Chapter 5
Facility Requirements

An evaluation of aviation and non-aviation demand, operational requirements and capacity were identified to determine landside and airside facility requirements. This information provides the basis for the types and quantities of facilities necessary to meet both short and long-term needs over the twenty-year planning period. Using FAA guidance in conjunction with applicable local design standards and guidelines, airfield, support and landside facilities were identified in an effort to establish the long term role of the Smith Reynolds Airport within the State of North Carolina and the U.S. marketplace. This chapter identifies the adequacy of existing facilities, needed new facilities and the anticipated time frame for development in conjunction with the airport's long-range plans. This information would later be used to develop several airside and landside alternatives in Chapter 5.

5.0 AIRPORT REFERENCE CODE (ARC) CODE DETERMINATION

It is necessary to evaluate an airport's history of operational activities in order to determine the types of aircraft that currently operate at INT as well as those that are expected to operate regularly within the next 5 years. This determination is important because it establishes the required design and construction standards for both landside and airside facilities that will be recommended as a part of this master plan update. Rather than identifying a particular aircraft make and model, the FAA classifies aircraft into groups depending upon three factors including weight, wingspan, and aircraft approach speed. This identification and grouping of aircraft for a particular airport determines the airport reference code. FAA Advisory Circular (AC) 150/5300-13, Airport Design, defines Airport Reference Code (ARC) as the coding system used to relate airport design criteria to the operational and physical characteristics of aircraft operating or anticipated to operate at an airport. The ARC consists primarily of two components; the first component considers the aircraft approach speed which is depicted by a letter as shown in **Table 5-1** while the second component refers to the aircraft wingspan as shown in **Table 5-2**. As mentioned earlier, weight is also a factor that is often associated with ARC code. Aircraft weighing 12,500 lbs or less are classified as "small" aircraft; whereas, those aircraft weighing more than 12,500 lbs are considered "large" aircraft. At airports with small critical aircraft, the term "exclusively small aircraft" is referenced after the ARC code, i.e. ARC A-I (exclusively small aircraft).

Table 5-1 Aircraft Approach Categories	
Category A	Speed less than 91 knots.
Category B	Speed 91 knots or more but less than 121 knots.
Category C	Speed 121 knots or more but less than 141 knots.
Category D	Speed 141 knots or more but less than 166 knots.
Category E	Speed 166 knots or more.

**(Based on 1.3 times aircraft stall speed in landing configuration at maximum landing weight.)*
Source: AC 150-5300-13, Change 14.

Table 5-2 Airplane Design Group	
Group I	Wingspan up to but not including 49 feet.
Group II	49 feet up to but not including 79 feet.
Group III	79 feet up to but not including 118 feet.
Group IV	118 feet up to but not including 171 feet.
Group V	171 feet up to but not including 214 feet.
Group VI	214 feet up to but not including 262 feet.

Source: AC 150-5300-13, Change 14.

Typically, the critical aircraft is based on the aircraft with the longest wingspan and the highest approach speed that consistently makes substantial use of the airport. FAA Order 5090.3C, Field Formation of the NPIAS, defines substantial use as scheduled commercial service or 500 or more annual aircraft operations. The most recent Airport Layout Plan (1994) classified the Smith Reynolds Airport as a C-III which states that the airport's critical aircraft has an approach speed between 121kts and 140kts and has a wingspan between 79 feet to 117 feet. In order to verify the critical aircraft at INT, Enhance Traffic Management System Counts (ETMSC) were obtained from the FAA's website. ETMSC data recorded during 2007 and 2008 were specifically analyzed since this data comprised the latest two years of data recorded. A review of the 2007 and 2008 data revealed that the majority of operational activity at INT is performed by mid-sized jets and small privately owned aircraft. The mid-sized jet fleet includes such aircraft as the Cessna Citation II/Bravo/Encore, Bombardier Challenger 601, Falcon 2000, and the Learjet 60. The small privately owned aircraft fleet includes a variety of single-engine aircraft included Piper, Cessna, and Beechcraft models. However, a substantial amount of large commercial aircraft activity was performed by Boeing 737 aircraft. This activity is directly associated with the large maintenance hangar facility which performs a variety of services to this type of aircraft. A conclusive review of the data revealed that the Boeing 737 models performed the required 500 annual operations in both 2007 and in 2008. As such, the Boeing 737 was identified as the critical aircraft for INT which accurately verifies the C-III airport reference code. Runway 15-33 is used exclusively by 737 aircraft activity; therefore, this runway is designated as a C-III. Runway 4-22 was designed and constructed for smaller aircraft activity and is therefore designated as a B-II which has an approach speed between 91 knots and 120 knots and have wingspans ranging from 49' to 79'. **Exhibit 5-1** illustrates a sample of aircraft types within each approach category.

Aircraft	Airport Reference Code	Wingspan	Length
Cirrus SR22	A-I	38.3 ft	26.0 ft
Beechcraft King Air 100	B-I	45.8 ft	39.9 ft
Cessna Citation XLS	B-II	56.3 ft	52.0 ft
Hawker HS-125-700	C-I	47.0 ft	50.7 ft
Bombardier CL-600	C-II	61.8 ft	68.4 ft
Gulfstream G-V	D-III	93.5 ft	96.4' ft
Boeing 737-500	C-III	94.8' ft	119.6' ft
Boeing 757-200	C-IV	124.8' ft	155.3' ft

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Smith Reynolds Airport - Master Plan Update

Aircraft Fleet Mix and Associated Aircraft Reference Code (ARC)

5-1

DRAWING NO.

5.1 RUNWAY SYSTEM REQUIREMENTS

The most important component of any airfield is the runway. The runway must be of the proper length, width and strength to accommodate the critical aircraft safely. The FAA Advisory Circular AC 150/5300-13, Airport Design dictates the standards for runways at airports. FAA AC 150/5325-4B dictates the standards for determining runway length requirements at airports. The following sections reviews and evaluates the need for runway improvements at the Winston-Salem Airport.

Runway 15-33 Length Analysis

In order to identify the runway length requirements for INT, it was necessary to perform a runway length analysis in accordance with AC 150/5325-4B – Runway Length Requirements for Airport Design. The advisory circular requires that five steps be performed in order to identify the requirements for a particular facility. A summary of these requirements are listed below:

1) Identify the list of critical design airplanes that will make substantial use of the proposed runway for an established planning period of at least five years.
2) Identify the airplanes that will require the most demanding runway lengths at maximum certificated takeoff weight.
3) Apply the airplanes identified in step 2 to table 1-1 of AC 150/5325-4B in order to determine the appropriate grouping of aircraft and location of design guidelines.
4) Select the recommended runway length from the runway lengths obtained during step 3.
5) Apply necessary adjustments and/or correction factors to the obtained runway length generated previously during step 4.

Step 1 – Identify list of critical design airplanes

Although the Boeing 737 aircraft was identified earlier in this chapter as the critical aircraft for INT, it was important to review the runway length requirements for the business jet and commercial aircraft that regularly operate at the airport. **Table 5-3** illustrates a comparison of commercial and business jet that often operate at INT along with their associated performance and weights. As denoted in the table, the runway length and weight requirements associated with the larger commercial service aircraft superseded the requirements of the smaller business jet aircraft. The runway lengths shown are based on published lengths and assume standard aircraft weights and meteorological conditions.

