CHAPTER FOUR

Airport Facility Requirements

AIRPORT FACILITY REQUIREMENTS

Introduction

This chapter evaluates the airfield's operational capacity and delay and also identifies the long-range requirements used to determine the facilities needed to meet the forecast demand as planned in accordance with Federal Aviation Administration (FAA) airport design standards and airspace criteria. Identification of a needed facility does not necessarily constitute a "requirement" in terms of design standards, but an "option" for facility improvements to accommodate future aviation activity. However, market demand will ultimately drive the requirements for construction and development at Skylark Field Airport (ILE).

Airfield/airside facility components include runways, taxiways, navigational aids (NAVAIDs), airfield marking/ signage, and lighting, while terminal area/landside components are comprised of hangars, terminal building, aircraft parking apron, fuel dispensing units, vehicular parking, and airport access requirements.

As previously presented in the Inventory Chapter, the FAA outlines design standards in FAA Advisory Circular (AC) 150/5300-13 (current series). Runway pavements and associated safety areas are delineated through the runway design code (RDC) while taxiway pavements and safety areas are defined by the taxiway design group (TDG). The RDC/TDG correlate the design and layout of an airport to the operational and physical characteristics of the critical / design aircraft. The RDC/TDG directly influence pertinent safety criteria such as runway length, runway width, runway/taxiway separation distances, building setbacks, size of required safety and object free areas, etc. The critical / design aircraft is based on the largest type aircraft expected to operate at an airport on a regular basis defined as a minimum of 500 annual operations (landings or takeoffs).

Airfield Capacity Analysis

The FAA's standard method for determining airport capacity and delay for long-range planning purposes can be found in

AC 150/5060-5, *Airport Capacity and Delay*. For this portion of the analysis, generalized airfield capacity was calculated in terms of: 1) hourly capacity of runways and 2) annual service volume (ASV). This approach utilizes the projections of annual operations by the proposed fleet mix as projected in the Forecast Chapter while considering a variety of other factors that are described below.

AIRFIELD CHARACTERISTICS

In addition to the aviation activity forecasts, a number of the Airport's characteristics and operational conditions are required to properly conduct the FAA capacity analysis. These elements affecting airfield capacity include:

- Runway Configuration;
- Aircraft Mix Index;
- Taxiway Configuration;
- Operational Characteristics; and,
- Meteorological Conditions.

When analyzed collectively, the above elements provide the basis for establishing the generalized operational capacity of an airport as expressed by Annual Service Volume (ASV). The following sections evaluate each of these characteristics with respect to ILE.

RUNWAY USE CONFIGURATION

The runway use configuration is one of the primary factors determining airfield capacity. The capacity of a two or more runway system is substantially higher than an airport with a single runway. If runways intersect, the capacity is generally not as great as in a parallel runway layout because operations on the second runway are not possible until the aircraft on the first runway has cleared the intersection point.

As previously mentioned in the Inventory Chapter, ILE is a one runway system with Runway 01-19 on a north/south alignment. It is 5,495 feet long and 100 feet wide. Based on the runway at ILE, runway use configuration one (1) from AC 150/5060-5 will be employed.

TAXIWAY CONFIGURATION

The distance an aircraft has to travel to an exit taxiway after landing also sets limits on the airfield capacity. Larger aircraft require more distance to slow to a safe speed before exiting the runway. Thus, they require greater runway occupancy times. If taxiways are placed at the approximate location where the aircraft would reach safe taxiing speed, the aircraft can exit and clear the runway for another user. However, if the taxiway is spaced either too close or too far from the touchdown zone, the aircraft will likely spend more time on the runway than if the taxiway had been in the optimal location. The optimal location for exit taxiways is in a range from 2,000 feet to 4,000 feet from the landing threshold with each exit separated by at least 750 feet.

