Chapter Three

AIRPORT FACILITY REQUIREMENTS

To properly plan for the future of Salina Regional Airport (SLN), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter uses the results of the forecasts presented in Chapter Two, as well as established planning criteria, to determine the airside (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, aircraft parking apron, and automobile parking) facility requirements.

The objective of this effort is to identify the adequacy of existing airport facilities and outline what new facilities may be needed, and when these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in the next chapter. Analysis in Chapter Four - Alternatives will determine the most cost-effective and efficient means for implementing proposed facility development.

PLANNING HORIZONS

An updated set of aviation demand forecasts for Salina Regional Airport has been established. These activity forecasts include commercial passenger enplanements, annual operations, based aircraft, fleet mix, and peaking characteristics. With this information, specific components of the airfield and landside system can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than on a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established that take into consideration

the reasonable range of aviation demand projections. The planning horizons are the Short Term (approximately years 1-5), the Intermediate Term (years 6-10), and the Long Term (years 11-20).

It is important to consider that the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important for the plan to accommodate these changes so that airport officials can respond to unexpected changes in a timely fashion.

The most important reason for utilizing milestones is it allows airport management the flexibility to make decisions and develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program.

DESIGN STANDARDS

The FAA publishes Advisory Circular (AC) 150/5300-13A, *Airport Design*, to guide airport planning. The AC provides guidance on various design elements of an airport intended to maintain or improve safety at airports. The design standards include airport elements such as runways, taxiways, safety areas, and separation distances. According to the AC, *"airport planning should consider both the present and potential aviation needs and demand associated with the airport."* Consideration should be given to planning runway and taxiway locations that will meet future separation requirements even if the width, strength, and length must increase later. Such decisions should be supported by the aviation demand forecasts and coordinated with the FAA and shown on the Airport Layout Plan (ALP).

AC 150/5300-13A was published on September 28, 2012. It is intended to replace AC 150/5300-13, *Airport Design,* which was dated September 29, 1989. The latter was subject to 18 published changes over 23 years.

The previous Airport Design AC established the design standards based primarily on the Airport Reference Code (ARC). Paragraph 4 defined the ARC as "*a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport."*

In the current AC, the definition of the Airport Reference Code is found in Paragraph 102.i. and reads, *"An airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport."*

The current Airport Design AC introduces not only the Runway Design Code (RDC), but also the Runway Reference Code (RRC). The RDC is defined in Paragraph 102.mmm as, *"A code signifying the design standards to which the runway is to be built."* Paragraph 105.c. indicates that the Aircraft Approach Category (AAC), the Airplane Design Group (ADG), and the approach visibility minimums combine to form the RDC of a particular runway. These provide the information needed to determine certain design standards that apply.

The RRC is defined as, *"A code signifying the current operational capabilities of a* *runway and associated parallel taxiway."* Like the RDC, the RRC is composed of the same three components: the AAC, ADG, and runway visibility minimums. The RDC, however, is based upon planned development with no operational component, while the RRC describes the current operational capabilities of a runway where no special operating procedures are necessary.

The RRC for a runway is established based upon the minimum runway to taxiway centerline separation.

DESIGN AIRCRAFT

The selection of appropriate Federal Aviation Administration (FAA) design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use the airport. The critical design aircraft is used to define the design parameters for the airport. In most cases, the design aircraft is a composite aircraft representing a collection of aircraft classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG) and Taxiway Design Group (TDG). In the case of an airport with multiple runways, a design aircraft should be selected for each runway. The first consideration is the safe operation of aircraft likely to use the airport. Any operation of an aircraft that exceeds design criteria of the airport may result in either an unsafe operation or a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The design aircraft is defined as the most demanding category of aircraft, or family of aircraft, which conducts at least 500 operations per year at the airport. Planning for future aircraft use is of particular importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the long range potential needs of the airport.

Exhibit 3A summarizes representative design aircraft categories. As shown on the exhibit, the airport does serve large commercial transport aircraft such as Boeing 737, 747, 757, or 767. In fact, even larger Boeing 747 and 777, as well as DC-10 and Airbus A360 aircraft, have operated at SLN on a limited basis over the last 11 years. Large transport aircraft are most commonly used by commercial passenger and cargo airlines as well as charter operators under CFR Part 121. As "America's Fuel Stop," large commercial aircraft will utilize the airport for fueling services. The airport also supports irregular specialty operators with large aircraft as outlined in Chapter One.

The airport is also utilized on a frequent basis by a wide variety of business jet aircraft. The business jets range from very light jet (VLJ) models such as the Eclipse to the largest business jets on the market today, including the Gulfstream family, Global Express, and Boeing Business Jet (BBJ). Business jet activity at SLN is much more frequent than activity by large air carrier type aircraft.

The Department of Defense (DoD) maintains its own system of military airports and also operates on civilian airports. The military utilizes SLN on a regular basis. Unfortunately, the FAA does not allow for military aircraft to serve as the airport's critical aircraft. These operations cannot be used to justify or support capital expenditures under FAA grant programs at civilian airports; however, the DoD and/or airport sponsor may freely expend their own available capital resources to improve specific facilities for military uses. As such, the military aircraft operations at the airport will be factored only as a local airport sponsor consideration.

In order to determine airfield design requirements, a design aircraft, or group of aircraft with similar characteristics, is determined for each runway. This begins with a review of aircraft currently using the airport and those expected to use the airport through the 20-year planning period. Each aircraft falls within a certain FAA design category based on its characteristics as detailed below.

Runway Design Code (RDC)

The AAC, ADG, and approach visibility minimums are combined to form the RDC of a particular runway. The RDC provides the information needed to determine certain design standards that apply. Generally, runway standards are related to aircraft approach speed, aircraft wingspan, and designated or planned approach visibility minimums.

The RDC has three components. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by runway visual range (RVR) values in feet of 1,200, 1,600, 2,400, and 4,000. "NPI-1" is to be designated for runways with a non-precision instrument approach procedure having visibility minimums between one and three miles. "VIS" is the designation for runways with only visual approaches. **Table 3A** presents the RDC parameters outlined in AC 150/5300-13A, *Airport Design*.

TABLE 3A
Runway Design Code Parameters

Aircraft Approach Category (AAC)		
Category	**Approach Speed**	
A	less than 91 knots	
B	91 knots or more but less than 121 knots	
C	121 knots or more but less than 141 knots	
D	141 knots or more but less than 166 knots	
E	166 knots or more	
Airplane Design Group (ADG)		
Group #	**Tail Height (ft)**	**Wingspan (ft)**
I	<20	<49
II	20-<30	49-<79
III	30-<45	70-<118
IV	45-<60	118-<171
V	60-<66	171-<214
VI	66-<80	214-<262
Visibility Minimums		
RVR (ft)	**Flight Visibility Category (statute miles)**	
VIS	3-mile or greater visibility minimums	
NPI - 1	Lower than 3 miles but not lower than 1-mile	
4,000	Lower than 1-mile but not lower than ¾-mile (APV ≥ ¾ but < 1-mile)	
2,400	Lower than ¾-mile but not lower than ½-mile (CAT-I PA)	
1,600	Lower than ½-mile but not lower than ¼-mile (CAT-II PA)	
1,200	Lower than ¼-mile (CAT-III PA)	

RVR: Runway Visual Range
APV: Approach Procedure with Vertical Guidance
PA: Precision Approach
Source: FAA AC 150/5300-13A, Airport Design

A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- Eclipse 500/550
- Piper Archer
- Piper Seneca

B-I

- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I
- Beechjet 400

B-II

- Super King Air 200
- Cessna 441
- DHC Twin Otter
- Super King Air 350
- Beech 1900
- Citation Excel, Sovereign
- Falcon 50, 900, 2000
- **Citation II**, III, IV, VII
- Embraer 120

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

C-I, D-I

- Beech 400
- **Lear 25, 31, 35, 45, 55, 60**
- Israeli Westwind

C-II, D-II

- Cessna Citation X
- **Gulfstream II, III, IV**
- Challenger 300/600
- ERJ-135, 140, 145
- CRJ-200/700
- Embraer Regional Jet
- Lockheed JetStar
- Hawker 800

C-III, D-III *less than 100,000 lbs.*

- ERJ-170
- CRJ 705, 900
- Falcon 7X
- **Gulfstream 500**, 550, 650
- Global Express, Global 5000

C-III, D-III *over 100,000 lbs.*

- ERJ-90
- **Boeing Business Jet**
- B-727
- B-737-300, 800
- MD-80, DC-9
- A319, A320

C-IV, D-IV

- **B-757**
- B-767
- C-130
- DC-8-70
- MD-11

D-V

- **B-747** Series
- B-777

Note: Aircraft pictured is identified in bold type.

Taxiway Design Group (TDG)

The TDG relates to the undercarriage dimensions of the design aircraft. Taxiway/taxilane width and fillet standards, and in some instances, runway to taxiway and taxiway/taxilane separation requirements, are determined by TDG. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

The TDG standards are based on the Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances are determined solely based on the wingspan (ADG) of the design aircraft utilizing those surfaces.

CURRENT DESIGN AIRCRAFT

The critical design aircraft is defined as the most demanding category of aircraft which conduct 500 or more itinerant operations at the airport each year. In some cases, more than one specific make and model of aircraft comprises the airport's critical design aircraft. One category of aircraft may be the most critical in terms of approach speed, while another is most critical in terms of wingspan and/or tail height, which affects runway/taxiway width and separation design standards. The critical design aircraft for a non-primary commercial service airport may be a specific aircraft model or it can be a combination of several aircraft within the same design code that, when combined, exceed the 500 operations threshold.

A critical design aircraft will be determined for each runway. The largest design aircraft in terms of approach speed and airplane design group will determine the appropriate design standards for primary Runway 17-35, and the associated taxiways. Crosswind Runway 12-30 should be designed to accommodate the airport's commercial airline and business jet critical aircraft. Parallel Runway 18-36 and crosswind Runway 4-22 should be designed primarily for small aircraft use.

The airport is supported by six helipads and a special landing pad for the Kansas Army Guard helicopters which is on Taxiway A. While the airport is used by helicopters, they are not included in this determination as they are not assigned an approach speed or an airplane design group.

Based Aircraft

The determination of the design aircraft (or family of aircraft) will first examine the types of based aircraft followed by an analysis of itinerant activity. The majority of the based aircraft are single and multi-engine piston-powered aircraft which fall within approach categories A and B and ADG I and II. These smaller aircraft are often used for local operations which are not included in the critical aircraft determination.

The next step is to identify the larger based aircraft, including turboprops and business jets that may contribute to meeting the itinerant operations threshold of 500 annual operations. These aircraft types typically have higher utilization rates than smaller aircraft and rarely perform local operations. These aircraft types can represent the critical aircraft on their own, due to high utilization, or in combination with other aircraft with similar characteristics.

The airport's current commercial passenger airline, SeaPort Airlines, utilizes a single engine turboprop Pilatus PC-12. This aircraft falls within ACC-A and ADG-II. There are two based business jets at the airport, a Cessna Citation V and Cessna Citation XL. Both of these aircraft are within ACC-B and ADG-II. The airport is also home to several Beechcraft King Air turboprop aircraft which also fall within ACC-B and ADG-II.

Itinerant Aircraft

SLN is served by an airport traffic control tower (ATCT); however, the ATCT only logs aircraft operations by operational type, as air carrier, air taxi, general aviation, and military, but not by specific aircraft make and model. The FAA maintains the *Traffic Flow Management System Counts* (TFMSC) database. The TFMSC database documents certain aircraft operations at certain airports. Information is added to the TFMSC database when pilots file flight plans and/or when flights are detected in the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to factors, such as incomplete flight plans and limited radar coverage, TFMSC data cannot account for all aircraft activity at an airport. Therefore, there are more operations at an airport than are captured by the TFMSC. Nonetheless, this information provides a reasonable estimate allowing for a greater extrapolation of all airport activity.

Since air carrier and business jet aircraft are larger and faster, they will typically have a greater impact on airport design standards than smaller aircraft. The following analysis will focus on itinerant activity by jets at Salina Regional Airport. The TFMSC database is the primary source for business jet activity at the airport. A secondary source was also consulted: www.airportiq.com.

Exhibit 3B presents the TFMSC jet aircraft activity at Salina Regional Airport from 2002 through November 2012. As can be seen, the airport has experienced a wide variety of jet operations from small VLJ business jets to large commercial transport aircraft. In fact, most types and sizes of business jets can and do operate at the airport, while larger commercial aircraft operations are relatively limited.

From 2002 through 2012, the airport has experienced a high of 13,202 jet operations to a low of 4,182 in the 11 months of 2012. The lowest full year total was 5,272 in 2009. It appears that jet aircraft operations have been generally trending downward at the airport over the last 11 years; however, interestingly the opposite holds for air taxi operations as noted in the previous chapter. Air taxi operations are generally going to include a higher percentage of jet aircraft operations than will the general aviation operation category.

Again, the data presented by the TFMSC is not an absolute count as many operations do not get logged. Some flight plans are not credited to the airport because they are opened or closed in the air or because radar coverage is lost. The TFMSC does, however, provide a good base from which to draw conclusions for critical design aircraft operations.