Table 5-3 INT Aircraft Performance			
Aircraft	**Takeoff Performance (ft.)**	**Landing Performance (ft.)**	**Weight (lbs)**
Commercial Aircraft			
737-200(1)	6,680	4,580	116,000
737-300	6,660	4,580	124,500
737-400	7,730	4,880	138,500
737-500	6,100	4,450	115,500
737-700	6,700	4,500	154,500
Embraer ERJ 145EX	5,900	4,000	48,501
Business Jet Aircraft			
Astra 1125	5,300	3,500	23,500
Challenger 600,601,604	5,700	2,775	41,250
Citation III/VI/VII	5,150	3,220	23,000
Citation X	5,140	3,410	36,100
Falcon 900	4,680	5,880	45,500
Falcon 2000	5,240	5,220	35,800
Raytheon Hawker 800	5,380	4,500	28,000
Learjet 35	5,000	2,900	18,300
Learjet 60	5,360	3,420	23,500

Sources: Business Jet information obtained from FAA RGL 01-2, Commercial Aircraft information was obtained from Aviation Week & Space Technology, January 2001. Runway length requirements were calculated based on standard day +25d and maximum takeoff weight (MTOW).
(1) 737-200 with JT8D-15A Engines

<u>Step 2 – Identify aircraft that require most demanding runway lengths</u>

Some very large Boeing aircraft models such as the 757, 767, and the Boeing 737-900 aircraft regularly visit the airport; however, the combined total activity of these larger aircraft did not meet the FAA's requirements of 500 annual operations. For this reason, their associated performance and weights were not analyzed. A further review of the ETMSC data revealed that the Boeing 737-200 series aircraft was one of the most frequently utilized aircraft at INT. For this reason, the 737-200 series aircraft and its associated performance characteristics was used for further evaluation in steps 3 through 5.

<u>Step 3 – Determine critical aircraft grouping</u>

This 737 aircraft was applied to Table 1-1 shown on page 3 of AC 150/5325-4B to determine the critical aircraft grouping. This model falls into the category of aircraft weighing more than 60,000 lbs and therefore requires an analysis of individual aircraft performance data based on literature published by the aircraft manufacturer. **Table 5-4** illustrates the resulting analysis of takeoff length requirements and **Table 5-5** denotes the landing length performance as derived from Boeing's aircraft performance manuals. The length requirements of the aircraft shown in these tables are less than those shown previously in Table 5-3 because these runway length analyses took into consideration the weights of the aircraft that typically operate at INT. The Boeing 737 models that often visit INT are there for the purpose of receiving maintenance and upgrades that are performed at the ACFC Large Maintenance Hangar and therefore are not carrying passengers. Hence, the runway lengths shown are based upon fully fueled aircraft without passengers.

Table 5-4 Aircraft Manufacturer Takeoff Performance		
Aircraft	**Weight (lbs)***	**Takeoff Performance (ft.)**
737-200	***92,000***	***5,200***
737-300	112,000	5,100
737-400	114,000	4,600
737-500	108,000	5,100
737-700	126,000	5,100

Source: Boeing aircraft performance manuals
Note: The takeoff performances shown are based on a fully-fueled aircraft without passengers during dry runway conditions (standard day+27°F).

Table 5-5 Aircraft Manufacturer Landing Performance	
Aircraft	**Landing Length Requirement (ft.)**
737-200	5,000'
737-300	5,300
737-400	5,400
737-500	5,300
737-700	***5,600***

Source: Boeing aircraft performance manuals
Note: The landing length requirements shown are based on the most demanding aircraft (engines) during wet runway conditions and at maximum design landing weight and with 40° flap settings.

Step 4 – Select recommended runway lengths from manufacturer performance data

As identified in the previous two tables, the two most demanding aircraft models are comprised of the 737-200 and 737-700 models. The 737-200 is the most demanding aircraft as far as takeoff performance is concerned with a requirement of 5,000 feet; whereas, the 737-700 had the most demanding landing performance requirements.

Step 5 – Apply adjustments to selected runway lengths

The final step of establishing runway length requirements involves taking the runway lengths determined in the previous step and then applying the necessary corrections to account for factors such as airport elevation, runway gradient, temperature, and also for wet runways. FAA AC 150/5325-4B states that wet runways should be used only to calculate landing length requirements; whereas, runway gradient differences are only applied to takeoff operations. However, temperature is applied to both landing and takeoff operational requirements. As noted in the footnotes of the landing performance table, the manufacturer charts had already taken into consideration wet runway conditions, temperature and airport elevation. Therefore, the only remaining variable to apply was the difference between runway centerline elevations (gradient).

The difference in elevation between runway ends 15 and 33 is 68'. The FAA recommends an additional 10 feet of runway length for each foot of runway elevation difference which therefore equates to an additional 680' of runway length for takeoff operations. The mean maximum temperature for the hottest month in Winston-Salem is 89°F. Since the aircraft performance charts already specified runway performance for a +27°F difference, the chart runway lengths were used to determine runway takeoff performance at INT. **Table 5-6** illustrates the resulting runway length adjustments for takeoff performance; whereas, **Table 5-7** illustrates the resulting runway length adjustment for landing performance, and **Table 5-8** illustrates the required standards for the B-II and C-III aircraft categories.

Table 5-6
Aircraft Manufacturer Takeoff Performance

Aircraft	Takeoff Performance (ft.) (A)	Runway Gradient (B)	Total Runway Length Requirement
737-200	5,200	+680'	5,880'

Source: Boeing aircraft performance manuals
The takeoff performances shown were based on a fully-fueled aircraft without passengers during dry runway conditions +27°F.

Table 5-7
Aircraft Manufacturer Landing Performance

Aircraft	Landing Length Requirement (ft.)(A)	Total Runway Length Requirement
737-700	5,600	5,600'

Source: Boeing aircraft performance manuals
Note: The landing length requirements shown are based on the most demanding model aircraft during wet runway conditions and at maximum fuel weight without passengers.

Tale 5-8
Runway Dimensional Standards

Item	B-II(1)	C-III
Runway Width	75 ft.	100 ft.
Runway Shoulder Width(2)	10 ft.	20 ft.
Runway Blast Pad Width	95 ft.	140 ft.
Runway Blast Pad Length	150 ft.	200 ft.
Runway Safety Area Width	150 ft.	500 ft.
Runway Safety Area Length Prior to Landing Threshold	300 ft.	600 ft.
Runway Safety Area Length Beyond RW End	300 ft.	1,000 ft.
Runway Object Free Area Width	500 ft.	800 ft.
Runway Object Free Area Length Beyond RW End	300 ft.	1,000 ft.

(1) Applies to Runways with not lower than ¾ mile approach visibility minimums.
(2) Design Groups V and VI normally required stabilized or paved shoulder surfaces.

A collective review of FAA criteria and individual aircraft performance revealed the runway length requirements at INT are adequate per FAA standards to accommodate the types of aircraft that currently operate and those that are forecasted to operate at the airport during the next 20 years. It should be noted that neither the ACFC, nor economists, nor airport planners have the ability to accurately predict which types of businesses and associated aircraft may operate regularly at INT in the future. As such, it is wise to make provisions to accommodate all potential operational activity as a part of this study. A number of factors must be considered prior to extending or reconstructing the runway at INT including the cost to construct versus the financial gain attained by investing in an improvement of this magnitude. Therefore, it is recommended that the ACFC continue to monitor traffic in the future in order to reevaluate the need for extending Runway 15-33 in the future. Subsequent to identifying the need for a longer runway, the ACFC should conduct a cost-benefit analysis prior to committing to a specific extension length.