Based on FAA criteria, the exit factor within the formula is maximized when a runway has four exit taxiways within the optimal range. As previously documented, Runway 01-19 is served by Taxiway Bravo, full-length parallel east of the runway, and Taxiway Golf, a partial parallel taxiway west of the runway. There are five exit/connector taxiways for Runway 01-19 along Taxiway Bravo two that meet the optimal location criteria. Taxiway Golf currently has two connector taxiways to Runway 01-19 that do not meet optimal exit taxiway criteria.

AIRCRAFT MIX INDEX

The operational fleet at an airport influences an airfield's capacity based upon differing aircraft requirements. Various operational separations are set by the FAA for a number of safety reasons. An airfield's capacity is the time needed for the aircraft to clear the runway either on arrival or departure. As aircraft size and weight increases, so does the time needed for it to slow to a safe taxing speed or to achieve the needed speed for takeoff. Thus, a larger aircraft generally requires more runway occupancy time than a smaller aircraft. As additional larger aircraft enter an airport's operating fleet, the lower the capacity will likely be for that airport.

There are four categories of aircraft used for capacity determinations under the FAA criteria. These classifications are based on the maximum certificated takeoff weight, the number of engines, and wake turbulence classifications. The aircraft indexes and characteristics are shown in the following table, **Table 4-1**, *Aircraft Classifications*, and the following figure, **Figure 4-1**, *Cross Section of Aircraft Classifications*.

These classifications are used to determine the mix index, which is required to calculate the theoretical capacity of an airfield. The mix index is defined as the percent of Class C aircraft plus three (3) times the percent of Class D aircraft, reflected as a percentage (C+3D). The percent of A and B class aircraft do not count towards the calculation of mix index due to the quick dissipation of turbulence produced by this category. Using the FAA formula outlined in AC 150/5060-5, the aircraft mix for ILE will be 20 by the end of the planning effort.

AIRFIELD OPERATIONAL CHARACTERISTICS

Operational characteristics that can affect an airfield's overall capacity include the percent of aircraft arrivals and the percent of touch-and-go operations.

Percent of Aircraft Arrivals

The percent of aircraft arrivals is the ratio of landing operations to the total operations for the airport. This metric is valuable because aircraft approaching an airport for landing require more runway occupancy time than an aircraft departing the airfield. The FAA methodology typically determines airfield capacity using 40 percent, 50 percent, or 60 percent of arrivals. For ILE, the percent of arrivals is not typically a significant factor, thus, for purposes of calculations a 50 percent of arrivals factor was used.

Percent of Touch-and-Go Operations

The percent of touch-and-go operations plays a critical role in determination of airport capacity. Touch-and-go operations are typically associated with flight training activity. At ILE, touch-and-go operations are a large part of the picture primarily due to the training activity conducted by Central Texas College (CTC) and Genesis Aero. These touch-and-go operations are approximately 35 percent of the total airfield operations and are expected to remain consistent throughout the next 20 year period.

Meteorological Conditions

Aircraft operating parameters are dependent upon the weather conditions, such as cloud ceiling height and visibility range. As weather conditions deteriorate, pilots must rely on instruments to define their position both vertically and horizontally. Capacity is lowered during such conditions because the FAA requires aircraft separation to increase for safety reasons. Additionally, some airports may have limitations with regards to their instrument approach capability which also impacts capacity during inclement weather. The FAA defines three (3) general weather categories, based upon the ceiling height of clouds above ground level and visibility.

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

ILE observes VFR conditions approximately 92.5 percent of the

TABLE 4-1 | AIRCRAFT CLASSIFICATIONS

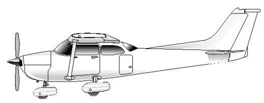
Aircraft Class	Maximum Certificated Takeoff Weight (lbs)	Number of Engines	Wake Turbulence Classification[1]
A and B	Under 12,500	Single-/Multi-	Small
C	12,500 – 300,000	Multi-	Large
D	Over 300,000	Multi-	Heavy

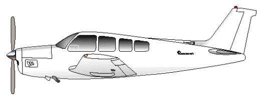
Source: FAA Advisory Circular 150/5360-5, Change 2, Airport Capacity and Delay.

