recommendation is the installation of a complete security fence around the entire airport boundary, with appropriate gates as necessary to provide water access in the event of an emergency.

RECOMMENDATION #4: SUBSCRIBE TO TSA RSS

Subscribe to TSA news through a Really Simple Syndication (RSS) feed to the airport's website. This will provide the airport and visitors to its website with the latest security news transmitted by TSA.

SUMMARY OF AIRPORT FACILITY REQUIREMENTS

This section summarizes the facilities that are adequate and those that require improvements in the 20-year planning period.

[22] TSA Information Publication A-001, dated May 2004.

ADEQUATE FACILITIES

- Additional runway or taxiway capacity will not be needed unless commercial airline service returns to Groton-New London, and only if the yet unknown design aircraft and leg length require a longer runway.
- For the same reasons, the passenger terminal will not require expansion.
- Although not discussed in this Chapter, major roadway improvements are not envisioned within the planning horizon.
- Auto parking requirements are not projected to increase significantly, thus the existing surplus of space will remain available, with perhaps minor adjustments to accommodate surges in growth in the FBOs or TASMG.
- No increase in ARFF or the ARFF building will be required.

FACILITIES REQUIRING IMPROVEMENTS OR UPGRADES

- Airfield Lighting will require upgrades, particularly the REILS and PAPI/VASI. Runway lights and taxiway lights should be converted to LED during the next system replacement cycle.
- The general aviation facilities and other support facilities will all require improvements over the planning horizon, but not to the extent that more land is required. Thus the airport has little need to acquire more property for capacity purposes.
- At some point in the 10-20 year period ARFF equipment will require replacement due to age.
- The SRE fleet is one of the few areas where increased capacity is required. The fleet should be brought into line with current FAA standards in terms of the number and size of equipment. In concert, the SRE/Maintenance building should be expanded from its current 7,000 square feet to 11,000 square feet.
- An upgrade to modern GPS instrument approach procedures would improve the airport's operational capability. Specifically, the analysis presented in Appendix 4 suggests that an RNAV (GPS) procedure with LNAV minimums to Runway 15 has merit. In addition, the establishment of an RNAV (GPS) LPV procedure to Runway 23 offers an improved operational capability when the achievable approach minimums of 280-1 are compared to the existing 522-1 levels.
- Security changes should be considered. Advanced technology should be employed in the areas of identification cards (Smart Cards) and video surveillance systems.

The activity levels that may trigger changes are more important than the actual years that are identified in this chapter. In order to provide maximum flexibility for CTDOT, Table 4.8

summarizes the trigger points that will lead to the need to expand the airport's facilities. It is important to note that as demand patterns, fleet mix, etc. change over time, the activity triggers may also change. However, this table provides order of magnitude planning criteria for CTDOT to monitor actual conditions and activity levels at Groton-New London.

Table 4.9 - Summary of Trigger Points

Facility	Trigger	Trigger Point (When Major Expansion is Set in Motion)
Runway/Taxiway System	Peak hour operations, annual operations	Operation levels in the range of 138,000 - 184,000 (currently 53,500 and forecasted to increase to 63,000 by 2027)
Runway Length (Primary)	Aircraft Type and Stage Length	Not anticipated in this planning period. However, the introduction of commercial airline service where forecast aircraft and leg length exceeds 5,000 foot runway.
Runway Length (Crosswind)	Design Standard is 80% of the Primary Runway	When primary runway length exceeds 5,000 feet.
Technology & Taxiway Improvements	Airport Role	Needs as soon as possible to improve safety, meet FAA standards, and help offset the need for additional runway capacity
Runway Safety Areas (RSA)	FAA Standards	Provide standard length RSA or EMAS as soon as possible to enhance safety
Overnight Aircraft Parking	Airport Role	Aircraft apron size reaches 80-90% of capacity
Hangars	Airport Role	When demand reaches 80-90% of capacity; or when private development interest exists (helps increase airport revenue)
Terminal Building	Return of Air Carrier Service	Conduct terminal study to analyze demand/capacity
ARFF	Frequency and Size of Design Aircraft	ARFF Index approaches Index B
Instrument Approach Procedures	Existing	Now. Prepare request for new IAP and implement aeronautical survey in accordance with AC 5300-16, 5300-17, and 5300-18 (current editions).