The exhibit also shows the breakout of these business jets by approach category and airplane design group. Over the sam-

Salina Regional SLN Airport

ARC	Aircraft	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
A-I	Diamond 20	22	6	2	4	4		4	0	4	2	0
	Diamond Star DA40	2	2	4	6	0	0	0	0	0	0	0
	Diamond Twin Star	0	0	0	0	0	2	0	2	0	0	0
	Eclipse 500	0	0	0	0	0	0	26	38	54	72	86
Total Operations by A-I		24	8	6	10	4	2	30	40	58	74	86
B-I	Adams A 700	0	0	0	0	2	0	0	0	0	0	0
	Aérospatiale SN-601 Corvette	8	12	4	0	0	0	0	0	0	0	0
	Cessna Citation Citationjet	36	104	52	14	8	44	36	32	26	14	6
	Cessna Citation CJ1	684	564	490	492	464	458	378	304	332	230	154
	Cessna Citation CJ2	4	8	6	164	168	144	256	204	256	330	212
	Cessna Citation CJ3	0	0	0	0	0	0	2	4	4	12	22
	Cessna Citation I/SP	110	74	40	60	56	52	14	26	24	40	30
	Cessna Citation Mustang	0	0	0	0	4	12	6	18	66	38	40
	Dassault Falcon/Mystère 10	286	260	262	202	178	152	128	96	88	138	28
	Embraer Phenom 100	0	0	0	0	0	0	0	2	34	22	60
	MU30 - Mitsubishi MU300/ Diamond I	72	82	64	68	42	38	24	16	16	22	4
	North American Rockwell Sabre 40/60	136	176	88	34	56	48	38	36	42	18	10
	PRM1 - Raytheon Premier 1/390 Premier 1	32	22	10	18	204	236	194	120	114	142	116
	T1 - Fuji T1	0	4	0	166	270	198	88	38	4	0	0
Total Operations by B-I		1,368	1,306	1,016	1,218	1,452	1,382	1,164	896	1,006	1,006	682
B-II	Cessna Citation Excel/XLS	514	704	942	982	1,062	1,068	832	470	522	478	316
	Cessna Citation II/Bravo	852	696	596	478	336	370	288	210	160	244	210
	Cessna Citation II/SP	20	20	8	14	12	10	6	12	2	2	4
	Cessna Citation Sovereign	0	0	0	8	8	26	46	34	38	52	42
	Cessna Citation V/Ultra/Encore	1,228	976	1,152	1,132	1,124	986	662	478	624	422	398
	Dassault Falcon 2000	36	40	78	84	90	80	42	66	76	50	30
	Dassault Falcon 900	4	4	16	10	16	6	8	8	4	12	0
	Dassault Falcon/Mystère 20	264	382	288	342	316	430	270	210	348	158	146
	Dassault Falcon/Mystère 50	32	24	18	8	28	36	14	14	22	14	16
	Embraer Phenom 300	0	0	0	0	0	0	0	0	4	8	14
	Fairchild Dornier 328 Jet	0	0	2	0	2	6	0	2	0	0	0
Total Operations by B-II		2,950	2,846	3,100	3,058	2,994	3,018	2,168	1,504	1,800	1,440	1,176
C-I	BAe HS Hawker 400/600	312	224	136	96	78	68	44	24	24	16	22
	IAI 1121 Commodore	2	0	0	0	0	0	0	0	0	0	0
	Learjet 23/24/25/28	710	604	506	334	272	170	130	92	112	54	28
	Learjet 31/35/36	1,882	1,452	1,114	1,088	1,036	956	624	488	520	428	330
	LearJet 55	644	576	466	454	470	438	228	172	220	162	110
	North American Rockwell Sabre 75	2	0	4	0	0	0	0	0	0	0	0
	Raytheon/Beech Beechjet 400/T-1	1,636	1,300	1,232	1,014	660	662	560	446	480	544	400
	IAI 1123/4/5 Westwind	632	466	412	442	474	324	174	76	94	80	40
Total Operations by C-I		5,820	4,622	3,870	3,428	2,990	2,618	1,760	1,298	1,450	1,284	930
C-II	BAe HS Hawker 800	908	794	772	958	928	792	578	366	390	394	292
	BAe/Raytheon Hawker 1000	58	52	44	26	36	46	52	18	4	2	0
	Bombardier Challenger 300	0	0	2	4	2	10	18	6	8	10	8
	Bombardier Challenger 600/601/604	162	104	66	126	68	86	88	48	68	34	34
	Bombardier CRJ-100	0	0	12	8	6	2	0	0	2	0	0
	Bombardier CRJ-200	2	4	4	12	10	12	12	14	24	18	10
	Bombardier CRJ-700	4	0	2	2	0	0	0	4	0	0	0
	Cessna Citation III/VI/VII	768	734	490	532	490	404	334	296	246	190	148
	Cessna Citation X	58	122	84	106	132	122	148	74	68	108	60
	Embraer ERJ 135/140/Legacy	0	6	2	8	6	12	14	6	8	6	2
	Embraer ERJ-145	0	0	0	4	0	0	0	0	4	0	4
	Gulfstream III/G300	40	28	44	26	30	12	12	2	2	4	8
	IAI 1126 Galaxy	0	0	0	34	42	44	32	28	32	30	48
	Raytheon 4000 Hawker Horizon	2	2	4	4	2	2	0	0	0	0	0
Total Operations by C-II		2,002	1,846	1,526	1,850	1,752	1,544	1,288	862	856	796	614

ARC	Aircraft	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
C-III	Airbus A318/19/20/21	2	4	2	0	2	0	4	2	0	0	0
	Boeing (Douglas) DC 9	28	86	26	16	8	20	24	28	48	64	26
	Boeing (Douglas) MD 80 Series	28	20	12	6	10	8	0	0	2	4	0
	Boeing 717-200	0	0	0	0	0	0	0	0	0	2	0
	Boeing 727	86	32	12	122	10	14	4	6	22	14	6
	Boeing 737-200/VC96	32	78	34	16	6	6	12	6	12	4	2
	Boeing 737-300/400	26	42	30	14	16	18	14	2	0	4	0
	Boeing 737-600	0	0	2	12	4	4	2	0	0	0	0
	Boeing 737-700/800	12	4	10	0	2	8	8	4	18	4	4
	Bombardier BD-700 Global Express	6	4	2	4	2	2	6	4	4	4	6
	Bombardier CRJ-900	0	0	0	0	0	0	0	6	10	4	0
	Dassault Falcon F7X	0	0	0	0	0	0	0	2	12	14	2
	Douglas DC 9-10/30/50	94	46	28	30	18	16	14	0	2	0	0
	Embraer 170	0	0	0	0	2	0	0	0	0	0	0
	Fokker 100	0	0	32	2	0	2	0	0	0	0	0
	Fokker F-70	12	0	0	0	2	2	0	0	0	0	0
	Fokker F-28 Fellowship	10	14	6	0	0	0	0	0	0	0	0
Total Operations by C-III		336	330	196	222	82	100	88	60	130	118	46
C-IV	Airbus A300	0	0	0	0	0	0	0	2	2	0	2
	Airbus A310	0	0	0	0	0	0	0	4	6	0	0
	Boeing 707-300	0	12	2	4	10	8	0	0	2	0	0
	Canadair CL-44	0	0	0	0	0	0	2	0	0	0	0
	Douglas DC 8	0	0	0	0	0	0	0	0	0	0	24
	Lockheed L-1011 Tristar	2	0	2	0	0	0	0	0	0	0	0
Total Operations by C-IV		2	12	4	4	10	8	2	6	10	0	26
C-V	Boeing 777-200/300	2	2	0	0	0	0	0	0	0	0	0
Total Operations by C-V		2	2	0	0	0	0	0	0	0	0	0
D-I	Learjet 40/45	14	172	410	342	430	476	356	288	310	314	248
	Learjet 60	454	440	470	522	412	420	288	230	238	240	262
Total Operations by D-I		468	612	880	864	842	896	644	518	548	554	510
D-II	Gulfstream G150	0	2	2	0	0	0	6	6	12	16	8
	Gulfstream II/G200	118	76	60	48	56	68	26	42	2	16	8
	Gulfstream IV/G400	22	24	20	40	34	46	14	16	14	12	22
	Lockheed L-1329 Jetstar 731	66	50	60	26	30	4	0	0	0	0	0
	Lockheed L-1329 Jetstar 8	6	2	0	0	0	0	0	0	0	0	0
Total Operations by D-II		212	154	142	114	120	118	46	64	28	44	38
D-III	BAC 111	4	0	4	16	30	8	18	2	6	2	8
	Gulfstream V/G500	4	0	10	6	8	8	2	10	2	8	58
Total Operations by D-III		8	0	14	22	38	16	20	12	8	10	66
D-IV	Boeing (Douglas) DC 10-10/30/40	0	0	0	0	0	0	0	2	0	0	0
	Boeing (Douglas) MD 11	0	0	6	0	0	0	0	0	0	0	2
	Boeing 747-200	4	6	2	4	0	2	2	0	0	0	2
	Boeing 747-400	0	0	0	4	0	0	0	0	0	0	0
	Boeing 757-200/800	2	0	4	8	2	2	8	6	8	8	2
	Boeing 767-200/300	4	2	4	0	2	0	18	4	2	2	2
Total Operations by D-IV		10	8	16	16	4	4	28	12	10	10	8
D-V	Airbus A360	0	2	0	0	0	0	0	0	0	0	0
Total Operations by D-V		0	2	0	0	0	0	0	0	0	0	0
TOTAL JET OPERATIONS		13,202	11,748	10,770	10,806	10,288	9,706	7,238	5,272	5,904	5,336	4,182

Exhibit 3B
Historical Jet Aircraft Operations at SLN

ple period, 42 percent of the jet activity was by aircraft in approach category B, 47 percent in approach category C, and ten (10) percent in approach category D. Aircraft operations by AAC also varied with 53 percent of the activity by aircraft in AAC-I, 45 percent in AAC-II, two (2) percent in AAC-III, and 0.27 percent in AAC-IV. There were operations by aircraft in AAC-V but the values were very low, amounting to zero percent over the period.

A review of military aircraft was also conducted; however, these operations do not count toward the FAA critical aircraft design. The majority of military aircraft operations were conducted by fast and relatively small jet trainer and fighter aircraft such as the T-38 and F-18. Several larger military aircraft such as the C-130, C-135, C-17, and C-141 aircraft also operated at the airport on an infrequent basis over the sample period.

Runway 17-35 Design Aircraft

Salina Regional Airport experiences frequent business jet operations and irregular use by larger commercial transport aircraft. As such, the runway should be designed and planned to continue to accommodate these types of aircraft. Through November 2012, the TFMSC reported 4,182 jet operations for the airport; however, no singular jet aircraft accounted to 500 operations. The Beechjet 400 aircraft operated the most singularly at 400 operations, while the Cessna Citation V and Lear 31/35/36 models accounted for the second and third highest amount at 398 and 330 operations, respectively. Over the sample period, those three aircraft accounted for 28,034 total operations, which represented 30 percent of all jet aircraft operations for the period. The Beechjet 400 and Lear 30 models fall within ARC C-II, while the Citation V is a B-II aircraft.

Based on summary tables presented on **Exhibit 3B**, total jet operations by AAC B, C, and D exceed the critical design aircraft threshold of 500 annual operations. For ADG, historical operations by aircraft in ADG I and II have exceed the threshold. As such, the minimum runway design for Runway 17-35 should be RDC D-II, which combines AAC D with ADG II.

The current ALP for the airport defines Runway 17-35 as an ARC C-III. According to the TFMSC data, operations by aircraft in ADG III have not exceeded the 500 operational threshold; however, the airport has averaged 175 operations by ADG III aircraft since 2002. While this does not meet the design threshold, it is considerable. Unless there is a discernible decreasing trend in operations by aircraft in this category, an airport should not be downgraded. In fact, the opposite is true for Salina Regional Airport where historical trends indicate that operations by ADG III aircraft will continue in the future. **Therefore, this master plan will utilize an existing RDC of D-II and C-III for Runway 17-35. Typically, the two standards are combined to consider an existing RDC of D-III.**

Runway 12-30 Design Aircraft

A crosswind runway primarily functions to provide an alternate runway for periods when wind conditions do not favor the primary runway orientation. The FAA stipulates that the primary runway should be capable of providing 95 percent or more crosswind coverage for all aircraft types. If the primary runway does not provide 95 percent or greater coverage, a crosswind runway is recommended. Analysis to be presented later in this chapter indicates the primary Runway 17-35 does not fully conform to the FAA crosswind coverage standard. As such, the availability of at least one crosswind runway is justified.

Runway 12-30 is the airport's primary crosswind runway. It serves the needs of all airport operations when winds dictate or when the primary runway is closed due to maintenance, snow/ice, or other reasons. Moreover, the runway is also certified for commercial airline operations. As such, the runway should be capable of meeting the needs of the majority of aircraft operating at the airport.

The current ALP for the airport defines Runway 12-30 as an ARC C-II facility (Note: The new AC would classify Runway 12-30 as RDC C-II). As presented earlier, the airport is utilized by a wide variety of aircraft with business jets in ARC groupings C-II and D-I having the highest operational totals by grouping. The airport's commercial airline, SeaPort Airlines, operates a Pilatus PC-12 which falls in ARC A-II. Most regional airline turboprop aircraft fall within ARC B-II and regional jets in ARC C-II. **Therefore, this master plan will consider an existing RDC of C/D-II for Runway 12-30.**

Runway 18-36 Design Aircraft

Typically, a parallel runway is provided only if annual aircraft operations exceed 80 percent of the airport's annual service volume (ASV). The ASV is a calculated number which generally represents the operational capacity of a runway. It is the point at which operational delays due to congestion become exponential. Parallel Runway 18-36 was not constructed due to capacity; however, it was constructed to provide Kansas State University-Salina with a stand-alone training runway. It is also the runway designated for use by Unmanned Aircraft System (UAS) operations.

The current ALP indicates that Runway 18-36 is currently designed to RDC B-II design standards. This category is inclusive of all aircraft which utilize the runway in support of KSU and UAS training operations. **Therefore, Runway 18-36 currently falls within RDC B-II.**

Runway 4-22 Design Aircraft

Runway 4-22 is a secondary crosswind runway that provides the lowest wind coverage of the airport's three runway orientations. This runway is not currently eligible for FAA grant funding; therefore, the airport sponsor must provide direct funding for the maintenance of this runway. The current alignment of the runway, wedged between Runway 17-35 and Runway 12-30, presents airfield design flaws to be discussed later. **The current ALP indicates that Runway 4-22 falls in ARC B-II design which is adequate to meet existing demand**.

FUTURE DESIGN AIRCRAFT

Since 2002, total jet activity has averaged 8,587 operations per year; however, the trend has been generally decreasing over the period. Over the last five years, jet operations at SLN have averaged 5,586 per year. As a reminder, the TFMSC for 2012 did not include the full 12 months as data was only available through November at the time of writing this report.

SLN has exhibited a long term trend of high jet aircraft activity. The majority of those operations were conducted by business jets; however, larger commercial airline transport aircraft have also utilized the airport on an infrequent basis.

The recent decreasing operational trend can be directly attributed to the national economic recessions. It is reasonable to assume that trend will reverse as the economy continues to recover.

The aviation demand forecasts indicate the potential for continued growth in jet activity at the airport. This includes a forecast of eight (8) based business jets by the long term planning horizon. The type and size of jet aircraft using the airport regularly can impact the design standards to be applied to the airport system. Therefore, it is important to have an understanding of what type of aircraft may use the airport in the future. Factors such as population and employment growth in the airport service area, the proximity and level of service of other regional airports, and development at the airport can influence future activity.

In 2001, approximately 47 percent of business jets manufactured were in approach category B with the remaining 53 percent being larger business jets in approach categories C and D. By 2011, only 40 percent manufactured were in approach category B and 60 percent were in approach categories C and D as shown in **Table 3B**. Thus, the trend in business jet manufacturing is toward larger aircraft. This trend provides an indication that the airport should at least maintain ARC C/D-III design standards through the long term planning period. Representative business jet aircraft in ARC C/D-III include the Gulfstream V, Global Express, and Boeing Business Jet.

TABLE 3B
Business Jet Deliveries by ARC for 2001 and 2011

ARC	2001 Business Jets Manufactured	Percent	2011 Business Jets Manufactured	Percent
B-I	104	13%	92	14%
B-II	265	34%	177	26%
Total B-II and Smaller	**369**	**47%**	**269**	**40%**
C-I	17	2%	5	1%
C-II	185	24%	201	30%
C-III	50	6%	73	11%
D-I	92	12%	43	6%
D-II	36	5%	0	0%
D-III	35	4%	90	13%
Total C-I and Larger	**415**	**53%**	**412**	**60%**
TOTAL	**784**		**681**	

Source: General Aviation Manufacturers Association

The trend toward manufacturing of a larger percentage of medium and large business jets, those in approach categories C and D, may lead to greater utilization of these aircraft at Salina Regional Airport. Moreover, the airport will continue to be utilized by large transport aircraft as has been the case in the past. **Table 3C** presents a forecast estimate of future jet aircraft operations by AAC and ADG at Salina Regional Airport.