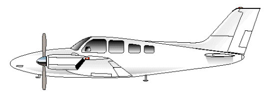
[1] Wake turbulence classifications as defined by the FAA, Small – Aircraft of 41,000 lbs. maximum certificated takeoff; Large – Aircraft more than 41,000 lbs certificated takeoff weight, up to 255,000 lbs: Heavy – Aircraft capable of takeoff weights of more than 255,000 lbs whether or not they are operating at this weight during a particular phase of flight.

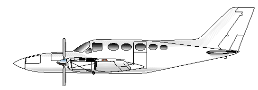
TABLE 4-1 | CROSS SECTION OF AIRCRAFT CLASSIFICATIONS

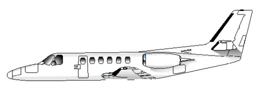
Class A and B
12,500 lbs. or less (Single-/Multi-Engine)

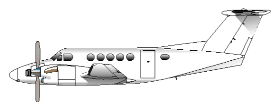

Cessna 172 (Skyhawk)


Beechcraft A36 (Bonanza)

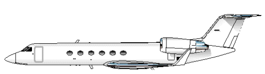

Beechcraft 58TC (Baron)

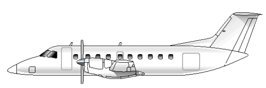

Cessna 421C (Golden Eagle)

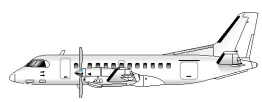

Cessna Citation II

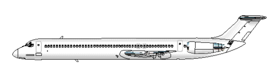

Beechcraft King Air B300

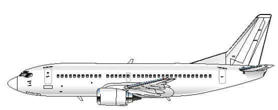
Class C
Large aircraft, 12,500 lbs. to 300,000 lbs.

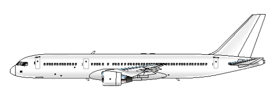

Gulfstream V


Embraer 120 (Brasilia)

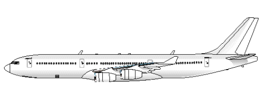

Saab 340

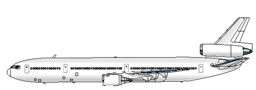

MD-80

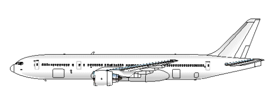

Boeing 737

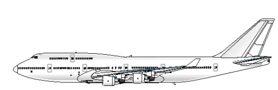

Boeing 757

Class D
Heavy aircraft, More than 300,000 lbs.


Airbus A340-200


MD-11


Boeing 777-200


Boeing 747-400

Source: Dr. Antonio Trani, Department of Civil Engineering, Virginia Tech University.

time, IFR conditions approximately 6.8 percent of the time, and PVC conditions approximately 0.7 percent of the time.

HOURLY CAPACITY OF RUNWAY

Hourly capacity of a runway measures the maximum number of aircraft operations that can be accommodated by an airport's runway configuration in one hour. This capacity is calculated by analyzing the appropriate series of graphs and tables for VFR and IFR conditions within FAA (AC) 150/5060-5. From these figures, the hourly capacity is calculated by multiplying the hourly capacity base, the touch-and-go factor, and the exit factor together.

The equation for this formula is:

Hourly Capacity =

$$C^* \times T \times E$$

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

Following the calculation of the hourly capacity, a weighted hourly capacity is determined by calculating the ratio of annual demand to average daily demand during the peak month. The mix index (P) and weighting factor are derived from nomographs and tables in AC 150/5060-5.