Runway 4-22 Length Analysis

Although the state will likely provide grant funding for ongoing maintenance and upkeep projects to Runway 4-22, it is unlikely that the airport will be able to obtain funds for an extension to this runway. Furthermore, Runway 4-22 is primarily used to accommodate small general aviation and corporate activity and is often utilized to conduct flight training activities. Larger general aviation aircraft that require more than the 3,938' of available runway are able use the main runway. For these reasons, no additional runway length is required nor recommended for Runway 4-22 at this time.

Runway Width Analysis

As mentioned earlier, Runway 15-33 is classified by FAA standards as a C-III runway; whereas Runway 4-22 is classified as a B-II runway. Per the FAA Advisory Circular AC/150 5300-13, the required runway width for a C-III runway is 100' and the required runway width for a B-II runway with not less than ¾ statute mile visibility minimums is 75'. Runway 4-22 has a width of 100' and Runway 15-33 has a width of 150'. As such, both runways currently exceed FAA standards for width.

Pavement Strength Analysis

It is vital that each runway be able to support the weight of the critical aircraft that regularly operate on the runway. The load of the aircraft comes to bear on the runway through the landing gear and these loads will be distributed differently depending upon the aircraft's wheel configuration. Because there are different landing gear configurations and because each configuration has a different footprint and load distribution, there are different expressions of maximum load bearing capacity of a runway. There are basically four descriptors used to delineate aircraft wheel loadings: S – Single Wheel (e.g. DC-3), D – Dual Wheel (e.g. 737), DT – Dual Tandem (e.g. 767), and DDT – Double Dual Tandem (e.g. 747).

Runway 15-33 – Most larger corporate jet and commercial aircraft that operate at INT utilize Runway 15-33 due to its available length. However, smaller single-wheel aircraft will also use this runway when weather conditions dictate. The airport's single-wheel strength is published at 110,000 lbs which is more than adequate to accommodate loads from these aircraft types. The airport's critical aircraft (Boeing 737) has a dual wheel gear configuration. The gross weights of this aircraft vary by model but generally range between 111,000 lbs. and 174,000 lbs. The heaviest of the fleet are comprised of the 800 and 900 series; however, the 200, 300, 400, 500, and 700 series comprise a majority of 737 activities at Smith Reynolds. As mentioned earlier, most of the larger aircraft that regularly visit INT are visiting to receive maintenance and are therefore are not carrying passengers. As such, it is uncommon to see a 737 aircraft operating at gross weight. For this reason, the existing pavement strength is adequate for dual wheel activity. Although the airport is also given a dual-tandem rating for larger aircraft such as the Boeing 767, this type of aircraft activity is infrequent. The gross weight of the 767 aircraft varies by model from 300,000 lbs. to 450,000 lbs. However, as pointed out with the 737 aircraft, the 767s that visit INT are not carrying passengers and are therefore not operating at gross weight. Furthermore, the infrequency of these aircraft types do not dictate a design strength to support them since annually they perform less than 500 operations. This being said, the pavement strength for single wheel, dual wheel and dual tandem wheel aircraft is adequate to support the type of aircraft activities that are common at INT. It should be noted that although the pavement strength is given a rating that is associated with a type of wheel load, the pavement can support the occasional passage of aircraft with much a higher weight. However, if frequent passages by heavier aircraft are common, the pavement will likely deteriorate at a more rapid rate than was intended by design. The pavement strength for Runways 4-22 and 15-33 are displayed in **Table 5-9.**

Table 5-9
Pavement Strength

Landing Gear Configuration	Runway 4-22	Runway 15-33
Single Wheel Gear	40,000 lbs.	110,000 lbs.
Dual Wheel Gear	55,000 lbs.	135,000 lbs.
Dual Tandem Wheel Gear	90,000 lbs	230,000 lbs.

Source: The LPA Group Incorporated, March 2010.

Runway Safety Area Analysis

As a part of the runway safety area analyses, there are three runway safety area components that require review: Runway Safety Area (RSA), Runway Object Free Area (ROFA), and Runway Protection Zones (RPZ). The subsequent discussion details each safety area and presents potential resolutions to correct any non-standard conditions that were identified.

Runway Safety Area (RSA) – The RSA is centered on the runway center line and extends outward and beyond the runway ends. FAA AC 150/5300-13 states that the RSA shall be: (a) cleared and graded and have no potentially hazardous ruts, humps, depressions, or surface variations; (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 within the safety area due to their function.

Runway Object Free Area (ROFA) – Similar to RSA, the ROFA is also centered on the runway center line and extends outward and beyond the runway ends. FAA 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 non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the ROFA. This includes parked airplanes and agricultural equipment. **Table 5-10** illustrates the runway safety area and runway object free area dimensions and associated FAA standards for both runways at INT.

Table 5-10
Runway Safety Area Standards

	Runway 4-22			Runway 15-33		
	FAA Standards	**Runway 4**	**Runway 22**	**FAA Standards**	**Runway 15**	**Runway 33**
RSA						
Width	150'/75'(4)	150'/75'(4)	150'/75'(4)	500'/250'(4)	500'/250'(4)	(1)
Length (Beyond End)	300'	300'	***130'(2)***	1,000'	***980(3)***	(1)
ROFA						
Width	500'/250'(4)	500'/250'(4)	500'/250'(4)	800'/400'(4)	800'/400'(4)	800'/400'(4)
Length (Beyond End)	300'	300'	***125'(2)***	1,000'	***865'(3)***	1,000'

Source: FAA AC 150/5300-13
(1) An engineered material arresting system was recently constructed at the end of Runway 33 which allows the runway to meet federal standards. The EMAS bed is 170ft. wide and 304 ft. long.
(2) Tree clearing and fence relocation required to meet RSA and ROFA standards at end of Runway 22
(3) Small portion of existing RSA and ROFA currently overlaps Liberty Street. near end of Runway 15
(4) Represents offset distance in each direction from runway centerline

Runway Protection Zone (RPZ) – The RPZ, or clear zone, is a two-dimensional trapezoidal shaped area beginning 200 feet from the runway's landing 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 runway protection zone is dictated by 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. If the landowner and county cannot come to a sale agreement, property acquisition can be acquired through condemnation; however, this option should always be considered as a last resort due to the legal fees and associated delay that will be incurred as a component of this process. **Table 5-11** denotes the RPZ dimensions and associated FAA standards for both runways at INT.

Table 5-11
Runway Protection Zone Standards

	RW 4	**RW 22**	**RW 15**	**RW 33**
Inner Width	500'	500'	800'	1,000'
Outer Width	700'	700'	1,010'	1,750'
Length	1,000'	1,000'	1,700'	2,500'

Runway 15 – Approximately 20' of RSA currently extends beyond the airport property and into the vicinity of N. Liberty Street. This 20' could be recovered through the application of declared distances. Similarly, a small portion of ROFA (approximately 135') is currently being impacted by N. Liberty Street; however impacts to such a small section of the outer ROFA will likely be considered minor and may therefore be waived by the FAA. If not, the runway's declared distances, (Runway 33 landing and accelerate stop distance available) may have to be diminished to accommodate the entire ROFA and/or RSA. The ROFA associated with this runway currently appears to overlay aircraft parked along the northeast side of the ramp. However, due to the lower elevation of this ramp area, neither the aircraft nor the fuel farm in this area penetrates the invisible plain that defines the ROFA. For this reason, no corrective action is required.