TABLE 3C
Jet Operations Forecast By Design Category
Salina Regional Airport

	HISTORICAL JET OPERATIONS*				FORECAST JET OPERATIONS			
Design Categories	**2002**	**Percent**	**2011**	**Percent**	**Short Term**	**Inter. Term**	**Long Term**	**2032 Percent**
Approach Category A	24	0.2%	74	1.4%	95	140	270	2.00%
Approach Category B	4,318	32.7%	2,446	45.8%	2,770	3,670	5,280	40.00%
Approach Category C	8,162	61.8%	2,198	41.2%	2,710	3,320	5,940	45.00%
Approach Category D	698	5.3%	618	11.6%	725	970	1,710	13.00%
Total	**13,202**	**100%**	**5,336**	**100.0%**	**6,300**	**8,100**	**13,200**	**100%**
Airplane Design Group I	7,680	58.2%	2,918	54.7%	3,420	4,210	6,465	49.00%
Airplane Design Group II	5,164	39.1%	2,280	42.7%	2,710	3,630	6,210	47.00%
Airplane Design Group III	344	2.6%	128	2.4%	155	240	500	0.48%
Airplane Design Group IV	12	0.1%	10	0.2%	15	20	25	0.20%
Airplane Design Group V	2	0.0%	0	0.0%	0	0	0	0.00%
Total	**13,202**	**100.0%**	**5,336**	**100%**	**6,300**	**8,100**	**13,200**	**100%**

**Traffic Flow Management System Counts (TFMSC) - FAA activity database.*

Jet aircraft operations are forecast to increase from approximately 5,336 in 2011, the most recent full data year, to approximately 6,300 within five years. The majority of these operations are anticipated by those jets in aircraft approach categories B and C and ADG I and II. Over time, operations by business jets in aircraft approach categories C and D are anticipated to represent majority larger share. **Therefore, the future critical design aircraft for primary Runway 17-35 is projected to remain in RDC C/D-III.**

Crosswind Runway 12-30 serves as a vital secondary runway for periods of high crosswinds and for when the primary runway is closed. As such, it should be fully capable of meeting the needs of most aircraft operations. Since business jets are the most demanding of these operations, the runway should be capable of meeting the needs of regular users. Based on the information presented earlier, business jets in ARC C-II and D-I are the most common and most demanding. **As such, Runway 12-30 should continue to conform with RDC C/D-II standards in the future.**

Parallel Runway 18-36 is designed to primarily accommodate small aircraft and UAS operations by KSU Salina. Current operations at the airport do not justify the need for a parallel runway for capacity reasons; however, the runway does meet a need and should remain in current form as long as the Airport Authority can fund its operation. **Runway 18-36 is recommended to be maintained utilizing design standards associated with RDC B-II**.

As mentioned earlier, Runway 4-22 provides the least favorable wind coverage of the four-runway system. Discussions with the ATCT indicate that the runway is utilized fewer than 100 times per year. The runway layout presents design flaws which would need to be corrected at some point in the future to meet FAA standards. Finally, the runway is not eligible for FAA grant funding and must be maintained solely with local funding resources. As a result, this master plan is recommending the ultimate closure of Runway 4-22. Closure of the runway would not deplete airfield capacity. Moreover, the Airport Authority would realize a cost savings for simple operation as well as the capital expenditures which will be required to improve the runway to FAA standards.

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** measures the maximum number of aircraft operations that can take place in an hour. Very rarely will any runway reach its absolute capacity, so this measuring tool is not an effective way to determine airfield needs. The airfield **annual service volume (ASV)** is an annual level of service that is used to define airfield congestion and delay as a runway nears its hourly capacity. The airfield's calculated ASV is not the point at which gridlock occurs; rather, it is the point at which operational delays become exponential. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield. These various factors are depicted in **Exhibit 3C**. The following describes the input factors as they relate to Salina Regional Airport.

- **Runway Configuration** – Primary Runway 17-35 is 12,300 feet long and 150 feet wide. Runway 12-30, the primary crosswind runway, is 6,510 feet in long and 100 feet wide. Runways 17-35 and 12-30 do not intersect; however, Runway 12-30 and Runway 18-36 do intersect at the northwestern third of Runway 12-30. Parallel Runway 18-36 is 4,300 feet long and is located more than 4,000 feet west of the primary runway. Runway 4-22 is not being considered in the capacity analysis because it is so infrequently used and is being considered for closure.

- **Runway Use** – Runway use will be controlled by wind and/or airspace conditions. The direction of takeoffs and landings are generally determined by the speed and direction of the wind. It is generally safest for aircraft to take-off and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components. Runway 17-35 is utilized the most, estimated at more than 70 percent of the time. The availability of instrument approaches is also considered. Runway 17-35 is primarily utilized in instrument weather conditions unless crosswinds dictate the use of Runway 12-30. Runways 18-36 and 4-22 are visual, daytime runways only and are not served by instrument approaches or runway lighting.

- **Exit Taxiways** – Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determines the occupancy time of an aircraft on the runway. For Salina Regional Airport, those taxiway exits (located between 2,000 and 4,000 feet from the runway threshold) count in the capacity determination. Landings to each end of Runway 17-35 have one exit credited. Landings to Runways 12-30 and 18-36 do not have exits.

- **Weather Conditions** – The airport operates under visual flight rules (VFR) 87.80 percent of the time. When cloud ceilings are between 500 and 1,000 feet and visibility is between one and three miles, IFR conditions apply, which is approximately 7.40 percent of the year. Poor visibility conditions

(PVC) apply when cloud ceilings are below 500 feet and visibility is below one mile. PVC conditions occur 4.80 percent of the year. **Table 3D** summarizes the weather conditions between 2001 and 2011.

TABLE 3D
Annual Weather Conditions
Salina Regional Airport

Condition	Cloud Ceiling	Visibility	Observations	Percent
Visual (VFR)	>1,000'	> 3 mi.	88,215	87.80%
Instrument (IFR)	≤ 1,000' and > 500'	≤ 3 mi. and Vis > 1 mi.	7,401	7.40%
Poor Visibility (PVC)	≤ 500'	≤ 1 mi.	4,810	4.80%
		TOTAL	**100,426**	**100.00%**

Source: National Oceanic and Atmospheric Administration (NOAA). Ten years of data from 2001-2010 as obtained from the SLN weather reporting station.

- **Aircraft Mix** – Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of small and medium-sized propeller and some jet aircraft, all weighing 12,500 pounds or less. These aircraft are associated primarily with general aviation activity, but do include some air taxi, air cargo, and commuter aircraft. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds, which include most business jets and some turboprop aircraft. Class D aircraft consists of large aircraft weighing more than 300,000 pounds. The airport generally does not experience operations by Class D aircraft on a basis for use in this analysis; however, Class C operations are estimated to be 5.5 percent of total annual operations. This is forecast to grow to approximately ten (10) percent by the long term planning period. The remaining are operations by Class A and Class B aircraft.

- **Percent Arrivals** – Percent arrivals generally follow the typical 50/50 percent split.

- **Touch-and-Go Activity** – Approximately 60 percent of general aviation operations are considered touch-and-go in nature. Forecasts for touch-and-go operations are to remain at approximately 60 percent throughout the planning period.

- **Peak Period Operations** – For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month, as calculated in the previous chapter, are utilized. Typical operations activity is important in the calculation of an airport's annual service volume as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year.

Given the factors outlined above, the current airfield ASV is estimated at 360,000 operations. This considers the parallel runways and a crosswind runway. The ASV does not indicate a point of absolute gridlock for the airfield; however, it does represent the point at which operational delay for each aircraft operation will increase exponentially. The current operation level estimated for Salina Regional Airport represents 26.85 percent of the airfield's ASV. By the end of the planning period, total annual operations are ex-

AIRFIELD LAYOUT

Runway Configuration


Runway Use


Number of Exits

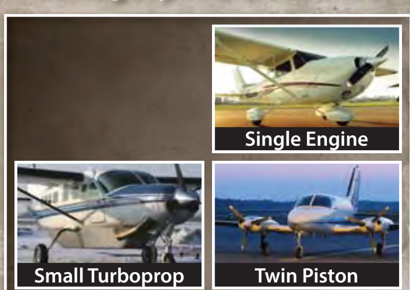

WEATHER CONDITIONS

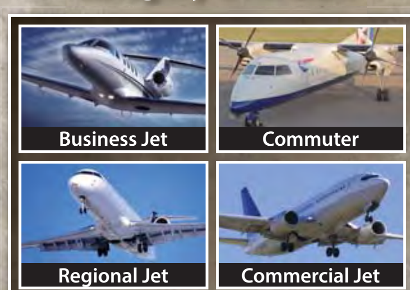
VMC
Visual Meteorological Conditions


IMC
Instrument Meteorological Conditions


PVC
Poor Visibility Conditions

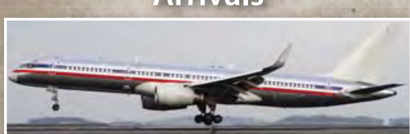

AIRCRAFT MIX

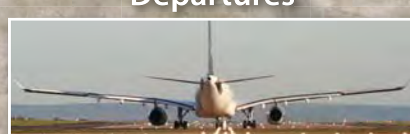
Category A & B Aircraft


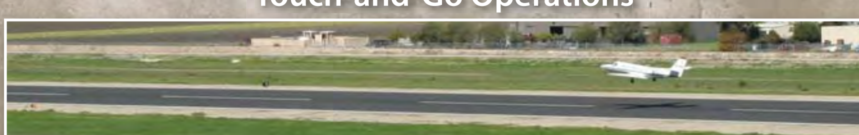
Category C Aircraft


Category D Aircraft


OPERATIONS

Arrivals


Departures


Touch-and-Go Operations


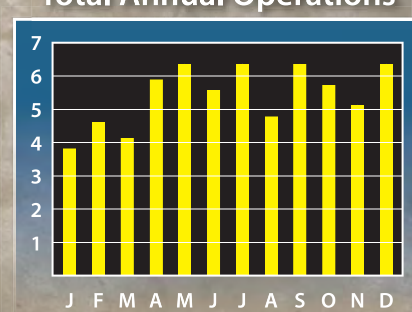
Total Annual Operations


Exhibit 3C
Airfield Capacity Factors

pected to represent 37.96 percent of the airfield's ASV. **Table 3E** summarizes the capacity analysis for Salina Regional Airport.

TABLE 3E
Airfield Demand/Capacity Summary
Salina Regional Airport

	PLANNING HORIZON			
	Current	**Short Term**	**Intermediate Term**	**Long Term**
Operational Demand				
Annual	96,663	106,530	116,077	134,769
Design Hour	45	49	54	63
Capacity				
Annual Service Volume	360,000	359,000	358,000	355,000
Percent Capacity	26.85%	29.67%	32.42%	37.96%
Delay				
Per Operation (Minutes)	0.2	0.2	0.3	0.4
Total Annual (Hours)	322	355	580	898

Source: FAA AC 150/5060-5, Airport Capacity and Delay

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. This is an approximate level to begin the detailed planning of capacity improvements. At the 80 percent level, the planned improvements should be under design or construction. Based on current and projected operations developed for this study, improvements specifically designed to enhance capacity are not necessary during the 20-year scope of this master plan.

AIRFIELD REQUIREMENTS

As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. These components include:

- Runway Configuration
- Safety Area Design Standards
- Runways
- Taxiways
- Navigational Approach Aids
- Lighting, Marking, and Signage

RUNWAY CONFIGURATION

The airport is currently served by a four-runway system including two parallel and two crosswind runways. Primary Runway 17-35 and parallel Runway 18-36 are orientated in a north and south manner. Runway 12-30, the primary crosswind runway, is oriented in a northwest to southeast manner. Runway 4-22 is a secondary crosswind runway and is oriented in a southwest to northeast manner.

For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off.

FAA Advisory Circular 150/5300-13A, *Airport Design,* recommends that a crosswind runway be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of not exceeding 10.5 knot (12 mph) component for RDC A-I and B-I, 13 knot (15 mph)component for RDC A-II and B-II, and 16 knots (18 mph) component for RDC A-III, B-III, C-I through C-III, and D-I through D-III.

Weather data specific to the airport was obtained from the National Oceanic Atmospheric Administration (NOAA) National Climatic Data Center. This data was collected from SLN weather reporting station over a continuous 10-year period from 2001 to 2011. A total of 100,426 observations of wind direction and other data points were made.

In all-weather conditions, Runway 17-35 and Runway 18-36 provide 92.78 percent wind coverage for 10.5 knot crosswinds, 96.24 percent coverage at 13 knots, and 98.68 percent at 16 knots. Crosswind Runway 12-30 provides for 84.19 percent wind coverage at 10.5 knots, 91.62 percent at 13 knots, and 97.14 percent at 16 knots. Runway 4-22 provides 76.38 percent wind coverage for 10.5 knot crosswinds, 85.39 percent coverage at 13 knots, and 93.47 percent at 16 knots. The combined runway system all-weather wind coverage at 10.5 knots is 99.76 percent.

Under instrument flight rule (IFR) conditions, the crosswind component coverages for the primary runway alignment decreases. Runways 17-35 and 18-36 remain the best orientations for wind coverage; however, Runway 12-30 actually provides higher crosswind coverage for 13 and 16 knot components than it does for all-weather conditions **Exhibit 3D** presents both the all-weather and IFR windrose for the airport.

The airport should maintain, at a minimum, a two-runway system, as no single runway orientation provides the full 95 percent wind coverage. The crosswind runway should, at a minimum, meet the design standards for aircraft in RDC A/B-I. As discussed previously, Runway 12-30 should be maintained as the crosswind runway and Runway 4-22 should be planned for ultimate closure once its useful life expires or if the FAA requires it to meet geometrical design standards.

RUNWAY DESIGN STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ).

The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. The RPZ should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensure the RPZ remains free of incompatible development. The various airport safety areas are presented on **Exhibit 3E**.