TABLE 4-2 | HOURLY CAPACITY AND WEIGHTED HOURLY CAPACITY

	Year	2015	2025	2035
Hourly Capacity Base (C*)	VFR	99	92	91.5
	IFR	65	62.5	60
Touch-and-Go Factor (T)	VFR	1.2	1.2	1.2
	IFR	1.0	1.0	1.0
Exit Factor (E)	VFR	0.86	0.86	0.86
	IFR	0.35	0.35	0.35
Hourly Capacity (C)	VFR	102.17	94.94	94.42
	IFR	22.75	21.88	21.00
	PVC	0.0	0.0	0.0
Mix Index (P)	VFR	2.0	5.0	6.0
	IFR	5.0	11.0	13.0
	PVC	25.0	25.0	25.0
Percent Arrivals	VFR	5.0%	5.0%	5.0%
	IFR	2.5%	2.5%	2.5%
	PVC	1.0%	1.0%	1.0%
Weighting Factor (W)	VFR	1.0	1.0	1.0
	IFR	16.0	16.0	16.0
	PVC	25.0	25.0	25.0
Weighted Hourly Capacity (Cw)		24.71	23.47	24.76

Source: FAA Advisory Circular 150/5360-5, Change 2, Airport Capacity and Delay.

The equation formula for calculating the weighted hourly capacity CW is:
Weighted Hourly Capacity =

$$\frac{(P1 \times C1 \times W1) + (P2 \times C2 \times W2) + (Pn \times Cn \times Wn)}{(P1 \times W1) + (P2 \times W2) + (Pn \times Wn)}$$

where: P = mix index
C = hourly capacity
W = weighting factor

Table 4-2, Hourly Capacity and Weighted Hourly Capacity, depicts the factors and the airport's calculated capacity values.

ANNUAL SERVICE VOLUME

Under the FAA methodology, the most important value that must be computed to evaluate the capacity at an airport is the annual service volume (ASV). ASV represents a measure of the approximate number of total operations that an airport can support annually. Using the FAA's methodology to estimate ASV, the ratio of annual operations to average daily operations, during the peak month, must first be calculated along with the ratio of average daily operations to average peak hour operations, during the peak month. These values are then multiplied together resulting in a product to be multiplied by the weighted hourly capacity.

The equation used to calculate ASV is:
Annual Service Volume =

$$Cw \times D \times H$$

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

ILE's ASV, as calculated based on the method above, can be seen in **Table 4-3**, *Annual Service Volume (ASV)*. Based on these calculations, ILE operates well below the FAA maximum annual service volume of 230,000.

RUNWAY 01-19

Runway Length

FAA AC 150/5325-4B, *Runway Length Requirements*, provides guidance to help determine the most appropriate recommended runway lengths for an airport, which is predicated upon the category of aircraft using the airport. By design, the primary runway typically has the longest runway, the most favorable wind conditions, the greatest pavement strength, and the lowest straight-in instrument approach minimums.

Runway 01-19 meets the length requirements for the existing RDC of B-II-4000 and also 100 percent of the small GA fleet with 10 passenger seats. If the airport were to consider accommodation of 75 percent of the large general aviation fleet

TABLE 4-3 | ANNUAL SERVICE VOLUME (ASV)

Year	Annual Operations	Average Day of Peak Month	Design Hour Operations	Weighted Hourly Capacity (Cw)	Daily Demand (D)	Hourly Demand (H)	Annual Service Volume (ASV)	FAA Maximum ASV[1]	ILE Capacity Level
2015	31,100	100.3	27.5	24.71	310.0	3.65	27,959	230,000	12.2%
2025	33,700	108.7	33.8	23.47	310.0	3.22	23,427	230,000	10.2%
2035	36,900	119.0	46.1	24.76	310.0	2.58	19,803	230,000	8.6%

Source: FAA Advisory Circular 150/5360-5, Change 2, Airport Capacity and Delay.

1 FAA Maximum Annual Service Volume defined in AC 150/5060-5 based on single runway configuration with parallel taxiway, instrumentation, airspace limitations, and percent arrivals and touch-and-go operations.

(12,500 pounds to 60,000 pounds) at 60 percent useful load Runway 01-19 would need to be expanded by only five feet. Upgrading Runway 01-19 to C-II support capabilities impacts property ownership based on expanded safety areas discussed later in this chapter. Expansion beyond B-II level of support would require significant property acquisition and realignment of important arterial feeders like Business 190 on the north or FM 2490/US 190 on the south. Any future runway lengthening to accommodate the larger categories of aircraft will require justification and approval through TXDOT before any funding assistance is granted.