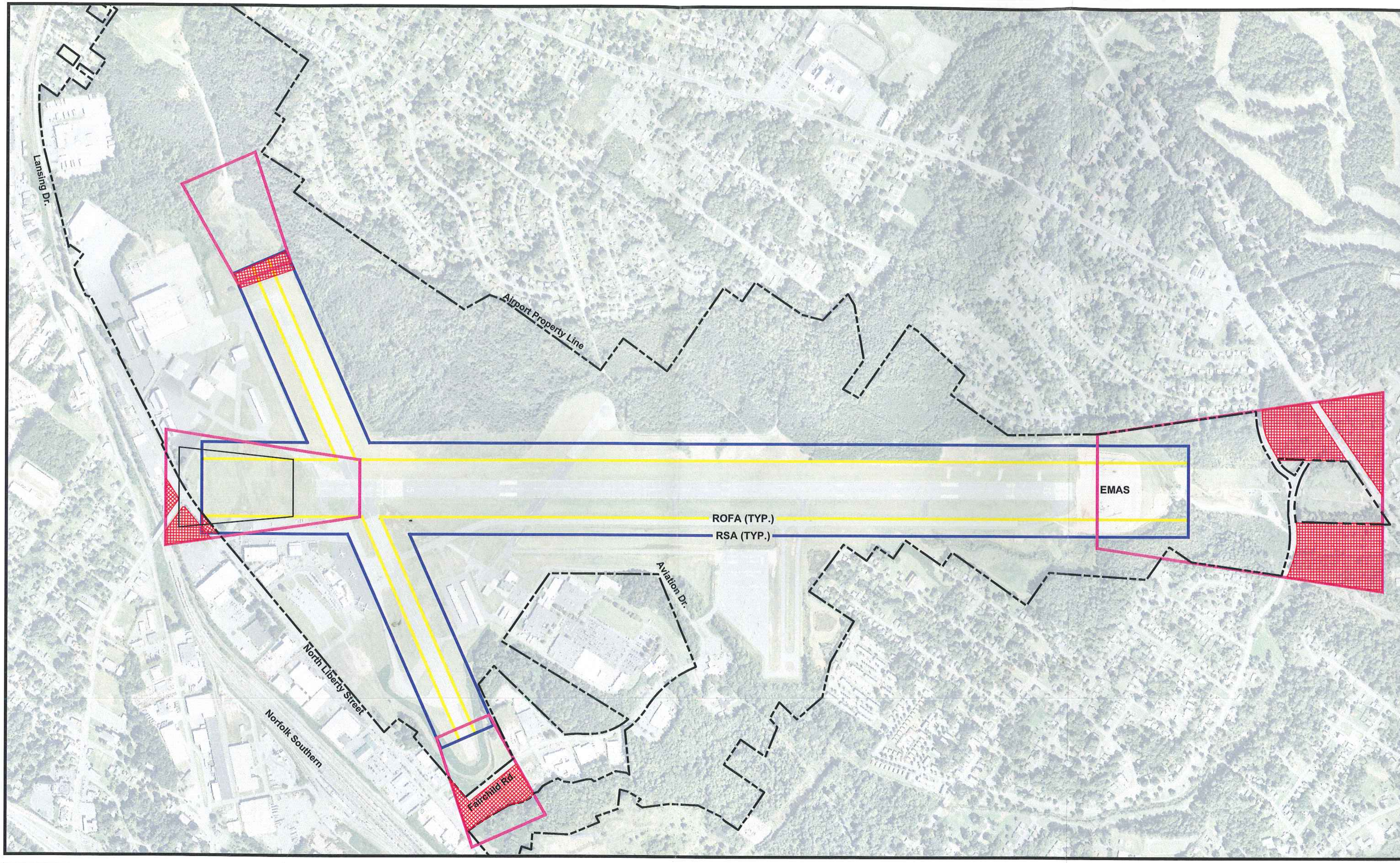
The associated runway protection zone (RPZ) currently covers several commercial / industrial businesses and residential properties that are located northwest of N. Liberty Street and in the vicinity of N. Glenn Ave. Since the airport property line terminates at N. Liberty Street, it is recommended that the airport either acquire easement over the adjacent properties or purchase these properties such that the airport retains an interest in the entire RPZ zone.

Runway 33 – Due to the recent construction of the engineering materials arresting system (EMAS), this runway now meets FAA requirements for runway safety area and runway object free area. However, the runway protection zone associated with this runway currently has some residences which are located south of Bowen Road and New Walkertown Road (311). It is recommended that the airport either purchase these properties or acquire easement to cover the entire RPZ area.

Runway 4 – This runway end meets the required safety and object free area requirements as stipulated by the FAA; however, the runway protection zone includes a few commercial / industrial buildings that should be located within airport property or within an airport easement. This being said, it is recommended that the airport either acquire an easement or purchase the properties located within the RPZ area.

Runway 22 – Both the runway safety area and object free area associated with this runway end are currently being encroached upon by a nearby fence and also by several trees and other types of vegetative growth. It is recommended that the trees and other vegetation be cleared a distance of 300' from the runway end and the fence be relocated outward a distance of approximately 160' from its current location in order to meet FAA standards. The entire runway protection zone is located within airport property and therefore complies with FAA standards.

Exhibit 5-2 graphically illustrates the evaluation of RSA, ROFA, and RPZ criterion.



AVCON / LPA TEAM	SMITH REYNOLDS AIRPORT MASTER PLAN UPDATE	Runway Safety Area Evaluation	0 400 800 SCALE: 1" = 800'		5-2 DRAWING NO.

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5.2 TAXIWAY SYSTEM REQUIREMENTS

An efficient taxiway system is designed to provide freedom of movement to and from the runways and between the aviation related facilities and the runway systems of the airport. The taxiway system includes entrance and exit taxiways, taxiway run-up areas, apron taxiways and taxilanes. The FAA taxiway design standards are determined by the aircraft wingspan for the critical aircraft that routinely uses the taxiway. These standards allow an appropriate safety margin beyond the maximum wingspan for each Airplane Design Group. In the following section taxiways and their related connectors are analyzed for safety and compliance to FAA design standards. The standards for group I, II, and III aircraft wingspans are shown in **Table 5-12**; whereas, the existing taxiways, taxilanes, and associated connectors are detailed in **Table 5-13**.

Table 5-12
Taxiway Dimensional Standards

Item	I	II	III
Taxiway Width	25 ft.	35 ft.	50 ft.
Taxiway Shoulder Width	10 ft.	10 ft.	20 ft.
Taxiway Safety Area Width	49 ft.	79 ft.	118 ft.
Taxiway Object Free Area Width	89 ft.	131 ft.	186 ft.
Taxilane Object Free Area Width	79 ft.	115 ft.	162 ft.

Table 5-13
Existing Taxiway & Taxilane Inventory

Designator	Type	Width	Group Standard
A	TW	50 ft.	III
B	Connector	>50 ft.	III
C	Connector	>50 ft.	III
D	Connector	>50 ft.	III
E	Connector	>50 ft.	III
F	TW	50 ft.	III
H	TL	35–50 ft. (varies)	III
J	Connector	> 50 ft.	III
K	TL	35 ft.	II
M	Connector	35 ft.	II
N	Connector	35 ft.	II
O	TL	35 ft.	II
P	TL	35 ft.	II

A collective review of the various taxiways and taxilanes at INT revealed that most of the existing facilities currently comply with federal standards. However, taxiway H, which currently provides access to the nearby hangar structures, has a varying width from 35 ft. to 50’. Due to the number of large aircraft that would normally use this taxilane, it is recommended that the narrow sections of this taxiway be increased from 35’ to 50’ in the future such that it complies with group III standards.