Dimensional standards for the various safety areas associated with the runways are a function of the type of aircraft ex-

ALL WEATHER WIND COVERAGE

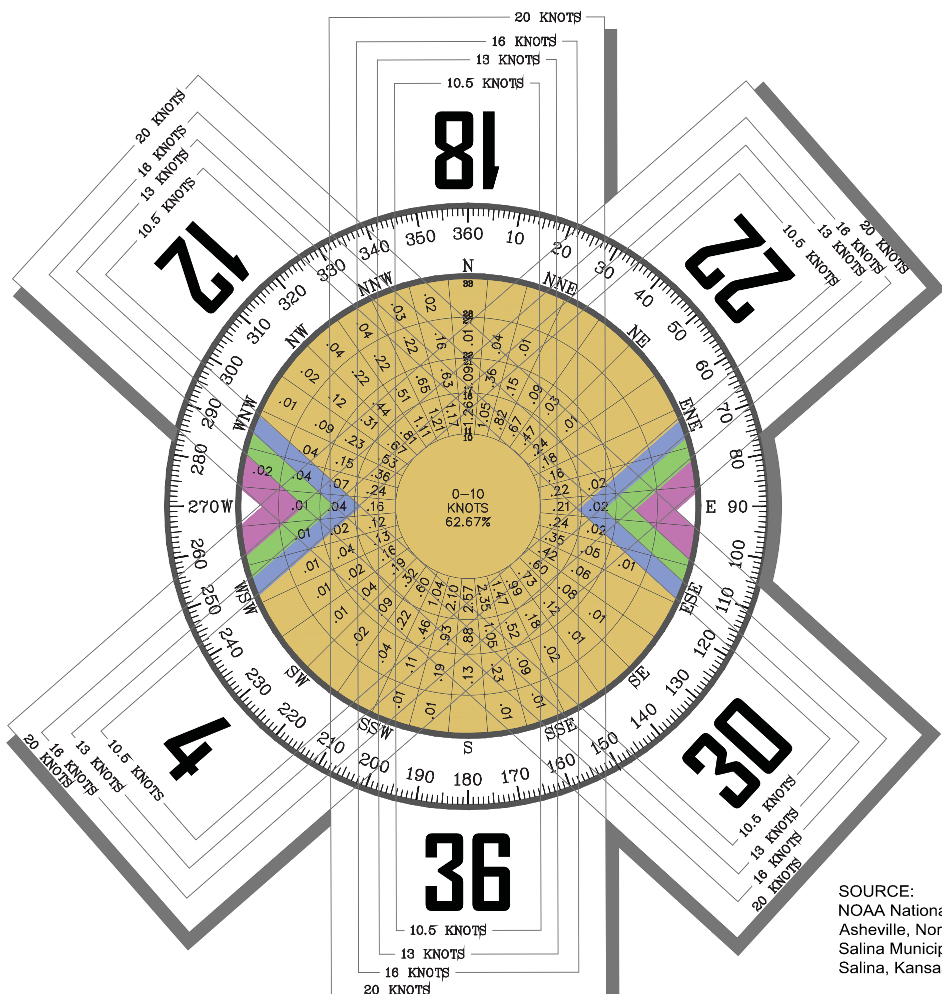
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 17-35	92.78%	96.24%	98.68%	99.63%
Runway 12-30	84.19%	91.62%	97.14%	99.39%
Runway 4-22	76.38%	85.39%	93.47%	97.88%
Runway 18-36	92.78%	96.24%	98.68%	99.63%
Combined Runway 17-35 & 12-30	98.28%	99.44%	99.86%	99.96%
Combined Runway 17-25, 12-30, 4-22, & 18-36	99.76%	99.94%	99.98%	100.00%

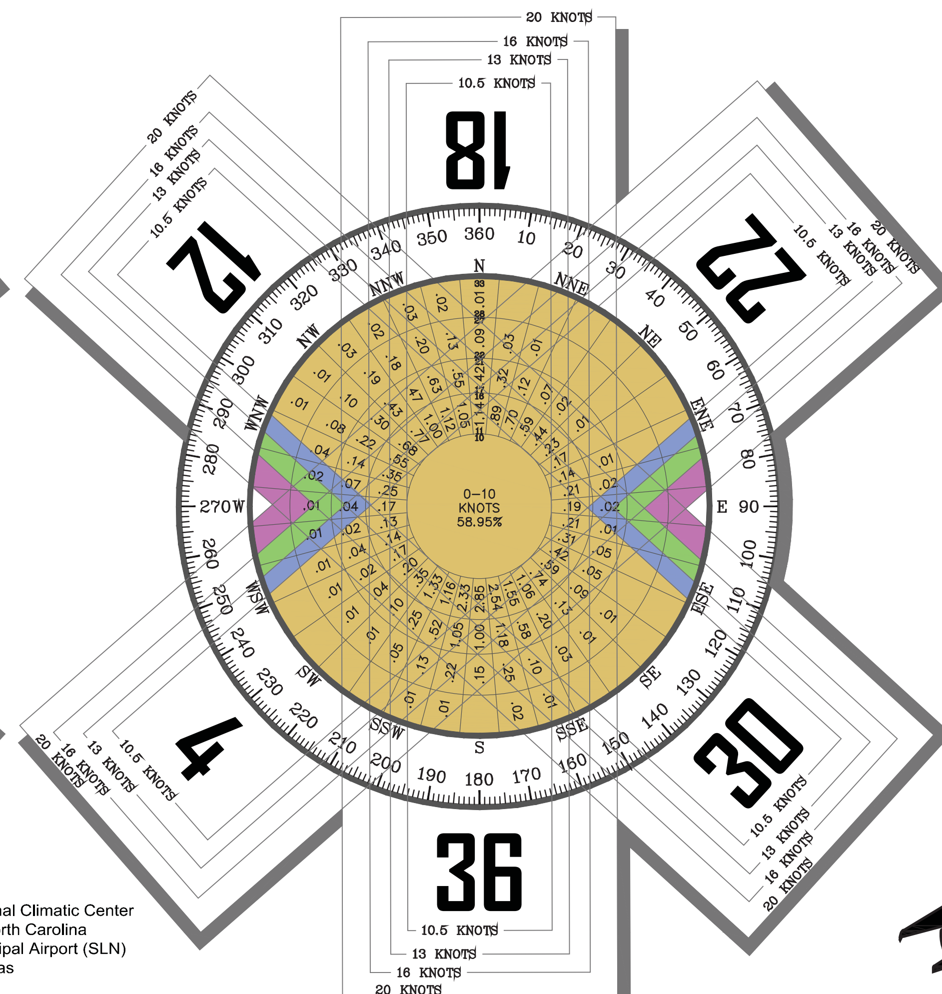
VFR WIND COVERAGE

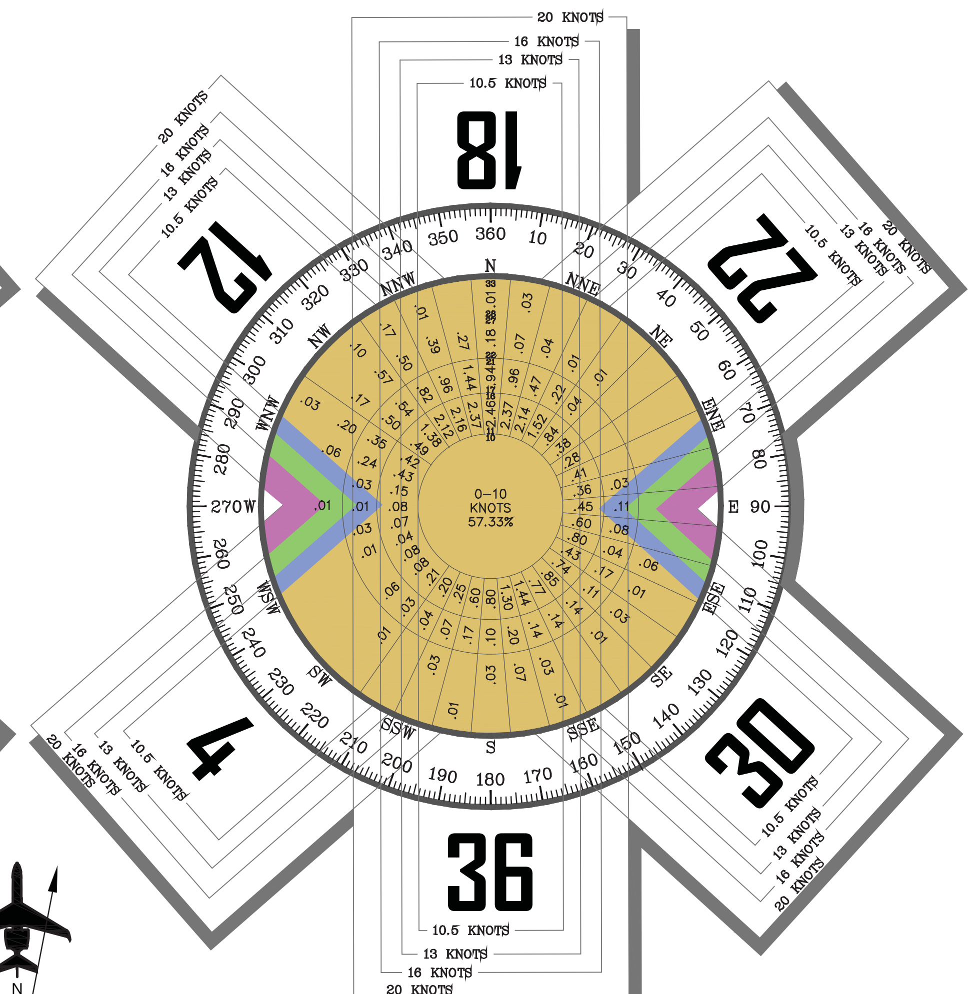
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 17-35	93.03%	96.43%	98.79%	99.68%
Runway 12-30	83.87%	91.42%	97.02%	99.37%
Runway 4-22	76.34%	85.48%	93.61%	98.05%
Runway 18-36	93.03%	96.43%	98.79%	99.68%
Combined Runway 17-35 & 12-30	98.30%	99.44%	99.86%	99.96%
Combined Runway 17-25, 12-30, 4-22, & 18-36	99.77%	99.95%	99.99%	100.00

IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 17-35	89.80%	94.06%	97.73%	99.30%
Runway 12-30	83.98%	91.77%	97.65%	99.58%
Runway 4-22	72.38%	82.31%	91.46%	96.50%
Runway 18-36	89.81%	94.06%	97.73%	99.31%
Combined Runway 17-35 & 12-30	98.01%	99.39%	99.88%	99.96%
Combined Runway 17-25, 12-30, 4-22, & 18-36	99.63%	99.92%	99.97%	100.00%





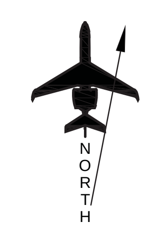


SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Salina Municipal Airport (SLN)
Salina, Kansas

OBSERVATIONS:
100,426 All Weather Observations
2001-2010

88.215 VFR Observations
2001-2010

7,160 IFR Observations
2001-2010



Magnetic Declination
4° 15'39" East (January 2012)
Annual Rate of Change
00° 07.9' West (January 2013)

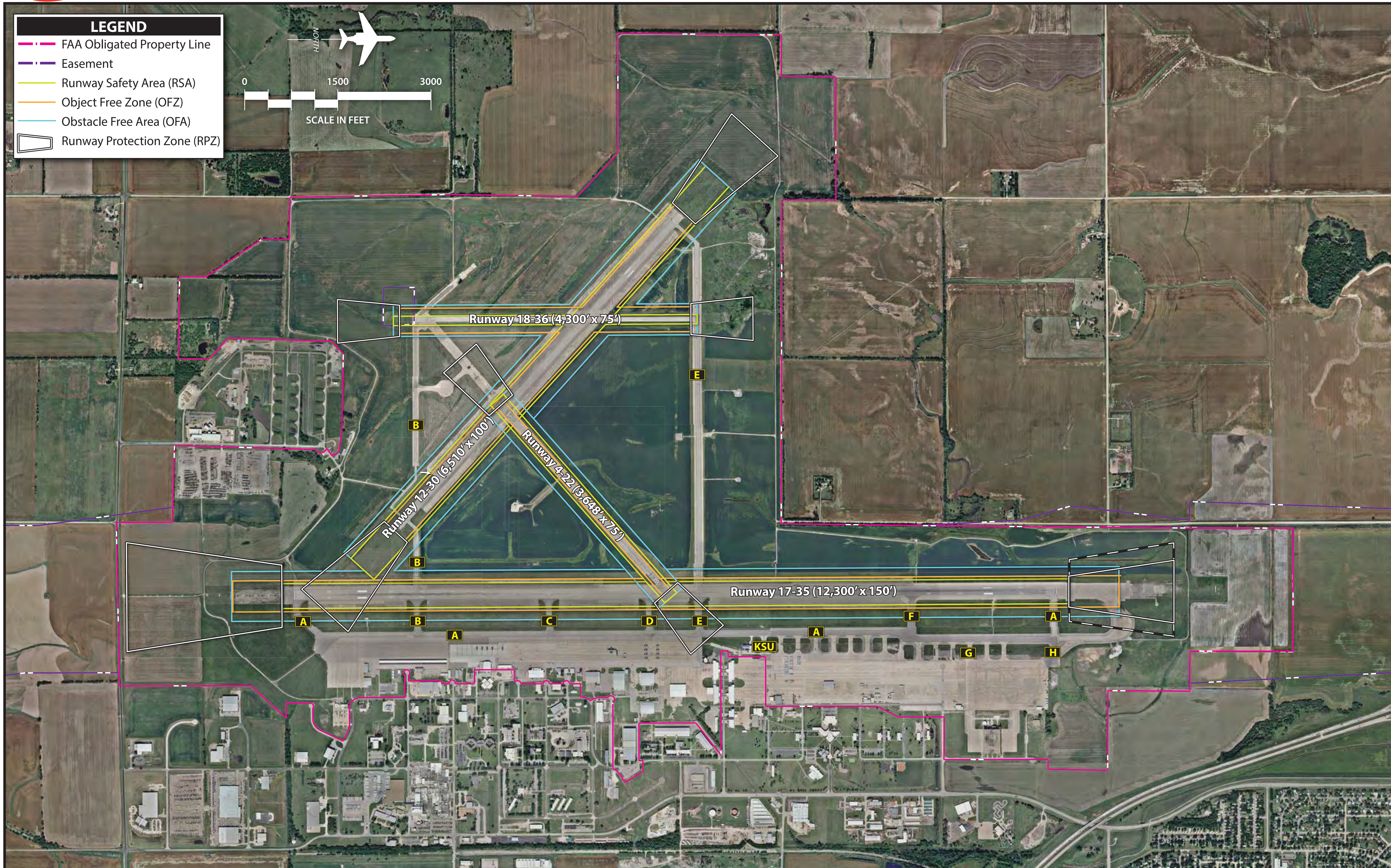


Exhibit 3E
Airfield Safety Areas

pected to use the runways as well as the instrument approach capability. **Table 3F** presents the FAA design standards as they apply to the runways at Salina Regional Airport.