A significant factor to consider when analyzing the generalized runway length requirements is that the actual length necessary for a runway is a function of elevation, temperature, and stage length. As temperatures change, the runway length requirements change accordingly. Thus, if a runway is designed to accommodate 75 percent of the fleet at 60 percent useful load, this does not prevent larger aircraft at certain times and during specific conditions from utilizing the runway. However, the amount of time such operations can safely occur is restricted.

Runway Width

FAA AC 150/5300 (current series) delineates the requirements for runway width. At present, Runway 01-19 is 100 feet wide. This width exceeds the minimum runway width recommended for the existing RDC of B-II-4000 of 75 feet. At the next major runway rehabilitation project runway width will need to be considered along with the forecast growth of C-II type aircraft at ILE. Any initiative to reduce runway width will also encounter the need to move runway edge lighting and possibly visual approach aids.

TABLE 4-4 | RUNWAY LENGTH REQUIREMENTS – RUNWAY 01/19

Aircraft Category	Length (Dry Pavement) (ft)	Length (Wet Pavement) (ft)	Deficiency (ft)
Small Aircraft: 12,500 pounds or less			
95% GA Fleet	3,400	3,400	0
100% GA Fleet	4,100	4,100	0
100% GA Fleet with 10 or more passenger seats	4,500	4,500	0
Large Aircraft: Between 12,500 and 60,000 pounds			
75% of fleet at 60% useful load	5,500	5,500	5
75% of fleet at 90% useful load	7,200	7,200	1,705
100% of fleet at 60% useful load	5,960	5,960	465
100% of fleet at 90% useful load	9,610	9,610	4,115

Source: AC 150/5325-4B, Runway Length Requirements for Airport Design, Figures 3-1 and 3-2.

Generalized length only. Actual lengths should be calculated based on the specific aircraft's operational nomographs.

Useful load refers to all usable fuel, passengers, and cargo.

Calculations based on 848 feet airport elevation, mean maximum daily temperature of 96° and maximum difference in runway end elevation of 6.9 feet.

Figures are increased 10 feet for each foot of elevation difference between high and low points of runway centerline.

[1] By regulation, the length for turbo-jet powered airplanes is increased 15% up to 5,500', whichever is less for 60 percent useful loads and 15 percent up to 7,000', whichever is less for 90 percent useful loads.

Runway Alignment

The FAA defines runway alignment based on crosswind coverage. The prescribed crosswind coverage for a given runway is 95 percent for each given ARC. **Table 4-5** shows the crosswind coverage percentages for Runway 01-19 and the various ARCs at the airport indicating that the crosswind component for the 10.5 nautical mile per hour (knots) is above the prescribed threshold of 95 percent.

AIRFIELD DESIGN STANDARDS

Compliance with airport design standards is required to maintain a minimum level of operational safety. The major airport design elements are established from FAA AC 150/5300(current series), *Airport Design* and Federal Aviation Regulations (FAR) Part 77, *Objects Affecting Navigable Airspace*, and should conform with FAA airport design criteria without modification to standards.

Runway Safety Area

The runway safety area (RSA) is a two-dimensional area surrounding and extending beyond the runway and taxiway centerlines. This safety area is provided to reduce the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway. In addition, it must be cleared and free of objects except those required for air navigation and graded to transverse and longitudinal standards to prevent water accumulation, as consistent with local drainage requirements. Under dry conditions, the RSA must support emergency equipment and aircraft without causing structural damage or injury to the occupants. The FAA recommends the airport own the entire RSA in "fee simple" title. Based on FAA B-II design standards, the RSA should extend beyond the end of the runway for 300 feet and be 150 feet wide with no steeper grade than three percent. Due to existing grades beyond the Runway 01 end, only 100 feet of RSA is available. The airport has implemented declared distances to remedy the RSA length deficiency to retain the current usable runway length. **Figure 4-2** graphically illustrates the existing deficiency and declared distances for each runway end of Runway 01-19.