Taxiway A Separation – Per FAA standards, the required runway to taxiway centerline separation distance for group C-III runways is 400'. The current separation distance between Taxiway A and Runway 15-33 is approximately 281'; thus, the existing taxiway would have to be shifted an additional 119' to the southwest order to meet FAA standards. The existing general aviation apron was constructed in consideration of these standards. As such, the ultimate relocation of Taxiway A will not encroach the required separation distance of the future taxiway alignment as related to the existing apron parking area. However, the FAA may choose to waive their published standards provided that the cost to comply is impracticable or provided that a determination is made that safety is not compromised. Any waiver of FAA standards would be documented and approved by the FAA in what is referred to as a "Modification To Agency Airport Design, Construction, And Equipment Standards". The request and process to submit such modifications is outlined in FAA Order 5300.1F.

5.3 AIRFIELD REQUIREMENTS

In addition to the runways and taxiways, other facilities and equipment help provide safe aircraft operations at INT. In this portion of the Facility Requirements chapter, each component of the airfield will be examined individually and evaluated in comparison to FAA criteria to identify safety deficiencies and substandard facilities. Additionally, improvements and upgrades that could improve service, capacity, or that may provide alternative benefits to the airport will also be discussed.

Instrument Approach Facilities

An important component to be evaluated involves an airport's ability to accommodate operations during instrument conditions. The following section compares the airport's current approach facilities to those currently available.

Runway 15/33 – Currently, the airport has an ILS or localizer approach to Runway 33, GPS approaches to Runways 15 and 33 and a VOR/DME approach to runway 15. To aid pilot visibility during instrument conditions, runway end identifier lights (REILs) are installed near the threshold of Runway 15; whereas, a medium intensity approach lighting system with runway alignment indicator lights (MALSR) is installed prior to the end of Runway 33. This runway currently has adequate approach instrumentation to meet demand through the planning period.

Runway 4/22 – Runway 4-22 currently does not have the instrumentation nor the lighting necessary to accommodate aircraft operations during instrument conditions. However, a GPS approach to both runway ends would benefit the traffic that normally use Runway 4-22 and could be implemented at a relatively low cost. Approach lighting would augment this approach by increasing runway visibility during IFR conditions. The most cost-feasible approach lighting solution is the runway end identifier lighting system (REILs) which are comprised of two flashing strobes positioned at the runway landing thresholds. For these reasons, it is recommended that the airport implement a GPS approach along with REILs to each runway end in the future. These improvements will be further discussed and investigated in the alternatives chapter of this report.

Airfield Lighting

Rotating Beacon – The rotating beacon at INT is located atop the Air Traffic Control Tower (ATCT) and stands approximately 35 feet above ground. The beacon is in good working condition and therefore requires no modifications or upgrades at this time.

Runway Edge Lights – Both active runways at INT have pavement edge lighting for increased visibility during nighttime and low-visibility operations. Runway 4-22 has medium intensity runway lighting (MIRL) installed on both sides of the runway, whereas Runway 15-33 has high intensity runway lighting (HIRL) installed. Because there is no air traffic control tower at the airport after 9:30 PM and before 6:45 AM, pilots can operate the runway lighting of Runway 15-33 through Common Traffic Advisory Frequency (CTAF). The lights on Runway 4-22 are not lighted while the tower is closed. The lights on both runways are in good condition and should only require ongoing maintenance throughout the remainder of the planning period.

Taxiway and Apron Lights – The primary taxiways (F & A) are equipped with Medium Intensity Taxiway Lighting (MITLs). The existing taxiway lights are in good condition. Any future taxiway improvements should include additional MITLs to supplement the existing system. Any future project required to repair or upgrade the existing system should also consider an upgrade to the more modern light emitting diodes (LED) lighting. This system uses less electricity than conventional taxiway lighting and the lights require very little maintenance. Outdoor fixtures and light poles currently provide lighting for apron areas. The existing lighting is adequate to allow aircraft to navigate the apron area. Any new or future apron improvements should include provisions for additional apron lighting.

Airfield Signage

Airfield signage at INT consists of lighted taxiway and runway signage and runway hold signage. Any future improvements to the airfield should include appropriate signage improvements as applicable. The existing signage at INT adequately provides pilots with the information required to safely navigate the airfield. Therefore, no improvements to existing signage is required or recommended at this time.

Pavement Markings

The existing airfield pavement markings are sufficient for both existing and future operations; however, the runway markings for Runway 4-22 should be upgraded in conjunction with the upgrade of future approaches. Specifically, if a GPS approach is implemented to Runways 4 or 22, the pavement should be re-marked to non-precision markings. Runway 15-33 is currently marked with non-precision and precision markings respectively. Thus, this runway is marked adequately for both existing and planned approaches throughout the remainder of the planning period.

Weather Instruments

The existing ASOS and wind cone equipment comprise the current on-field weather instruments at INT. This existing ASOS is adequate for the types of operational activity that frequently travel to and from INT. There are two wind cones located on the airfield; the first is co-located with the segmented circle on the north side of the airfield between Runway 22 and Taxiway F and the second is located near the end of Runway 33. Additional (supplemental) wind cones located at each runway end would provide additional crosswind information to pilots approaching and departing the runway ends.

Fuel Storage Requirements

As mentioned previously, Landmark Aviation is currently the sole provider of fuel at the Smith-Reynolds Airport. As shown in Table 5-14, Landmark maintains a combination of underground, above ground, and self-serve storage tanks that are collectively capable of storing up to 68,000 gallons of 100LL and Jet-A fuels.

Fuel sales data obtained from airport records denote that the typical ratio of Jet-A versus 100LL sold is approximately 91.58% and 8.42% respectively. Table 5-15 illustrates the fuel sales from November 2008 through October, 2009.

Table 5-14
FBO Existing Fuel Storage Facilities

Fuel Type	Fuel Storage Capacity
Jet A	50,000 gallons (2 tanks)
100LL	12,000 gallons (1 tank)
100LL (Self-Serve)	6,000 gallons (1 tank)
Total	68,000 gal

Source: Landmark Aviation, 2009.