TABLE 3F
Runway Design Standards
Salina Regional Airport

	Runway 17-35	Runway 12-30	Runway 18-36*
Runway Design Code	C/D-III	C/D-II	B-II
Visibility Minimums (in miles)	1 (17)/ ½ (35)	1	Visual
RUNWAY DESIGN			
Runway Width	150	100	75
Runway Shoulder Width	25	10	10
RUNWAY PROTECTION			
Runway Safety Area (RSA)			
Width	500	500	150
Length Beyond Departure End	1,000	1,000	300
Length Prior to Threshold	600	600	300
Runway Object Free Area (ROFA)			
Width	800	800	500
Length Beyond Departure End	1,000	1,000	300
Length Prior to Threshold	600	600	300
Runway Obstacle Free Zone (ROFZ)			
Width	400	400	400
Length Beyond End	200	200	200
Precision Obstacle Free Zone (POFZ)			
Width	800 (35)	NA	NA
Length	200 (35)	NA	NA
Approach Runway Protection Zone (RPZ)			
Length	1,700/2,500	1,700	1,000
Inner Width	1,000/1,000	500	500
Outer Width	1,510/1,750	1,010	700
Departure Runway Protection Zone (RPZ)			
Length	1,700	1,700	1,000
Inner Width	500	500	500
Outer Width	1,010	1,010	700
RUNWAY SEPARATION			
Runway Centerline to:			
Holding Position	250	250	200
Parallel Taxiway	400	300	240
Aircraft Parking Area	500	400	250

* These design standards also apply to Runway 4-22 currently
Note: All dimensions in feet
Source: FAA AC 150/5300-13A, Airport Design

Runway Safety Area (RSA)

The RSA is defined in FAA Advisory Circular (AC) 150/5300-13A, *Airport Design,* as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance to the approach speed of the critical design aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose such as runway edge lights or approach lights.

The FAA has placed a higher significance on maintaining adequate RSA at all airports. Under Order 5200.8, effective October 1, 1999, the FAA established the *Runway Safety Area Program.* The Order states, "The objective of the Runway Safety Area Program is that all RSAs at federally-obligated airports…shall conform to the standards contained in Advisory Circular 150/5300-13, *Airport Design*, to the extent practicable." Each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSA for each runway at the airport and perform airport inspections.

The RSA standards are met for all runways at Salina Regional Airport; however, the Runway 4-22 RSA extends atop Runway 17-35 and Runway 12-30. This is the design flaw previously mentioned. The FAA recommends that the RSA should not extend atop another runway if possible. As such, the remedy would be to shorten both ends of the runway, extend both ends of the runway through the other runways, or a combination of shortening/extending. These options would be impractical. Shortening the runway would reduce the utility of the runway, while extending would be costly and would not be eligible for grant funds requiring the Airport Authority to fund the entire project. For these reasons alone, the runway should be closed if the FAA mandates that the RSA not overlap the other runways.

Runway Object Free Area (ROFA)

The runway OFA is "a two-dimensional ground area, surrounding runways, taxiways, and taxilanes, which is clear of objects except for objects whose location is fixed by function (i.e., airfield lighting)." The OFA does not have to be graded and level like the RSA; instead, the primary requirement for the OFA is that no object in the OFA penetrates the lateral elevation of the RSA. The runway OFA is centered on the runway, extending out in accordance to the critical design aircraft utilizing the runway.

The OFA standards are met for all runways at Salina Regional Airport.

Runway Obstacle Free Zone (ROFZ)

The OFZ is an imaginary volume of airspace which precludes object penetrations, including taxiing and parked aircraft. The only allowance for OFZ obstructions is navigational aids mounted on frangible bases which are fixed in their location by function, such as airfield signs. The OFZ is established to ensure the safety of aircraft operations. If the OFZ is obstructed, the airport's approaches could be removed or approach minimums could be increased.

The OFZ standards are met for all runways at Salina Regional Airport.

A precision obstacle free zone (POFZ) is further defined for runway ends with a precision approach, such as the instrument landing system (ILS) approach to Runway 35. The POFZ is 800 feet wide, centered on the runway, and extends from the runway threshold to a distance of 200 feet. The POFZ is in effect when the following conditions are met:

a) The runway supports a vertically guided approach.
b) Reported ceiling is below 250 feet and/or visibility is less than ¾-mile.
c) An aircraft is on final approach within two miles of the runway threshold.

When the POFZ is in effect, a wing of an aircraft holding on a taxiway may penetrate the POFZ; however, neither the fuselage nor the tail may infringe on the POFZ. POFZ standards are met for Runway 35 at Salina Regional Airport.

Runway Protection Zones (RPZ)

The RPZ is a trapezoidal area centered on the runway, typically beginning 200 feet beyond the runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses, in order to enhance the protection of people and property on the ground. The RPZ is comprised of the central portion of the RPZ and the controlled activity area. The central portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway, and is the width of the ROFA. The controlled activity area is any remaining portions of the RPZ. The dimensions of the RPZ vary according to the visibility minimums serving the runway and the type of aircraft (design aircraft) operating on the runway.

While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 159/5300-13A, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements,
- Irrigation channels as long as they do not attract birds,
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator,
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable, and
- Unstaffed navigational aids (NAVAIDs) and facilities, such as required for airport facilities that are fixed by function in regard to the RPZ.

Any other land uses considered within RPZ land owned by the airport sponsor must be evaluated and approved by the FAA Office of Airports. The FAA has published *Interim Guidance on Land Uses within a Runway Protection Zone* (9.27.2012), which identifies several potential land uses that must be evaluated and approved prior to implementation. The specific land uses requiring FAA evaluation and approval include:

- Buildings and structures (Examples include, but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)
- Recreational land use (Examples include, but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.)

- Transportation facilities. Examples include, but are not limited to:
- Rail facilities - light or heavy, passenger or freight
- Public roads/highways
- Vehicular parking facilities
- Fuel storage facilities (above and below ground)
- Hazardous material storage (above and below ground)
- Wastewater treatment facilities
- Above-ground utility infrastructure (i.e., electrical substations), including any type of solar panel installations.

The *Interim Guidance on Land within a Runway Protection Zone* states, "RPZ land use compatibility also is often complicated by ownership considerations. Airport owner control over the RPZ land is emphasized to achieve the desired protection of people and property on the ground. Although the FAA recognizes that in certain situations the airport sponsor may not fully control land within the RPZ, the FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses."

Currently, the RPZ review standards are applicable to any new or modified RPZ. The following actions or events could alter the size of an RPZ, potentially introducing an incompatibility:

- An airfield project (e.g., runway extension, runway shift),
- A change in the critical design aircraft that increases the RPZ dimensions,
- A new or revised instrument approach procedure that increases the size of the RPZ, and/or
- A local development proposal in the RPZ (either new or reconfigured).

Since the Interim guidance only addresses new or modified RPZ, existing incompatibilities are essentially grandfathered under certain circumstances. While it is still necessary for the airport sponsor to take all reasonable actions to meet the RPZ design standard, FAA funding priority for certain actions, such as relocating existing roads in the RPZ, will be determined on a case by case basis.

As depicted on **Exhibit 3E**, all existing and future RPZs at SLN are fully contained on airport property. None of the RPZs extend over incompatible land uses, including public roadways. As such, SLN meets FAA requirements for RPZ.

Runway/Taxiway Separation

The design standards for the separation between runways and parallel taxiways are a function of the critical design aircraft and the instrument approach visibility minimum. The separation standard for RDC C/D-III with ½-mile visibility minimums is 400 feet from the runway centerline to the parallel taxiway centerline. This standard applies to parallel Taxiway A. Taxiway A far exceeds this standard being more than 600 feet from the runway.

The other three runways are not currently served by a parallel taxiway. If Runway 12-30 is to be served by a precision approach in the future, a parallel taxiway is required. Due to the cost of construction and difficult airfield geometry, a parallel taxiway for Runway 12-30 may be considered for the future but may not be implemented. Runways 18-36 and 4-22 do not need a parallel taxiway.

Agricultural Separation Standards

The FAA has developed separation standards between agricultural activities that occur on or adjacent to airport property and certain airport features, including runways, taxiways and aprons. To meet standard, the crop line can be no closer than the runway OFA

RUNWAYS

The adequacy of the existing runway system at Salina Regional Airport has been analyzed from a number of perspectives, including runway orientation and adherence to safety area standards. From this information, requirements for runway improvements were determined for the airport. Runway elements, such as length, width, and strength, are now presented.

Runway Length

The determination of runway length requirements for the airport is based on five primary factors:

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient
- Critical aircraft type expected to use the runway
- Stage length of the longest nonstop destination (specific to larger aircraft)

The mean maximum daily temperature of the hottest month for Salina Regional Airport is 93.3 degrees Fahrenheit (F), which occurs in July. The airport elevation is 1,287.7 feet above mean sea level (MSL). The runway elevation difference is 25.2 feet for Runway 17-35, 7.5 feet for Runway 12-30, and 7.0 feet for Runway 18-36. The gradient of all runways conform to FAA design standards for gradient.

A review of jet aircraft origination and destination information obtained from AirportIQ indicates that aircraft depart from SLN to a wide variety of locations across the United States. Common departure cities include Los Angeles, San Francisco, Baltimore/Washington, D.C., and New York City area airports. Aircraft stage lengths can vary but a reasonable maximum to consider would be the distance to reach both coasts non-stop, approximately 1,200 miles to New York and 1,100 miles to Los Angeles/San Francisco.

Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. Airplanes operate on a wide variety of available runway lengths. Many factors will govern the suitability of those runway lengths for aircraft such as elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Airport operators can pursue policies that can maximize the suitability of the runway length. Policies, such as area zoning and height and hazard restricting, can protect an airport's runway length. Airport ownership (fee simple or easement) of land leading to the runways ends can reduce the possibility of natural growth or man-made obstructions. Planning of runways should include an evaluation of aircraft types expected to use the airport, or a particular runway now and in the future. Future plans should be realistic and supported by the FAA approved forecasts and should be based on the critical design aircraft (or family of aircraft).

The first step in evaluating runway length is to determine general runway length requirements for the majority of aircraft operating at the airport. The majority of operations at Salina Regional Airport are conducted using smaller single engine piston-powered aircraft weighing less than 12,500 pounds. Following guidance from AC 150/5325-4B, to accommodate 95 percent of small aircraft with less than 10 passenger seats, a runway length of 3,600 feet is recommended. To accommodate 100 percent of these small aircraft, a runway length of 4,200 feet is recommended. Small aircraft with 10 or more passenger seats require a runway length of 4,500 feet.

Runway length requirements for business jets weighing less than 60,000 pounds have also been calculated. These calculations take into consideration the runway gradient and landing length requirements for contaminated runways (wet). Business jets tend to need greater runway length when landing on a wet surface because of their increased approach speeds.

AC 150/5325-4B stipulates that runway length determination for business jets consider a grouping of airplanes with similar operating characteristics. The AC provides two separate "family groupings of airplanes," each based upon their representative percentage of aircraft in the national fleet. The first grouping is those business jets that make up 75 percent of the national fleet, and the second group is those making up 100 percent of the national fleet. **Table 3H** presents a partial list of common aircraft in each aircraft grouping. A third group considers business jets weighing more than 60,000 pounds. Runway length determination for these aircraft must be based on the performance characteristics of the individual aircraft.

TABLE 3H
Business Jet Categories for Runway Length Determination

75 percent of the national fleet	MTOW	75-100 percent of the national fleet	MTOW	Greater than 60,000 pounds	MTOW
Lear 35	20,350	Lear 55	21,500	Gulfstream II	65,500
Lear 45	20,500	Lear 60	23,500	Gulfstream IV	73,200
Cessna 550	14,100	Hawker 800XP	28,000	Gulfstream V	90,500
Cessna 560XL	20,000	Hawker 1000	31,000	Global Express	98,000
Cessna 650 (VII)	22,000	Cessna 650 (III/IV)	22,000		
IAI Westwind	23,500	Cessna 750 (X)	36,100		
Beechjet 400	15,800	Challenger 604	47,600		
Falcon 50	18,500	IAI Astra	23,500		

MTOW: Maximum Take Off Weight
Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

Table 3J presents the results of the runway length analysis for business jets developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 5,500 feet is recommended. This length is derived from a raw length of 4,921 feet that is adjusted, as recommended, for runway gradient and consideration of landing length needs on a contaminated runway (wet and slippery). Dry runways would require approximately 5,200 feet, while 5,500 feet is needed to accommodate business jets landing in wet conditions. To accommodate 100 percent of the business jet fleet at 60 percent useful load, a runway length of 6,300 feet is recommended.

TABLE 3J Runway Length Requirements Salina Regional Airport				
Airport Elevation	1,287.7 feet above mean sea level			
Average High Monthly Temp.	93.3 degrees (July)			
Runway Gradient	25' Runway 17-35			
Fleet Mix Category	**Raw Runway Length from FAA AC**	**Runway Length With Gradient Adjustment (+250')**	**Wet Surface Landing Length for Jets (+15%)***	**Final Runway Length**
75% of fleet at 60% useful load	4,921'	5,171	5,500'	5,500'
100% of fleet at 60% useful load	5,983’	6,233’	5,500’	6,300’
75% of fleet at 90% useful load	6,937’	7,187’	7,000’	7,200’
100% of fleet at 90% useful load	9,190’	9,440’	7,000'	9,500’

*Max 5,500' for 60% useful load and max 7,000' for 90% useful load in wet conditions
Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design.

Utilization of the 90 percent category for runway length determination is generally not considered by the FAA unless there is a demonstrated need at the airport. This could be documented activity by a cargo carrier or by a business jet operator that flies out frequently with heavy loads. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 7,200 feet is recommended. To accommodate 100 percent of business jets at 90 percent useful load, a runway length of 9,500 feet is recommended.

Another method to determine runway length requirements at Salina Regional Airport is to examine aircraft flight planning manuals under conditions specific to the airport. Several aircraft that are known to operate at the airport were analyzed for takeoff length required under maximum loading conditions when the temperature is 93.3 degree. **Table 3K** shows the runway length results.

Runway 17-35 Length

Runway 17-35 is the primary runway and it is 12,300 feet long. Based on FAA recommended runway lengths presented in **Table 3J**, this runway should be capable of accommodating at least 100 percent of business jets at 60 percent useful load. As such, a minimum runway length of 6,300 feet is recommended.

Table 3K presents the specific runway length requirements for a variety of business jets and commercial transport aircraft which utilize the airport. These calculations were made with aircraft at maximum take-off weights representing long haul lengths. As previously mentioned, many departures from SLN over the last year were to distant locales on the east and west coasts. As presented in **Table 3K**, several business jet aircraft require more than 7,000 feet of runway length. The runway lengths for commercial aircraft varied between 7,200 feet for the MD 87/88 and 10,500 feet for the Boeing 767.