Object Free Area

The object free area (OFA) is a two-dimensional area surrounding runways, taxiways and taxilanes. It must remain clear of objects except those used for air navigation or aircraft ground maneuvering purposes, and requires clearing of above-ground objects protruding higher than the runway edge elevation at an adjacent point within the OFA. An object is considered any ground structure, navigational aid, people, equipment, terrain or parked aircraft. The FAA recommends that the airport own the entire OFA in "fee simple" title. Currently, ARC B-II standards indicate requirements of 500 feet wide and 300 foot length beyond each runway end. **Figure 4-2** depicts the recommended OFA standards along with deficiencies and associated declared distances remedy.

Obstacle Free Zone

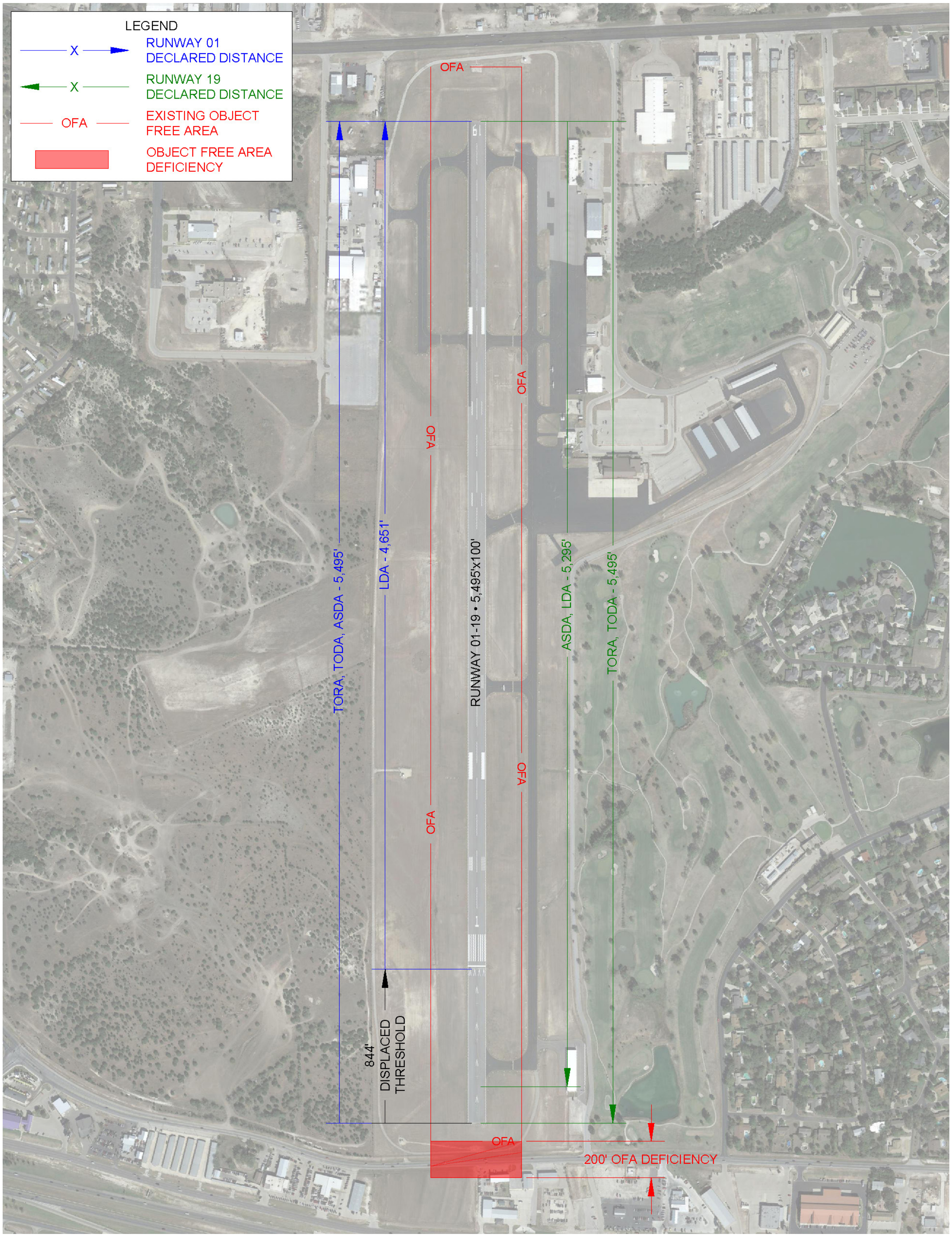
The obstacle free zone (OFZ) is airspace above and centered along the runway centerline, and precludes taxiing and parked airplanes and object penetrations except for frangible post mounted NAVAIDs expressly located in the OFZ by function. Due to the facilities required, only the Runway OFZ is applicable. The length of the OFZ is fixed at 200 feet beyond the associated runway end, but the width is dependent upon the RDC and visibility minimums associated with the instrument approach procedures associated with the runway. The OFZ width at ILE is 400 feet and the elevation of the OFZ is equal to the closest point on the runway. The runway OFZ at ILE is in compliance beyond the northern runway end; however, at the south end a small portion of the runway OFZ has a fence running through it and it extends beyond airport property into