Table 5-15
Fuel Flowage 2008 - 2009

Date	Total (gal)	100LL (gal.) (from truck)	100LL (self)	% 100LL (total)	Jet A (gal)	% Jet A
2008-Nov	87,207	4270	2200	7.42%	80,737	92.58%
2008-Dec	88,498	3773	1944	6.46%	82,781	93.54%
2009-Jan	88,498	3773	1944	6.46%	82,781	93.54%
2009-Feb	89,539	4145	2136	7.01%	83,258	92.99%
2009-Mar	80,491	4863	2505	9.15%	73,123	90.85%
2009-April	123,159	4364	2248	5.37%	116,547	94.63%
2009-May	100,462	4957	2553	7.48%	92,952	92.52%
2009-June	114,789	5670	2921	7.48%	106,198	92.52%
2009-July	95,498	5531	2849	8.78%	87,118	91.22%
2009-Aug	92,296	6525	3362	10.71%	82,409	89.29%
2009-Sept	77,798	8759	4512	17.06%	64,527	82.94%
2009-Oct	77,428	5370	2767	10.51%	69,291	89.49%
Total	**1,115,663**	**62,001**	**31,940**	**8.42%**	**1,021,722**	**91.58%**

Source: Airport Commission of Forsyth County (ACFC)

The historical operations data for INT stated that 51,839 operations occurred in 2008 and 44,158 are anticipated in 2009. The fuel sales data provided by the ACFC included 2 months in 2008 and 10 months in 2009. For this reason, a proportional relationship of operational activity was taken from each year to establish an operations number which reflects the fuel sales time period covered (45,437). Using this number, a ratio of fuel sold in gallons to number of annual operations was established (1.342 gallons of 100LL and 22.49 gallons of Jet-A). This ratio was then applied to the forecast of operational activity to determine the expected fuel sales through the remainder of the planning period. **Table 5-16** shows the anticipated annual and monthly fuel sales by type in relation to forecasted operational activity.

Table 5-16
Fuel Sales Forecast

Year	Ops Forecast	100 LL	Monthly Avg. 100 LL	Jet-A	Monthly Avg. Jet-A
2008	51,839	69,568	5,797	1,165,859	97,155
2009	44,158	59,260	4,938	993,113	82,759
2013	46,391	62,257	5,188	1,043,334	86,944
2018	49,036	65,806	5,484	1,102,820	91,902
2023	51,988	69,768	5,814	1,169,210	97,434
2028	55,274	74,178	6,181	1,243,112	103,593

As far as an airport's fuel storage capability is concerned, it is typically ideal to have adequate facilities to accommodate two weeks of fuel capacity during periods of normal demand. Under this assumption, fuel deliveries would occur regularly on a bi-weekly basis. Another way to view this is to assume that sufficient containment be provided to accommodate 50 percent of an average month's fuel sales by type. Based on the ratios established earlier and the number shown in Table 5-16, it was determined that the airport currently has adequate storage to accommodate 100LL sales through 2028; however a current deficiency of Jet-A storage exists. It should be noted that RJ Reynolds previously owned and maintained a private fuel farm which is located adjacent to their former hangar facility. Should an additional FBO be located at the airport in the future, this hangar and associated fuel storage facilities may be ideally suited to accommodate the airport's fuel storage requirements.

Based Aircraft Storage Requirements

This section evaluates INT's based aircraft storage requirements during the 20-year planning period. As described in Chapter 2, INT has a mix of hangar types and sizes (e.g., t-hangars, corporate hangars, and bulk hangars) and apron tiedown areas that accommodate the 109 based aircraft (comprised of 66 single-engine pistons, 13 multi-engine pistons, 12 turboprops, and 18 jet aircraft). This includes a total of 41 t-hangar bays, nearly 150,000 square feet of hangar space, and approximately 37,000 square yards of apron tiedown area. Based aircraft storage requirements are determined by developing a set of assumptions about storage preferences by aircraft type. As can be seen at INT, hangar storage is generally preferred to apron tiedown storage because aircraft owners want to protect their expensive airplanes from harsh weather conditions, vandalism, and theft. Some degree of based aircraft tiedown storage is still desired for INT to accommodate the demands of recreational pilots and flight training organizations.

Table 5-17 presents the assumptions used to establish based aircraft storage requirements for INT's forecast of based aircraft. As shown, the construction of 22 t-hangar bays and 80,000 square feet of corporate hangar space would be needed to accommodate the forecast of 16 additional based aircraft by 2028. The existing based aircraft tiedown apron is more than sufficient to accommodate long-term demands. The calculated requirements are used as minimum evaluation thresholds in the alternatives analysis so that a variety of flexible development options can be presented.

Table 5-17
Based Aircraft Storage Requirements

Aircraft Type	Aircraft 2008 Based	Aircraft 2028 Forecast	Apron Tiedown %	T-Hangar %	Corporate Hangar %
Single-Engine Piston	66	66	20%	80%	
Multi-Engine Piston	13	13	20%	80%	
Turboprop	12	15			100%
Jet	18	29			100%
Helicopter	0	2			100%
Totals	**109**	**125**			
Requirement Per Aircraft (per current INT practices)			300 SY	1 Bay	5,000 SF
Existing Availability			37,000 SY	41 Bays	150,000 SF
2008 Requirement			4,800 SY	63 Bays	150,000 SF
2028 Requirement			4,800 SY	63 Bays	230,000 SF
2028 Deficiency			None	22 Bays	80,000 SF

Source: The LPA Group Incorporated, March 2010.
Note: Existing corporate hangar availability includes all aircraft storage hangars listed in Table 2-4, as well as the FBO hangar.

Aircraft Storage Requirements

Approximately 28,000 square yards of transient aircraft parking is provided on the aprons serving the passenger terminal building and Landmark Aviation. Requirements for transient aircraft parking are calculated as a percentage of peak day activity, depending upon the average length of stay for visiting aircraft. At INT, peaking events often require aircraft to remain parked for several hours if not overnight on the transient apron. According to **FAA AC 150/5300-13**, Airport Design, up to 50 percent of itinerant peak day operations may be used to calculate transient aircraft parking demand, with each aircraft requiring 360 square yards of apron area for parking and circulation. However, due to the volume of passenger drop-offs and pickups without an extended aircraft layover, a 40 percent itinerant peak day value was determined to be more appropriate for determining INT's transient aircraft parking requirement. Then, the calculated requirement was increased by a minimum of 10 percent to accommodate expansion needs for at least the next two-year period. Using these procedures, **Table 5-18** presents the transient aircraft parking requirements for INT.

Table 5-18 Transient Aircraft Parking Requirements				
Year	**IT Peak Day Operations**	**Transient Requirement**	**Existing Availability**	**Deficit**
2008	153	24,235 SY	28,000 SY	None
2013	137	21,701 SY	28,000 SY	None
2018	145	22,968 SY	28,000 SY	None
2023	154	24,394 SY	28,000 SY	None
2028	163	25,819 SY	28,000 SY	None

Source: The LPA Group Incorporated, March 2010.
Note: Itinerant peak day operations calculated as 59.14% of peak day operations from Table 3-21.

5.4 LANDSIDE REQUIREMENTS

The landside requirements include all facilities that are located along and beyond the airport perimeter and include criteria such as security fencing, passenger terminal, vehicular parking, and aircraft rescue and fire fighting (ARFF) requirements. The following sections detail the landside facility requirements for INT.

Airport Security

INT is categorized by the National Plan of Integrated Airports System (NPIAS) as a general aviation airport; however, as pointed out earlier, the airport maintains a FAR Part 139 Certificate due to the level of activity by unscheduled large aircraft, (charter operations in aircraft with at least 31 seats). There are prescribed requirements for those airports who maintain a FAR Part 139 certificate. Section 139.335 describes the requirements of public protection as follows:

> "§ 139.335 Public protection.
> (a) In a manner authorized by the Administrator, each certificate holder must provide—
> (1) Safeguards to prevent inadvertent entry to the movement area by unauthorized persons or vehicles; and
> (2) Reasonable protection of persons and property from aircraft blast.
> (b) Fencing that meets the requirements of applicable FAA and Transportation Security Administration security regulations in areas subject to these regulations is acceptable for meeting the requirements of paragraph (a)(l) of this section."