TABLE 3K Select Business Jet Takeoff Length Requirements Salina Regional Airport			
Assumptions: Mean Maximum Temp of Hottest Month: 93.3 degrees Runway Gradient: 25-foot runway elevation difference Airport Elevation: 1,287.7 feet			
Aircraft	**ARC**	**MTOW**	**Takeoff Length**
BUSINESS JETS			
Beechjet 400	B-I	16,100	5,600
Cessna 525	B-I	10,700	3,700
Cessna 550	B-II	14,100	4,300
Cessna 560	B-II	16,830	4,400
Cessna 560XL	B-II	20,200	4,500
Cessna 680	B-II	30,300	4,600
Cessna 750	C-II	36,100	6,600
Global Express	C-III	99,500	7,200
Gulfstream 350 (III)	C-II	70,900	6,200
Gulfstream 450 (IV)	D-II	73,900	6,700
Gulfstream 550 (V)	D-III	91,000	7,300
Hawker 800XP	C-II	28,000	7,300
Lear 31	C-I	17,000	5,400
Lear 45	D-I	21,500	6,300
Lear 60	D-I	23,500	7,300
COMMERCIAL TRANSPORT JET AIRCRAFT			
Boeing 737-300	C-III	130,000	8,100
Boeing 737-500	C-III	125,000	7,900
Boeing 737-700	C-III	154,500	7,500
Boeing 757-300	C-IV	270,000	9,400
Boeing 767-300	C-IV	350,000	10,500
MD 82	C-III	141,000	8,200
MD 83	C-III	142,000	7,400
MD 87/88	C-III	138,000	7,200
ARC: Aircraft Reference Code MTOW: Maximum Certified Takeoff Weight *Source: Aircraft Flight Planning Manuals*			

Table 3K presented the specific runway length requirements for a variety of business jets and commercial transport aircraft which utilize the airport. These calculations were made with aircraft at maximum take-off weights representing long haul lengths. As previously mentioned, many departures from SLN over the last year were to distant locales on the east and west coasts. As presented in **Table 3K**, several business jet aircraft require more than 7,000 feet of runway length. The runway lengths for commercial aircraft varied between 7,200 feet for the MD 87/88 and 10,500 feet for the Boeing 767.

The airport's current runway length far exceeds that which is justified by annual aircraft operations. Typically, the FAA will participate in funding pavement projects which are required by specific design aircraft. Based on the information presented above, Runway 17-35 should be a minimum of 7,300 feet to meet business jet needs. Commercial carrier aircraft could support a longer runway but would be dependent upon the specific aircraft make and model that the FAA agrees to consider as the critical design aircraft

Runway 12-30 Length

Crosswind Runway 12-30 is currently 6,510 feet long. As previously mentioned, the runway should be fully capable of meeting the runway length needs of the majority of aircraft utilizing the airport. As such, the minimum length required would be 5,500 feet to meet 75 percent of business jets at 60 percent useful loading. It would be ideal for the runway to also meet the 100 percent at 60 percent useful loading category as well; however, it appears that most business jets presented in **Table 3K** will be satisfied with the runway's current length. The existing length of Runway 12-30 does not fully provide for all business jet activity at the airport but is sufficient for most, as well as current and future passenger airline aircraft.

Runway 12-30 is a vital airfield asset which supports all airport operations when the primary runway is closed and when crosswinds dictate. Its current length will offer sufficient length for nearly all operations at SLN. On very hot days, some aircraft may be weight-restricted but could use the runway with an added fuel stop enroute. As such, the existing length is adequate should be maintained in the future.

Runway 18-36 Length

Runway 18-36 is the outboard parallel runway which is 4,300 feet long. This runway is primarily utilized for small aircraft, especially for pilot training by KSU-Salina. It is also the designated runway for UAS operations. The minimum recommended runway length for this category of aircraft is 4,200 feet. Since this runway meets the design standards for all small aircraft, an extension of this runway will not be necessary.

Runway 4-22 Length

Runway 4-22 is the secondary crosswind runway at SLN and measures 3,648 feet. The current length limits the runway to small aircraft use only. To better serve the range of small aircraft, the runway should be at least 4,200 feet long.

As previously discussed, the current configuration of Runway 4-22 has its RSA for each end atop Runways 17-35 and 12-30. FAA design criteria suggest that the RSA of one runway should not cross over another active runway whenever possible. To mitigate the design flaw, the runway would need to be extended or shortened. Both options are less than ideal as detailed in the RSA section above. Moreover, the runway is rarely used as noted by ATCT personnel. As such, the runway should remain at its current length until closed at some point in the future.

Runway Width

The width of the runway is a function of the airplane design group for each runway. Runway 17-35 is currently, and is forecast to remain, in ADG III. The runway width design standard for RDC C/D-III is 150 feet. The existing width of Runway 17-35 should be maintained throughout the planning period.

Runway 12-30 is currently, and is forecast to remain, in RDC C/D-II. FAA standards call for a 100-foot runway width for RDC C/D-II runways. As such, Runway 12-30 should be maintained at its current width in the future.

Runways 4-22 and 18-36 are 75 feet, wide which meets the design standard width for RDC B-II. The width should be maintained for Runway 18-36, while Runway 4-22 is planned to be closed at some point in the future.

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. The FAA Airport/Facility Directory reports the pavement strength for Runway 17-35 at 75,000 pounds single wheel loading (S), 200,000 pounds dual wheel loading (D), 360,000 pounds dual tandem wheel loading (DT), and 600,000 pounds double dual tandem wheel loading (DDT). These strength ratings refer to the configuration of the aircraft landing gear. For example, S indicates an aircraft with a single wheel on each landing gear. The strength ratings of a runway do not preclude operations by aircraft that weigh more; however, frequent activity by heavier aircraft can shorten the useful life of that pavement. The strength rating for Runway 17-35 is adequate and should be maintained through the planning period.

Runway 12-30 is strength rated at 55,000 pounds S, 68,000 pounds D, and 125,000 pounds DT. The strength of this runway should be adequate through the long term planning period; however, frequent use of this runway by large business jets such as the G-IV/V, Global Express, or BBJ would require increased pavement strength up to 90,000 DT.

Runway 18-36 is strength rated at 30,000 pounds S which is adequate through the planning period. Originally constructed by the military, Runway 4-22 is strength rated at 100,000 pounds S, 135,000 pounds D, and 230,000 pounds DDT. This is more than adequate for aircraft using the runway and should be maintained until the runway is closed.

HELIPADS

There are six paved, stand-alone helipads at SLN. These facilities are primarily designed to segregate fixed wing aircraft activity from rotor activity. There is another designated helicopter landing pad on Taxiway A designated for use by the Kansas Army Guard Blackhawk helicopters. These facilities are important in improving operational efficiency and should be maintained through the planning period.

TAXIWAYS

The design standards associated with taxiways are determined by the taxiway design group (TDG) or the airplane design group (ADG) of the critical design aircraft. As determined previously, the applicable ADG for Runway 17-35 is ADG III now and into the future. For the remaining three runways, the applicable design is ADG-II. **Table 3L** presents the various taxiway design standards related to ADGs II and III.

TABLE 3L
Taxiway Dimensions and Standards
Salina Regional Airport

STANDARDS BASED ON WINGSPAN	***ADG II***	***ADG III***	
Taxiway Protection			
Taxiway Safety Area (TSA) width	79	118	
Taxiway Object Free Area (TOFA) width	131	186	
Taxilane Object Free Area width	115	162	
Taxiway Separation			
Taxiway Centerline to:			
Fixed or Movable Object	65.5	93	
Parallel Taxiway/Taxilane	105	152	
Taxilane Centerline to:			
Fixed or Movable Object	57.5	81	
Parallel Taxilane	97	140	
Taxiway Centerline to:			
Runway 17-35 Centerline	400	400	
Runway 12-30 Centerline	300	300	
Wingtip Clearance			
Taxiway Wingtip Clearance	26	34	
Taxilane Wingtip Clearance	18	23	
STANDARDS BASED ON TDG	***TDG 2***	***TDG 3/4***	***TDG 5***
Taxiway Width Standard	35	50	75
Taxiway Edge Safety Margin	7.5	10	15
Taxiway Shoulder Width	10	20	25

ADG: Airplane Design Group
TDG: Taxiway Design Group
Source: FAA AC 150/5300-13A, *Airport Design*

The table also shows those taxiway design standards related to TDG. The TDG standards are based on the Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance of the critical design aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be designed to the most appropriate TDG design standards based on usage.

The minimum taxiway design for Runway 17-35 should be TDG 3/4. As such, the taxiways associated with Runway 17-35 should be 50 feet wide. Several aircraft utilizing Runway 17-35 fall within TDG 5, to include the large commercial transport aircraft. While these aircraft do not operate at the airport more than 500 times annually, their limited operations would be problematic without the proper taxiway widths and fillets. This means that the taxiways associated with Runway 17-35 should be 75 feet wide.

For Runway 12-30, the applicable taxiway design is TDG 3 to account for all general aviation aircraft operating at the airport. Thus, the taxiways associated with Runway 12-30 should be at least 50 feet wide.

The taxiway standards for Runway 18-36 and Runway 4-22 should utilize design standards for TDG 2. Therefore, these taxiways should be 35 feet wide.

The current taxiway system is composed of varying taxiway widths. Taxiways A, E (between Runway 17-35 and Taxiway A), F, G, and H are 75 feet wide. Taxiways B (east of Runway 12), C, D, and E (west of Runway 17-35) are 50 feet wide. Taxiway

B west of Runway 12 is 35 feet wide. The current taxiway widths are sufficient to meet existing and planned aircraft TDG design criteria.

Taxiway Design Considerations

FAA AC 150/5300-13A, *Airport Design*, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The taxiway system at Salina Regional Airport generally provides for the efficient movement of aircraft; however, recently published AC 150/5300-13A, *Airport Design*, provides recommendations for taxiway design. The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation:

1. **Taxi Method**: Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate "judgmental oversteering," which is where the pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.
2. **Steering Angle**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.
3. **Three-Node Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot a maximum of three choices of travel. Ideally, these are right and left angle turns and a continuation straight ahead.
4. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
5. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiways systems simple using the "three node" concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold – through simple reduction in the number of occurrences, and through a reduction in air traffic controller workload.
   - *Avoid "high energy" Intersections*: These are intersections

in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.

- *Increase Visibility*: Right angle intersections, both between taxiways and runways, provide the best visibility. Acute angle runway exits provide for greater efficiency in runway usage, but should not be used as runway entrance or crossing points. A right angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
- *Avoid "dual purpose" Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
- *Indirect Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
- *Hot Spots*: Confusion intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.

6. **Runway/Taxiway Intersections**:
   - *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for a high-speed exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so they are visible to pilots.
   - *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage.
   - *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.
7. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in such a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.
8. *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and makes lighting and marking more difficult.

9. *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout that forces pilots to make a conscious decision to turn.
10. *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

FAA AC 150/5300-13A, *Airport Design*, states that, "existing taxiway geometry should be improved whenever feasible, with emphasis on designated "hot spots." To the extent practicable, the removal of existing pavement may be necessary to correct confusing layouts.

There are two identified hot spots on taxiway locations at Salina Regional Airport. One is located on Taxiway E at the hold position to Runway 17-35. The other is located on Taxiway B on the section of pavement between Runway 12 and Runway 17-35. The airport has installed runway guard lighting (RGL), also known as "wig-wags," at the hot spot locations. Analysis in the next chapter will consider any additional improvements which could be implemented at the hot spot locations.

INSTRUMENT NAVIGATIONAL AIDS

The airport has a sophisticated ILS precision instrument Category I (CAT-I) approach to Runway 35. This approach provides for visibility minimums as low as ½-mile and cloud ceilings down to 200 feet. A Global Positioning System (GPS) LPV (Localizer Performance with Vertical Guidance) instrument approach is also available to both ends of Runway 17-35. The GPS LPV approaches utilize the constellation of GPS satellites to provide both vertical and horizontal guidance for approaching aircraft without the need for extensive ground based equipment. The LPV approach to Runway 17 provides for visibility minimums of one mile and cloud ceilings of 250 feet. Runway 35 provides an LPV approach with ½ mile visibility minimums and 200-foot cloud ceiling minimums. These are excellent instrument approaches providing all-weather capability for the airport and they should be maintained in the future. Runway 17 should be planned for a not lower than ¾-mile visibility approach in the future.

Each end of Runway 12-30 is served by traditional lateral navigation (LNAV) only GPS approaches. These approaches offer visibility minimums of one-mile for AAC A and B aircraft. For AAC C aircraft, both approaches offer visibility minimums of 1.25 miles, which also remains the same for AAC D aircraft on the Runway 30 GPS approach. The AAC D visibility minimums increase to 1.5 miles for the Runway 12 GPS approach. Cloud height minimums are 435 feet for Runway 12 and 407 feet for Runway 30. Runway 12-30 should be considered for lower approach minimums in the future. It would be ideal for the runway to provide at least one approach which offers not lower than ¾-mile visibility minimums; however, this would require the installation of an approach lighting system. At a minimum, the runway should be capable of offering not lower than one mile visibility minimums for all AAC groupings.

Runways 18-36 and 4-22 are visual runways only and are not served by instrument approach procedures. The alternatives chapter will also explore the possibility of implementing GPS approaches with not lower than one mile visibility minimums on Runway 18-36; however, Runway 4-22 is proposed for closure and will not require an instrument approach procedure.

VISUAL NAVIGATION AIDS

The airport beacon is located southwest of Runway 12. The beacon provides for rapid identification of the airport with a rotating light that is green on one side and white on the opposite. The beacon should be maintained through the planning period.

Both ends of Runway 17-35 and Runway 12-30 are equipped with four-box precision approach path indicator (PAPIs). The PAPI-4 systems are adequate to serve all aircraft operations at the airport and should be maintained in the future. Runways 18-36 and 4-22 are not served by visual approach indicators nor are they needed. Runway 18-36 is primarily a training runway while Runway 4-22 is planned for closure.

Runway end identification lights (REIL) are strobe lights set to either side of the runway. These lights provide rapid identification of the runway threshold. REILs should be installed at runway ends not currently providing an approach lighting system but supporting instrument operations. Currently, this would apply to runway ends 12, 17, and 30. Runway 17 is being planned for lower instrument minimums requiring a more sophisticated approach lighting system. Analysis in the next chapter will evaluate the same for Runway 12-30 as well; however, REILS should be considered for Runway 12-30 if lower minimums cannot be achieved.

The FAA recommends an approach lighting system for instrument approaches not lower that ¾-mile and requires one for lower visibility minimums. Runway 35 has a medium intensity approach lighting system with runway alignment indicator lights (MALSR). This system is required as part of the ILS approach and allows for the visibility minimums to be ½-mile. This system should be maintained throughout the planning period.

An approach lighting system (ALS) leading to Runway 17 is recommended to provide instrument approach minimums of less than one mile. There is currently an LPV approach to Runway 35 with one mile visibility minimums. If an ALS is installed on Runway 17, the visibility minimums would likely be reduced to ¾ mile. Acceptable systems would include ODALS, MALS, SSALS and SALS. The same holds for an approach with lower than one mile minimums to Runway 12-30. To achieve CAT-I minimums on the Runway 17 end (½-mile visibility minimums), a more sophisticated MALSR or similar approach lighting system is required.

WEATHER AND COMMNUICATION AIDS

Salina Regional Airport has four lighted windcones, with one each located at the approach ends of Runway 17-35 and Runway 12-30. A non-lighted supplemental windcone is located adjacent to the remote communications outlet antenna array. Windcones provide information to pilots regarding wind conditions, including direction and speed. These windcones should be maintained.

The ATCT provides an automated terminal information service (ATIS). ATIS broadcasts contain essential information, such as weather information, active runways, available approaches, and any other information required by the pilots, such as important NOTAMs. These broadcasts are updated hourly during ATCT operational hours.