TABLE 4-5 | CROSSWIND COVERAGE

	All Weather Crosswind Coverage (Percent)				Instrument Meteorological Conditions Crosswind Coverage (Percent)			
Runway	10.5 kts	13.0 kts	16.0 kts	20.0 kts	10.5 kts	13.0 kts	16.0 kts	20.0 kts
01/19	94.82	97.92	99.54	99.92	96.03	98.47	98.71	99.95

Source: FAA Airports – GIS Wind Analysis Tool using ILE wind data.

FIGURE 4-2 | EXISTING DECLARED DISTANCES



Source: Garver, 2015

the Farm-to-Market Road 2410 right-of-way. The OFZ elevation beyond the Runway 01 end is equal to the runway end elevation of 848.0 feet above mean sea level (MSL). Terrain beyond the Runway 01 end slopes steeply after the first 100 feet to the airport perimeter road and fence. The airport perimeter fence is an eight foot tall fence with three strands of barbed wire atop and based on ground elevations is also below the OFZ elevations in this area. Ground elevations in the area and the right of way of FM 2410 are approximately 838.0 feet MSL and below the OFZ elevation. Hence this is considered an acceptable condition.

Building Restriction Line

The building restriction line (BRL) represents the boundary that separates the airside and landside facilities and identifies suitable building area locations based on airspace and visibility criteria. The BRL is established with reference to the FAR Part 77 primary and transitional surfaces, as well as the airfield safety areas. Based on existing instrument approach procedures, the Runway 01-19 primary surface is centered on runway centerline, 1,000 feet wide and extends 200 feet beyond each runway end. The transition surfaces slope up (7:1) from the primary surface to the horizontal surface 150 feet above airport elevation. Based on the activity at the field, instrument approach types, and RDC, the 35.0 foot BRL should be 745 feet from the runway centerline. Historically, KILE has maintained a BRL at 600 feet from runway centerline. The existing 600-foot BRL provides approximately 14 feet of airspace clearance beneath the transition surface based on airport elevation as the starting point. Specific building sites must take into account the ground elevation, structure height, and the perpendicular runway edge elevation in determining suitable building locations. The combination of these factors may make it possible for structures to be constructed closer than the established BRL. There are a number of existing buildings that may be an airspace obstruction that could require installation of obstruction lighting.

With the elimination of the approach lighting system serving Runway 01, the precision minimums associated with both the ILS and GPS/RNAV approach may be raised. If this transpires the FAR Part 77 primary surface size shifts down from 1,000 feet wide to only 500 feet wide. As a result of this the recommended 35.0 foot BRL also shifts closer to the runway and will occur at 495 feet from runway centerline.