Due to the requirements associated with Part 139 certification, the airport currently meets or exceeds the security requirements prescribed for general aviation airports. Regardless, an analysis of security requirements as they apply to general aviation facilities is depicted in the following sections for reference.

In May of 2004, the Transportation Security Administration (TSA) developed Security Guidelines for General Aviation Airports. According to the TSA website, "this listing of recommended guidelines or "best practices" was designed to establish non-regulatory standards for general aviation airport security. Their primary purpose is to help prevent the unauthorized use of a general aviation aircraft in an act of terrorism against the United States" "Security Guidelines for General Aviation Airports constitutes a set of federally endorsed guidelines for enhancing airport security at GA facilities throughout the nation. It is intended to provide GA airport owners, operators, and users with guidelines and recommendations that address aviation security concepts, technology, and enhancements."

The Security Guidelines for General Aviation Airports provides a measurement tool that is used to assess vulnerability characteristics of each general aviation airport. The TSA's measurement tool applies points and ultimately a total score to each type of facility based on a variety of characteristics including its location relative to sensitive sites and to mass population areas, type and number of based aircraft, runway length, and also relative to the number and types of operations conducted. An evaluation of INT using the TSA's measurement tool revealed that due to the airport's proximity to downtown Winston-Salem and also due to the types and frequency of operational activity etc., the overall score given to INT was a **34**. By comparing this score (i.e., points) versus suggested guidelines shown in **Exhibit 5-3**, it is recommended that INT implement all security procedures and recommendations shown in the orange, green, and yellow categories. It should be reiterated that these are recommended best practices and not necessarily requirements; however, since the TSA document is the only guidance available for identifying security standards at general aviation airports, it was utilized to establish the security requirements for INT as a part of this master plan document.

Exhibit 5-3
TSA Suggested Security Enhancements for General Aviation Airports

<table>
<tr><th colspan="4">Points/Suggested Guidelines</th></tr>
<tr><th>>45</th><th>25-44</th><th>15-24</th><th>0-14</th></tr>
<tr><td>• Fencing (Section 3.3.3)
• Hangars (Section 3.3.1)
• CCTV (Section 3.4.5)
• Intrusion Detection System (Section 3.4.6)</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">• Access Controls (Section 3.3.3)
• Lighting System (Section 3.3.4)
• Personnel ID system (Section 3.3.6)
• Vehicle ID system (Section 3.3.6)
• Challenge Procedures (Section 3.4.1)</td><td></td><td></td></tr>
<tr><td colspan="3">• LEO Support (Section 3.4.4)
• Security Committee (Section 3.4.3)
• Transient Pilot Sign-In/Out Procedures (Section 3.1.4)</td><td></td></tr>
<tr><td colspan="4">• Signs (Section 3.3.5)
• Documented Security Procedures (Section 3.5.1)
• Positive Passenger/Cargo/Baggage ID (Section 3.1.1)
• All Aircraft Secured (Section 3.2)
• Community Watch Program (Section 3.4.1)
• Contact List (Section 3.5.3)</td></tr>
</table>

Source: TSA Security Guidelines for General Aviation Airports, Appendix B.

Passenger Terminal – Commercial Service Provisions

As stated earlier, commercial service was commonplace at INT from the 1940s through the year 2000. Although it is difficult to predict the future needs of the airlines in today's economy, the ACFC desires to preserve the airport's capability to accommodate regularly scheduled passenger service in preparation for any opportunities that may arise in the future. Thus, it was necessary to evaluate the existing landside and airside facilities in order to provide recommendations to satisfy commercial service activity needs. For the purpose of this discussion commercial service activity is defined as regularly scheduled airline service or on-demand charter service. It is important to note, that the sizing, location, and number of facilities that may be required will vary dependent upon a number of factors including: type of activity, size of aircraft being used, the frequency of daily flights, and the passenger throughput that will be satisfied on a daily/hourly basis. For the purpose of this evaluation, it was assumed that the terminal in its existing configuration has sufficient space to accommodate the passenger throughput demand generated by any future commercial activity.

An evaluation of INT's existing facilities revealed that there are a number of improvements that could be made to the existing terminal in order to better accommodate passengers. However, not all of the recommendations within will be required until activity increases such that it mandates an improvement to correct an identified deficiency. Thus, if commercial activity commences in the future, it is recommended that the ACFC re-assess its commercial service needs by way of a terminal and/or commercial service planning study. The following list of improvements would allow the airport to improve its capability to accommodate commercial service activity in the future:

<u>Access Improvements</u> – The existing parking lots and access roads are likely adequate to accommodate passenger needs throughout the remainder of the planning period; however, some traffic flow and access improvements would be beneficial. The entrance road, Norfleet Drive is currently two-way in front of the airport terminal and includes parking to the west for rental cars and parking to the east for tenants etc. The existing rental car and tenant curbside parking should be removed and the entrance road should be re-striped in order to provide two lanes of one-way traffic (loop). The easternmost lane would be dedicated to through traffic; whereas, the interior lane would be used for loading and unloading. The parking spaces adjacent the terminal would be dedicated to taxis and to other ground transportation services. By utilizing a portion of the existing lower level parking lot, an interior loop could be created thereby allowing terminal traffic to re-circulate without travelling back onto N. Liberty Street. Finally, as demand warrants, it may be prudent to consider installing a traffic lights at the entrance and exits of Norfleet Dr. and at N. Liberty Street in order to alleviate traffic congestion in the vicinity of the airport terminal during peak periods of enplanements and deplanements.

<u>Baggage Improvements</u> – The existing baggage belt located within the terminal is unusable and would therefore have to be upgraded or replaced, or an alternate method of delivering baggage would have to be implemented prior to initiating passenger service.

Smaller commercial aircraft activity could be accommodated by utilizing wheeled carts that are parked in a designated area for passenger pickups and drop-offs.

Pavilion / Covered Walkway – Passengers departing aircraft from the terminal ramp currently have no protection during poor weather conditions. Depending upon how the baggage improvements are accommodated, it may be beneficial to construct a pavilion structure outside the existing hold room area for baggage pickup and also such that shelter from elements could be provided for those passengers waiting to enter or for those exiting the hold room.

Hold Room Improvements – Security improvements developed following the events of September 11, 2001, require that passengers be sterile prior to entering the airside hold rooms. Thus, the Transportation Security Administration (TSA) screening area would be located between the existing terminal lobby and the hold room located on the eastern side of the terminal adjacent the ramp area. Unfortunately, the restrooms and vending areas are located on the unsecured side within the terminal lobby. As such, sterile passengers waiting for a departing flight have no access to restroom facilities or to food and drink. Thus, it is recommended that the airport construct new restrooms adjacent the existing hold room or that Hertz be relocated and the secure area be reconfigured to include the vending and restroom areas. The latter option will require the construction or the use of alternate restroom facilities to accommodate non-sterile personnel.

Signage Improvements – In conjunction with the previously recommended improvements, it may be necessary to install new exterior marking and signage to illustrate traffic flow and to indicate the location of ground transportation facilities. Furthermore, it may be necessary to install new interior signage as necessary to provide additional passenger information such as the locations of ticketing and restrooms etc.

Ticket Counters – The existing ticket counters are currently in good condition and are co-located with adjoining support offices that would be ideal for the administrative functions associated with on-demand charter and/or scheduled airline activity. Thus, the existing counters are likely adequate to meet both short and long-term commercial needs.