Salina Regional Airport is equipped with an Automated Surface Observing System (ASOS). This is an important system that automatically records weather conditions such as wind speed, wind gust, wind direction, temperature, dew point, altimeter setting, visibility, fog/haze condition, precipitation, and cloud height. This information can be accessed by pilots and individuals via an automated voice recording on a published telephone number. This system should be maintained through the planning period.

Salina Regional Airport is situated relatively remotely from regional airspace controlling agencies which can lead to a loss of communications with air traffic control and flight services below a certain elevation. While not required, some airports will install a Remote Communication Outlet (RCO) or a Remote Transmitter/Receiver (RTR). These systems are aviation band radio transceivers, established to extend the communication capabilities of Flight Service Stations (FSS) and air traffic control facilities respectively. SLN is served by an RCO facility which should be maintained in the future.

A summary of the airside needs at Salina Regional Airport is presented on **Exhibit 3F**.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacity of the various components of each element was examined in relation to projected demand to identify future landside facility needs. This includes components for general aviation needs such as:

- Airline Terminal Complex
- Aircraft Hangars
- Aircraft Parking Aprons
- Terminal Building Services
- Auto Parking and Access
- Airport Support Facilities

AIRLINE TERMINAL COMPLEX

Components of the terminal area complex include the terminal building, gate positions, apron area, and automobile access and parking. This section identifies the facilities required to meet the airport's needs through the planning period.

The review of the capacity and requirements for various terminal complex functional areas was performed with guidance from FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*. This guidance is typically applied to CFR Part 121 operators, while SeaPort Airlines operates under CFR Part 135. As such, security screening by the Transportation Security Administration (TSA) is not required. Moreover, the facility requirements are not necessarily the same in some cases, especially for security.

Airline terminal capacity and requirements were analyzed for the M.J. Kennedy Air Terminal following functional areas:

- Airline ticketing and operations
- Departure facilities
- Baggage claim
- Terminal services
- Public use areas and security
- Administration/Support
- Automobile Access and Parking

Ticketing and Airline Operations

The first destination for enplaning passengers in the terminal building is usually the airline ticket counter. The ticketing area consists of the ticket counters, queuing area for passengers in line at the counters, and the ticket lobby which provides circulation.

The ticket lobby should be arranged so that the enplaning passenger has immediate access and clear visibility to the individual airline ticket counters upon en-

Salina Regional SLN Airport

CATEGORY	EXISTING				RECOMMENDED IMPROVEMENTS OVER PLANNING PERIOD			
RUNWAYS								
	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22
RDC	RDC C/D-III-2400	RDC C-II-NP-1	RDC B-II-VIS	RDC-B-II-VIS	Same	Same	Same	Consider:
Length x Width (in feet)	12,300 x 150	6,510 x 100	4,300 x 75	3,648 x 75	Same	Same	Same	***Closure of Runway***
Pavement Strength (in pounds)								
Single Wheel Loading (S)	75,000	55,000	30,000	100,000	Same	Same	Same	Same
Dual Wheel Loading (D)	200,000	68,000	N/A	135,000	Same	Consider 90,000	Same	Same
Dual Tandem Wheel Loading (DT)	360,000	125,000	N/A	230,000	Same	Same	Same	Same
Double Dual Tandem Wheel (DDT)	600,000	N/A	N/A	N/A	Same	Same	Same	Same
Runway Protection Zones								
Owned	Yes	Yes	Yes	Yes	Same	Same	Same	Same
Incompatible Uses	No	No	No	No	Same	Same	Same	Same
TAXIWAYS SERVING								
	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22
TDG	3/4/5	3	2	2	Same	Same	Same	Same
Parallel Taxiway	Full Length	None	None	None	Same	Consider	Same	Same
Number of Entrance/Exits	Five Exits	Two	Two	2	Same	3	Same	Same
Taxiway Widths (in feet)	Vary 50 and 75	50	35	35	Same	Same	Same	Same
NAVIGATION & WEATHER AIDS								
	ASOS/ATIS, Four Lighted Windcones, One Supplemental Windcone, RCO, Beacon				Same			
Instrument Approach Procedures	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22
ILS	ILS (17)	GPS/LPV	None	None	Same	Same	Same	Same
GPS LNAV	Yes (17, 35)	VOR (23)	None	None	Same	Same	Yes	Same
GPS LPV	Yes (17, 35)	No	None	None	Same	Yes	Same	Same
Other	VOR (17) NDB (35)	None	None	None	Next Gen Approaches	Next Gen Approaches	Next Gen Approaches	Same
LIGHTING AND MARKING								
	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22	Runway 17-35	Runway 12-30	Runway 18-36	Runway 4-22
Runway Lighting	HIRL	MIRL	HIRL	MIRL	Same	Same	Same	Same
Runway Marking	Precision	Non-precision	Basic	Basic	Same	Same	Same	Same
Taxiway Lighting	MITL	MITL	None	None	Same	Same	Same	Same
Approach Lighting System	MALSR (35)	None	None	None	Add: MALS (17)	Consider: MALS	Same	Same
Visual Approach Aids	PAPI-4L (17),PAPI-4R (35)	PAPI-4L (12, 30)	None	None	Same	Same	Same	Same





KEY

ARC - Airport Reference Code
ASOS - Automated Surface Observation System
ATIS - Automated Terminal Information Service
D - Dual Wheel Loading
DDT - Double Dual Tandem Wheel Loading
DT - Dual Tandem Wheel Loading
GPS - Global Positioning System
HIRL - High Intensity Runway Edge Lighting
ILS - Instrument Landing System
LPV - Localizer Performance Vertical Guidance
MALS - Medium Intensity Approach Lighting System
MALSR - Medium Intensity Approach Lighting System with Runway Alignment
MITL - Medium Intensity Taxiway Edge Lighting
MIRL - Medium Intensity Runway Edge Lighting
NDB - Nondirectional Radio Beacon
PAPI - Precision Approach Path Indicator
RCO - Remote Communication Outlet
RDC - Runway Design Code
S - Single Wheel Loading
TDG - Taxiway Design Group
VASI - Visual Approach Slope Indicator
VOR - Very High Frequency Omni-Directional Range

Exhibit 3F
Airside Requirements

tering the building. Circulation patterns should allow the option of bypassing the counters with minimum interference. Provisions for seating should be minimal to avoid congestion and to encourage passengers to proceed to the gate area.

Analysis of the existing airline ticketing spaces indicates that the areas currently provided are adequate based upon projected enplanement levels for the long term. It should be noted that the analysis considered only one regional airline operation at the airport.

Departure Gates and Hold Rooms

Ground level loading and unloading of passengers is appropriate for SLN as small turboprop aircraft are forecast to be the aircraft type serving the airport. Currently, there is a single departure gate in the terminal building. One gate is more than adequate to accommodate forecasted demand. A second gate would not be needed unless there were multiple hourly departures which are not forecast for SLN.

Aircraft seating capacities determine secure passenger hold room capacity requirements. Hold rooms are typically sized to provide adequate space and area for the largest group of people that can use each gate. TSA screening and secure holding of passengers is not necessary at SLN. Departing passengers simply check in at the counter and await their flight in the main terminal lobby.

The existing commercial airline apron is designed to accommodate one commuter airliner comfortably. Additional space is available if needed. Forecasts of peaking activity consider the potential for up to two hourly departures at some point in the future. While not likely unless service is changed, two hourly departures could be accommodated on the existing ramp.

Baggage Claim

The passenger arrival process consists primarily of those facilities and functions that reunite the arriving passengers with their checked baggage. SeaPort Airlines offers individualized baggage delivery service where baggage is wheeled into the lobby and delivered to the passengers. As such, no baggage claim devices are needed at the airport under current conditions. There is a baggage claim display shelf in the terminal building, which was used previously and could be again if needed in the future.

Terminal Services

Similar to airline ticketing, rental car counter facilities include office, counter area, and queue areas. There is one identified counter for rental car services. Space allotted to rental car areas is more than adequate to meet existing and projected demand levels.

The airport terminal includes a small concession area which is adequate for existing and projected demand levels. Existing public restroom space will be adequate into the long term as well.

Public Use Area and Security Screening

The public lobby is where passengers or visitors may comfortably relax while waiting for arrivals or departures. In today's environment, visitors must remain out of the secure departure areas, so a public lobby is important. As mentioned, there is no secure area in the SLN terminal building as it is not required. As such, the public lobby is shared with departing passengers. The lobby is large enough to accommodate both departing passengers and those meeting/greeting passengers.

A common feature of modern terminal buildings is the availability of public conference room facilities. In a business environment where a corporate official may visit many cities during a single day, the ability to meet clients or colleagues at the airport for private meetings can be an advantage. The M.J. Kennedy Air Terminal Building is equipped with a high-tech conference room. The existing conference room space should be adequate for the planning period.

Building Support and Administration

Building support facilities include all miscellaneous spaces at the airport, such as mechanical, telephone, business centers, walls/structures, and general circulation. As other components of the airport increase in size, so will supporting spaces.

Most of the administrative offices are located on the second floor of the terminal building. Administrative offices are also located on the first floor of the building. Heating, ventilating, and air conditioning (HVAC) mechanical spaces are adequate for building operations.

Terminal Access Roadway

The capacity of the airport access and terminal area roadways is the maximum number of vehicles that can pass over a given section of a lane or roadway during a given time period. It is normally preferred that a roadway operate below capacity to provide reasonable flow and minimize delay to the vehicles using it.
Principal access to the airport terminal building is from Bailey Road which stems from Centennial Road to the east. Centennial is directly connected to three roads having interchange access with I-135 which are Magnolia Road, Schilling Road, and Water Well Road. All terminal access roads are adequate to accommodate existing and projected passenger demand levels with the exception of the portion of Centennial Road from Jumper Road extended to Water Well Road. This section of roadway is a rural design without curb and gutter and has poor drainage and failing pavement. A portion of the roadway is maintained by the City of Salina and a portion is maintained by Saline County. It is recommended that the City and County include the rehabilitation of the southern portion of Centennial Road as highlighted in **Exhibit 3G** in future CIP plans and apply for available grant funding for design and rehabilitation costs.

Terminal Curb Frontage

The curb element is the interface between the terminal building and the ground transportation system. The length of curb required for the loading and unloading of passengers and baggage is determined by the type and volume of ground vehicles anticipated in the peak period on the design day.

A typical problem for terminal curb capacity is the length of dwell time for vehicles utilizing the curb. At airports where the curb front has not been strictly patrolled, vehicles have been known to be parked at the curb while the driver and/or riders are inside the terminal checking in, greeting arriving passengers, or awaiting baggage pick-up. Since most curbs are not designed for vehicles to remain curbside for more than two to three minutes, capacity problems can ensue. Since the events of 9/11, most airports police the curb front much more strictly

Exhibit 3G
Centennial Road Improvements

for security reasons. This alone has reduced the curb front capacity problems at most airports.

At SLN, the terminal parking lot structure provides one lane for loading and unloading of passengers and a second lane for automobile flow adjacent the terminal building. The curb frontage totals approximately 165 feet in length, which includes a covered loading/unloading area adjacent the main terminal doorway. Available curb length will be adequate through the planning period.

Vehicle Parking

Vehicle parking in the airline passenger terminal area of the airport includes those spaces utilized by passengers, visitors, and employees of the airline terminal facilities. Parking spaces are classified as public, employee, and rental car.

Public parking is located in surface lots immediately east of the terminal building. This parking area contains 124 spaces. These spaces are available for public, passenger, employee, and rental car parking. The current allotment of parking spaces will be adequate to meet existing and projected demand levels.

Terminal Building Requirements Summary

Based on the analysis conducted, the terminal building appears to be adequate for the planning period; however, the building is aging and consideration could be given to a new structure at some point in the future. The current building size is more than adequate to meet the size and function needs of the current commercial passenger airline at the airport. If the airline were to change to a CFR Part 121 carrier, however, additional space could be required to accommodate security screening and a secure passenger holdroom.

Analysis to be presented in the next chapter of the airport master plan will consider a new terminal facility. Given the relatively unstable regional airline industry, planning for an airline change at SLN is not unreasonable. As such, the ultimate plan will consider a new building which would only be needed if unforeseen airline service levels occur. Such planning will provide airport administration with a readied plan of action.

HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward more sophisticated aircraft (and consequently, more expensive aircraft); therefore, many aircraft owners prefer enclosed hangar space to outside tie-downs.

The demand for aircraft storage hangars is dependent upon the number and type of aircraft expected to be based at the airport in the future. However, hangar development should be based upon actual demand trends and financial investment conditions.

There are three general types of aircraft storage hangars: T-hangars, corporate box hangars, and conventional hangars. T-hangars are similar in size and will typically house a single engine piston-powered aircraft. Some multi-engine aircraft owners may elect to utilize these facilities as well. There are typically many T-hangar units "nested" within a single structure. There are 48 T-hangar units at the airport. For determining future aircraft storage needs, a planning standard of 1,200 square feet per based aircraft is utilized for T-hangars.

Corporate box hangars are open-space facilities with no interfering supporting structure. Executive box hangars can vary in size and can either be attached to others or be stand-alone hangars. Typically, executive box hangars will house larger multi-engine, turboprop, or jet aircraft. For future planning, a standard of 2,500 square feet per aircraft is utilized for box hangars.

Conventional hangars are the familiar large hangars with open floor plans that can store several aircraft. At Salina Regional Airport, several ex-military hangars and other larger hangars, generally those 10,000 square feet or larger, are considered conventional hangars. For future planning needs, 2,500 square feet per aircraft is utilized for conventional hangars.

Table 3M presents aircraft storage needs based on the demand forecasts. Assumptions have been made on owner preferences for a storage type based on industry trends. For example, as more individual hangars become available, it is presumed that owners currently storing their aircraft in a bulk storage conventional hangar may transition to their own hangar. It is also assumed that helicopters, jets, and turboprops will be stored in conventional or corporate hangars.

TABLE 3M
Hangar Needs
Salina Regional Airport

	Base Year	Short Term	Intermediate Term	Long Term
Total Based Aircraft	105	116	129	162
Aircraft To Be Hangared	105	116	129	162
T-Hangars (1,200 sf per aircraft)				
Single Engine (80%)		54	62	83
Multi Engine (50%)		3	3	3
Turbo/Jet (0%)		0	0	0
Helicopter/Other (0%)		0	0	0
Total T-hangar Positions	48	57	65	86
Total T-hangar Area	58,152	68,400	78,000	103,200
Additional Square Feet Needed		10,248	19,848	45,048
Conventional Hangars (2,500 sf per aircraft)				
Single Engine (KSU)		27	27	27
Multi Engine (20%)		1	1	1
Turbo/Jet (50%)		4	5	9
Helicopter/Other (80%)		11	12	13
Total Conventional Hangar Positions	~220	43	45	50
Total Conventional Hangar Area	556,645	107,500	112,500	125,000
Additional Square Feet Needed		None	None	None
Corporate Hangars (2,500 sf per aircraft)				
Single Engine (10%)		8	9	10
Multi Engine (30%)		2	2	3
Turbo/Jet (50%)		4	5	9
Helicopter/Other (20%)		2	3	4
Total Corporate Hangar Positions	15-20	16	19	26
Total Corporate Hangar Area	42,290	40,000	47,500	65,000
Total Square Feet Needed		None	5,210	22,710
total Hangar Storage Space Needed				
Total Hangar Positions	~288	116	129	162
Total Hangar Area (s.f.)	657,087	215,900	238,000	293,200
Maintenance Hangars and Area				
Maintenance Hangar Need (s.f.)		21,590	23,800	29,320

Source: Coffman Associates analysis

The airport maintains an abundance of large conventional hangar spaces. Most of those hangars were constructed by the military and several of these hangars are currently underutilized. Corporate and T-hangar facilities are currently full with a waiting list of 15 individuals. Seven on the waiting list are current airport tenants looking for a change, while eight are potential new airport tenants.

Conventional space will be adequate to meet demand through the planning period; however, additional T-hangar and corporate hangar spaces will be needed. It should be noted that this analysis does not suggest absolute needs. For example, a new airport tenant may choose to base in one of the conventional hangars or a new airport business could build a larger conventional hangar to suit their operational needs. The figures presented here are generalized only based on industry norms.

AIRCRAFT PARKING APRON

The aircraft parking apron is an expanse of paved area intended for aircraft parking and circulation. Typically, a main apron is centrally located near the airside entry point, such as the terminal building or FBO facility. Ideally, the main apron is large enough to accommodate transient airport users as well as a portion of locally based aircraft. Often, smaller aprons are available adjacent to FBO hangars and at other locations around the airport. SLN was once a military facility and characteristically maintains large apron areas. There is currently more than 300,000 square yards of apron lined along the eastern side of Runway 17-35. The apron is mostly continuous with designated areas for commercial airline adjacent the M.J. Kennedy Air Terminal, military restricted (adjacent to the Kansas Army Guard, Army Aviation Support Facility #2), and the remainder general aviation. KSU Salina operates from a 25,000 square yard apron which is owned and operated by KSU.

The commercial terminal area apron encompasses approximately 18,333 square yards. The Kansas Guard ramp encompasses approximately 10,000 square yards. The remainder of the existing apron is for general aviation use.

FAA Advisory Circular 150/5300-13A, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Salina Regional Airport, the number of itinerant spaces required is estimated at 13 percent of the busy-day itinerant operations.

A planning criterion of 650 square yards per aircraft was applied to determine future itinerant apron area requirements for single and multi-engine aircraft. For turboprops and business jets (which can be much larger), a planning criterion of 1,600 square yards per aircraft position was used. The short term need for itinerant apron area is 28,800 square yards. By the long term planning period, approximately 36,500 square yards is estimated.

An aircraft parking apron should provide space for the number of locally based aircraft that are not stored in hangars, transient aircraft, and for maintenance activity. For local tie-down needs, an additional ten spaces are identified for maintenance activity. Maintenance activity would include the movement of aircraft into and out of hangar facilities and temporary storage of aircraft on the ramp. Moreover, the calculation included the needs of KSU as their aircraft are generally tied down on the ramp. While the KSU ramp is not part of the airport's ramp, the aircraft are considered based aircraft.

Calculations indicated that local aircraft apron is adequate; however, the KSU ramp could be congested and undersized. The remainder of airport general aviation ramp area is more than adequate through the long term planning period. Total apron parking requirements are presented in **Table 3N**.

TABLE 3N
Aircraft Parking Apron Requirements
Salina Regional Airport

	Available	Short Term	Intermediate Term	Long Term
Single, Multi-engine Itinerant Aircraft Positions		24	26	30
Apron Area (s.y.)		19,200	20,900	24,300
Itinerant Business Jet Positions		6	7	8
Apron Area (s.y.)		9,600	10,500	12,200
Locally-Based Aircraft Positions		55	56	58
Apron Area (s.y.)		27,500	28,000	29,000
Total Positions		85	89	96
Total Apron Area (s.y.)	281,000	56,300	59,400	65,500

Source: Coffman Associates analysis

GA TERMINAL FACILITIES

General aviation terminal facilities have several functions. Space is necessary for a pilots' lounge, flight planning, concessions, management, and storage. If a stand-alone general aviation terminal is provided, some airports will have leasable space in the terminal building for such features as a restaurant, FBO line services, and other needs. Many airports do not offer a stand-alone general aviation terminal building. This space is commonly provided by FBOs or other specialty aviation operators.

The methodology used in estimating general aviation terminal facility needs is based on the number of airport users expected to utilize general aviation facilities during the design hour. General aviation space requirements were then based upon providing 120 square feet per design hour itinerant passenger. Design hour itinerant passengers are determined by multiplying design hour itinerant operations by the number of passengers on the aircraft (multiplier). An increasing passenger count (from 2.0 to 3.0) is used to account for the likely increase in the number of passengers utilizing general aviation services. **Table 3P** outlines the general aviation terminal facility space requirements for Salina Regional Airport.

TABLE 3P
General Aviation Terminal Facilities
Salina Regional Airport

	Current Need	Short Term	Intermediate Term	Long Term
Design Hour Operations	45	49	54	63
Design Hour Itinerant Operations	18	20	22	25
Multiplier	2.0	2.2	2.5	3.0
Total Design Hour Itinerant Passengers	36	44	54	75
General Aviation Building Spaces (s.f.)	4,300	5,200	6,500	9,000

Terminal services are provided by the two airport FBOs, America Jet and Flower Aviation. These FBOs offer full general aviation terminal facilities including pilots' lounge, flight planning, general lobby for meeting/greeting, restrooms, and concession vending. These operators adequately meet the needs for general aviation terminal spaces.

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airside or landside facilities have also been identified. These other areas provide certain functions related to the overall operation of the airport.

GA AUTOMOBILE PARKING

Planning for adequate general aviation automobile parking is a necessary element for any airport, especially those which experience high air taxi and itinerant general aviation activity. Parking needs can effectively be divided between itinerant airport users, locally based users, and airport business needs.

Itinerant users are typically those associated with FBO operations, such as passengers or employees. Locally based users primarily include those attending to their based aircraft. A planning standard of 1.9 times the design hour passenger count provides the minimum number of vehicle spaces needed for transient users. Locally based parking spaces are calculated as one-half the number of based aircraft minus the KSU based aircraft. Airport businesses not offering public services generally will dictate the amount of space required for automobile parking. Some operators need very little and others may need many for employees. In any event, these businesses will determine their own parking requirements over the planning period.

A planning standard of 315 square feet per space is utilized to determine total vehicle parking area necessary, which includes area needed for circulation and handicap clearances. General aviation parking requirements for the airport are summarized in **Table 3Q**..

TABLE 3Q
GA Vehicle Parking Requirements
Salina Regional Airport

	Current Need	Short Term	Intermediate Term	Long Term
Design Hour Itinerant Passengers	36	44	54	75
VEHICLE PARKING SPACES				
GA Itinerant Spaces	68	83	102	143
GA Based Spaces	30	35	41	57
Airport Business Parking Spaces	Individual Business Decision			
Total Parking Spaces	98	118	143	200
VEHICLE PARKING AREA				
GA Itinerant Parking Area (s.f.)	21,500	26,060	32,270	44,960
GA Based Parking Area (s.f.)	9,450	11,025	12,915	17,955
Airport Business Parking Area (s.f.)	Individual Business Decision			
Total Parking Area (s.f.)	30,950	37,085	45,185	62,915

Source: Coffman Associates analysis

There are approximately 100 automobile parking spaces provided by airport businesses serving the public at SLN. As such, there appears to be enough designated vehicle parking through the short term planning period. By the intermediate and long term planning periods, additional spaces may be needed. Parking should be made available in close proximity to airport businesses whenever possible.

In an effort to limit the level of vehicle traffic on the aircraft movement areas, many airports are providing separate parking in support of facilities with multiple aircraft parking positions, such as T-hangars. Vehicle parking spaces will be considered in conjunction with additional facility needs in the alternatives chapter.

AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITIES

Only those airports that are certificated under Title 14 Code of Federal Regulations (CFR), Part 139, are required to have on-site firefighting capabilities. Salina Regional Airport is a Class IV Part 139 airport and must maintain the minimum equipment and personnel based on a specific ARFF index. The index is established according to the length of aircraft and scheduled daily flight frequency. There are five indices, A through E, with A applicable to the smallest aircraft and E the largest (based on wingspan).

Salina Regional Airport is required to meet ARFF index A based on scheduled air carrier service offered by SeaPort Airlines; however, SLN provides a minimum of Class IV Index B ARFF capabilities. The ARFF facility was recently constructed and is located northeast of the intersection of Taxiways A and E. All existing ARFF facilities and equipment meet standard and should be maintained through the planning period.

FUEL STORAGE

The airport owns all fuel storage tanks at the airport, which consists of 12 underground storage tanks (UST) each having 25,000 gallon storage capacities as well as a 1,000 gallon capacity above ground tank. Ten of the UST are used for Jet A fuel storage and two for 100LL storage. The 1,000 gallon above ground tank is associated with the 100LL self-service fuel island. As such, the airport currently maintains a storage capacity of 250,000 gallons for Jet A fuel and 51,000 gallons for 100LL Avgas fuel.

Additional fuel storage capacity should be planned when the airport is unable to maintain an adequate supply and reserve. While each airport (or FBO) determines their own desired reserve, a 14-day reserve is common so as to properly accommodate fuel deliveries. When additional capacity is needed, it should be planned in 10,000 to 12,000 gallon increments. Common fuel tanker trucks have an 8,000-gallon capacity. **Table 3R** presents the forecast of fuel demand through the planning period.

TABLE 3R
Fuel Storage Requirements
Salina Regional Airport

			Planning Horizon		
	Current Capacity	**Baseline Consumption**	**Short Term**	**Intermediate Term**	**Long Term**
Jet A Requirements	250,000				
Annual Usage (gal.)		2,417,131	3,036,000	3,541,600	4,190,200
Daily Usage (gal.)		6,622	8,318	9,703	11,480
14-Day Storage (gal.)		92,708	116,449	135,842	160,720
Avgas Requirements	51,000				
Annual Usage (gal.)		72,104	90,000	97,500	112,500
Daily Usage (gal.)		198	247	267	308
14-Day Storage (gal.)		2,772	3,452	3,740	4,315

Assumptions:
Jet A: 2,500 gallons per air carrier operation
50 gallons per air taxi operation.
200 gallons per military operation
10 gallons per itinerant general aviation operation.
Avgas: 1.5 gallons per general aviation local operation.

Source: FBO fuel flowage reports from Airport Administration; Coffman Associates analysis

Fuel sales at SLN are relatively substantial and support the airport's moniker of "America's Fuel Stop." Since 2002, annual fuel sales have averaged 3.45 million gallons with 97 percent of that total being Jet A fuel. Over the last five years, however, fuel sales have decreased to mirror operational decreases by jets. The baseline consumption figures presented in the table represent the average figures over the last three years. Historic fuel sales and aircraft operational records were used to determine future fuel sales at SLN as presented in **Table 3R**.

PERIMETER FENCING

As discussed in Chapter One – Inventory, the airport has six-foot chain link fencing with three-strands of barbed wire on top surrounding the entire airport property for security. There are 44 access gates with 14 being electrically operated. The perimeter fencing serves two primary functions. First, it establishes a semi-secured environment, limiting easy and unintended access to the airfield. Second, the fencing also serves as a wildlife barrier that can limit the incursion of wildlife from entering the runway environment. The fencing meets applicable standards and should be maintained through the planning period.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demand projected for Salina Regional Airport for the next 20 years. In an effort to provide a more flexible master plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short term roughly corresponds to a five-year time frame, the intermediate term is approximately 10 years, and the long term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests based on actual need rather than on specific dates in the future.

The airport has been planned and designed to meet FAA design standards associated with ARC C/D-III. This category includes all business jets, regional jets, as well as commercial transport aircraft such as the Airbus 319/20/21, Boeing 727 and 737, DC 9 series, and MD 80 series aircraft. Historical operational trends indicate that the airport will continue to attract several thousand jet aircraft operations per year. As a result, the future design standard will remain ARC C/D-III.

At 12,300 feet in length, Runway 17-35 meets the needs of all aircraft using the airport. In fact, it exceeds the necessary length for the airport's critical design aircraft. The existing length may not be fully supported by FAA grant funding in the future as it is not fully justified. A minimum length of 7,300 feet is justified for FAA funding; however, a longer length could be justified if larger commercial transport jet aircraft operate more frequently in the future.

Runway 12-30, at 6,510 feet in length, meets the needs to serve as a primary crosswind runway. Its length will not be fully adequate for larger jets on hot days, but should be more than adequate to accommodate the majority of aircraft in the future. This runway should be maintained in its current configuration.

Parallel Runway 18-36 is a training runway measuring 4,300 feet. This length is adequate to serve its primary role. It is an important facility as it serves to separate most of the airport's training activity from the larger, faster aircraft operating on Runway 17-35. Its function provides a significant airfield capacity increase and improves overall operational efficiency by reducing airfield delays. As such, it should be maintained in the future as long as the Airport Authority can support its operation.

Crosswind Runway 4-22 was originally constructed by the military. The military commonly built triangular runway orientations at training facilities so as to minimize operational losses due to crosswind conditions. Its orientation, however, does not provide any significant operational benefits to the airport. Moreover, Runway 4-22 is configured in such a manner that its RSA extends onto Runway 17-35 and Runway 12-30. FAA standards suggest that the RSA of one runway should not overlap another. Finally, Runway 4-22 is not supported by FAA funding and the cost of its operation and upkeep is the responsibility of the Airport Authority. Given all of these considerations, this master plan is proposing the ultimate closure of Runway 4-22. Closure should only occur when financial considerations and/or FAA design improvements dictate.

On the landside, planning calculations show a need for additional hangar spaces for small and medium sized aircraft. Specifically, there is a need for T-hangars and corporate hangars. While the airport maintains an overall abundance of total hangar area, there is a current waiting list for smaller executive and/or T-hangar space. Most private aircraft owners desire singular segregated storage space over large clear span bulk storage hangars. As such, the plan will include the development of some additional hangar spaces. Hangar space needs will largely depend on individual desires and may not precisely follow the forecast.

The airport is served by commercial passenger airline service. This service is currently offered by SeaPort Airlines, which utilizes a single engine turboprop aircraft with 9 passenger seats. SeaPort operates under FAR Part 135 which does not require TSA security standards. As such, the current terminal building would be adequate to serve their needs through the planning period. If another airline were to regain service under FAR Part 121, the terminal building could become undersized to meet demand as TSA security requirements would need to be met. As a planning measure, alternative locations for a new terminal building will be examined in the next chapter.

The next chapter, Alternatives, will examine potential improvements to the airfield system and the landside. Most of the alternatives discussion will focus on those capital improvements that would be eligible for federal grant funds. Other projects of local concern will also be presented. On the landside, several facility layouts that meet the forecast demands over the next 20 years will be presented. Ultimately, an overall airport layout vision that is well beyond the 20-year scope of the master plan will be developed.