Auto Parking / Cell Phone Lot – The existing long-term parking lot which is located due west of the terminal contains approximately 285 spaces for use by passengers and by terminal employees. The existing parking area could potentially be utilized for passenger vehicles in its current configuration; however, a ticket spitter located at the parking lot entrance and perhaps a toll both located at the exit could generate additional revenues for the airport. These changes are only recommended if multiple commercial service flights occur weekly or if existing parking becomes a commodity during the planning period. Should commercial flights become a regular occurrence, it may also be necessary to identify an area within the auto parking lot for vehicles to park while they wait for arriving passengers. The identification of such would help alleviate congestion and address security concerns associated with traffic parked along the terminal curbside for extended wait periods.

Vehicular Parking Requirements

The passenger terminal building at Smith Reynolds Airport comprises a total area of 34,620 square feet (including the ATCT) and is supported by 338 automobile parking spaces. According to the *Unified Development Ordinances of Winston-Salem/Forsyth County enacted July 7, 2008*, public airports require one parking space for every 200 square feet of waiting area. Therefore, even if the entire terminal building area was counted as waiting area, a maximum parking requirement of 173 spaces would be mandated. With the introduction of any new service such as commercial or on-demand charters based at INT, the most recent edition of the *Unified Development Ordinances of Winston-Salem/Forsyth County* should be reviewed to determine the appropriate parking space requirement. For all other airport facilities, the ordinance identifies parking requirements based on the principal use of each facility. For example, the parking requirement for many industrial facilities is one space per employee. Most facilities at INT are supported by a sufficient amount of parking to accommodate long-term demands. However, a deficiency was identified in the parking lot supporting Landmark's FBO/Maintenance facility which is frequently congested due to the small size and configuration of each lot. Opportunities to expand the parking lots around Landmark Aviation are investigated later in this Master Plan Update.

Air Rescue and Fire Fighting (ARFF) Requirements

The ARFF facility is located on the south side of the airfield between runways 4-22 and 15-33 and is accessible from N. Liberty Street by taking Fairchild Rd. to the west until it turns into Aviation drive. Aviation Drive leads directly to the ARFF facility, airport maintenance, the south t-hangar facilities, and also to the small maintenance hangar. The ARFF building includes three vehicle bays, as well as group bunkroom, a modern kitchen, and living quarters.

Since INT holds a FAR Part 139 airport operating certificate (AOC), it is required to provide ARFF services. ARFF equipment and staff requirements are based upon the longest passenger air carrier aircraft that has five or more daily departures at the airport. Smith Reynolds does not have five or more daily departures of any passenger air carrier aircraft; therefore, the airport is required to provide Index A capability - the most basic service required under FAR Part 139. **Table 5-19** illustrates the ARFF index determination based on aircraft length. Each higher index requires additional equipment and fire-fighting agents to handle progressively larger aircraft.

<u>ARFF Index A</u> - requires one vehicle with either 500 lbs of sodium-based dry chemical, halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of aqueous film forming foam (AFFF) to total 100 gallons for simultaneous dry chemical and AFFF application.

<u>ARFF Index B</u> – requires either one vehicle with 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF

for foam production or two vehicles, one equipped with 500 lbs of sodium-based dry chemical, halon 1211, or clean agent and one with an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons.

Table 5-19
FAR Part 139 ARFF Index Determination

Index	Aircraft Length
Index A	< 90 ft
Index B	90 ft – 125 ft
Index C	126 ft – 158 ft
Index D	159 ft – 199 ft
Index E	200+ ft

Source: FAR Part 139, Certification of Airports, 2006.

The ARFF equipment at INT includes one Oshkosh Striker ARFF truck equipped with 500 lbs of sodium-based dry chemicals, 210 gallons of AFFF agent for foam production, and 1,500 gal of water. Two additional trucks owned by Forsyth County are based at the ARFF station and typically respond to off-airport structural fires. One truck is equipped with a sufficient air supply for self-breathing apparatuses for firefighters and the other truck is equipped with additional fire suppression agents. These trucks also are available for airport emergency response, when necessary. It should be noted that Smith Reynolds maintains FAR Part 139 Index B ARFF requirements for equipment and agents; however, they do not for the number of staff on duty. The airport reports that additional staff can be scheduled if an air carrier requests Index B capabilities in advance.

The ARFF facility is staffed 24 hours per day and seven days per week by 11 ARFF certified firefighters that are employed by Forsyth County. At least three firefighters are on duty at any given time and two additional firefighters are available for swing-shifts. Six of the 11 employees are part-time firefighters. Additional Forsyth County firefighters may be available for airport emergency response, but they are not ARFF certified. The airport maintains mutual aid agreements with surrounding Forsyth County and City of Winston-Salem fire stations, should an emergency warrant additional response units. Forsyth County operates its central emergency services command center in facilities adjacent to the ARFF building. These facilities and associated personnel do not have airside access. Surface access to both the ARFF building and the emergency services building from Aviation Drive leads to Liberty Street.

5.5 SUMMARY

This section identified the facility requirements necessary to meet the twenty-year forecast of aviation demand. Prior to the physical layout of these facilities, specific refinement must be accomplished to enable the Airport to develop in a coherent and logical manner. **Table 5-20** provides a summary of the facility requirements that were determined necessary to satisfy the forecasts of aviation demand presented in this study. Additional development recommendations are provided within to either enhance the airport or to increase safety, revenues, or capacity.

Table 5-20 Summary of Facility Requirements	
Runway Safety Areas	
Runway Safety Areas (RSA)	Runway 22 end – clear trees and relocate fence in order to meet RSA requirements. Runway 15 end – implement/adjust declared distances to meet RSA requirements.
Runway Object Free Areas (ROFA)	Runway 22 end – clear trees and relocate fence to meet ROFA requirements. Runway 15 end – implement/adjust declared distances to meet ROFA requirements.
Runway Protection Zones (RPZ)	Recommend acquisition or purchase of easement to cover incompatible land uses within RPZs at runway ends 4,15, and 33.
Taxiways / Connectors	
Taxiway H	Increase width of Taxiway H from 35' to 50' to meet group III standards.
Taxiway A	Relocate Taxiway A to the southwest approximately 119' in order to meet FAA runway to taxiway center line separation standards
Approach Facilities	
Precision Approach	No recommendations
Non-Precision Approach	Implement GPS approaches to Runway 4 and 22 ends
Visual Landing Aids	Add runway end identifier lighting to both ends of Runway 4-22
Airfield Lighting	No recommendations
Airfield Signage	No recommendations
Pavement Markings	Upgrade Runway 4-22 pavement markings to reflect future approaches, non-precision markings.
Weather Instrumentation	Add supplemental wind cones to end of each runway 4,22,15, and 33
Fuel Storage	Install 50,000 gallon Jet-A tank or utilize RJ Reynolds farm in future.
Security Fencing	Secure / upgrade fencing in select locations as necessary to meet FAA standards.
Landside Facilities	
T-Hangar Facilities	Additional 22 Bays (minimum)
Corporate Hangar Facilities	Additional 80,000 SF (minimum)
Tie-Downs	No recommendations
Aircraft Parking Apron	
Transient Aircraft Apron	No recommendations
Based Aircraft Apron	No recommendations
Total Aircraft Parking Apron	No recommendations
General Aviation Terminal	No recommendations
Auto Parking	
Parking Lot	Expand parking lot in vicinity of Landmark FBO/Maintenance facility.

Source: The LPA Group Incorporated, March 2010.