Runway Approach Surface

The approach surface is a three-dimensional trapezoidal FAR Part 77 imaginary surface extending beyond each runway end and has a defined slope requiring clearance over structures and objects beyond the runway threshold. The purpose of the approach surface is to provide proper clearance for the safe approach and landing of aircraft. The existing approach surface dimensions associated with Runway 01-19 differ on each runway end. The existing approach surface for the Runway 01 end is 1,000’ x 50,000’ x 16,000’ with a 50:1 slope for the first 10,000 feet, then 40:1 for the remaining 40,000 feet based on the precision approach. With the decommissioning of the approach lighting system, the approach surface to the Runway 01 end is reduced in size with dimensions of 1,000’ x 10,000’ x 4,000’ and extends up at a 34:1 slope. Runway 19 is a visual runway end with circling minimums from the Runway 01 instrument approach procedures. The Runway 19 approach surface dimensions are 500’ x 5,000’ x 1,500’ and it extends up a 20:1 slope.

Any obstructions to the approach surfaces will be identified by an obstruction survey and be depicted on the Airport Layout Plan (ALP).

Runway Line-of-Sight

An acceptable runway profile permits any two points, generally each runway end, five feet above the runway centerline, to be mutually visible for the entire runway length. The sight distance along a runway from an intersecting taxiway needs to be sufficient to allow a taxiing aircraft to enter safely or cross the runway, in addition to seeing vehicles, wildlife and other hazardous objects. However, if the runway offers a full-length parallel taxiway, an unobstructed line of sight will exist from any point five feet above the runway centerline to any other point five feet above the runway centerline for one-half the runway length. There are no line-of-sight requirements for taxiways. As ILE is equipped with a nearly full-length parallel taxiway, there are no line of sight deficiencies.

As can be seen in the **Table 4-6**, *Airport Design Standards*, the airport meets or exceeds the design criteria for Runway 01-19 with the exception of the RSA and ROFA. In the future, if any lowering of the instrument approach minimums occurs, new criteria may impose deficiencies in design standards.

Runway Protection Zone

The purpose of the runway protection zone (RPZ) is to enhance the protection of people and property on the ground, and to prevent obstructions that are potentially hazardous to aircraft operations. The FAA recommends that airports own the entire RPZ in "fee simple" title and that the RPZ be clear of any non-aeronautical structure or object that would interfere with the arrival and departure of aircraft. However, if "fee simple" interest is unachievable, the next option is controlling the heights of objects through an avigation easement.

The RPZ is a two-dimensional trapezoid area that normally begins 200 feet beyond the paved runway end, and extends along the runway centerline. When it begins somewhere other than 200 feet from a runway end, there is a need for two RPZs, approach and departure. The approach RPZ begins 200 feet from the threshold. A departure RPZ begins 200 feet from the end of runway pavement or TORA if different.

An FAA Interim Guidance Letter (IGL) (Sept 2012) addressed acceptable property uses within an RPZ. The IGL was released to specify and emphasize existing use standards and indicates that if any of the following parameters are met then the RPZ ownership must be reevaluated:

TABLE 4-6 | AIRPORT DESIGN STANDARDS

Item	Runway 01/19 (B-II)	FAA Design Standard (B-II Not Lower than ¾-mile vis. Min.)	FAA Design Standard (C-II, Not Lower than ¾-mile vis. Min.)
Runway Design			
Width (ft)	100	75	100
RSA Width (ft)	150	150	500
RSA Length beyond R/W end (ft)	**100**/300	300/300	1,000/1,000
OFA Width (ft)	500	500	800
OFA Length beyond R/W end (ft)	**100**/300	300/300	1,000/1,000
Obstacle Free Zone Width (ft)	400	400	400
Obstacle Free Zone Length (ft)	200	200	200
Runway Setbacks – Runway Centerline to:			
Parallel Taxiway (ft) Centerline (ft)	305	240	400
Holdline (ft)	250	250	250
Aircraft Parking Area (ft)	400	250	400
Taxiway Design			
Width (ft)	50/60	35	50
Safety Area Width (ft)	79	79	79
Object Free Area Width (ft)	131	131	131

Source: AC 150/5300-13A, Change 1, Airport Design.

Bold type indicates design deficiency for B-II Not Lower than 3/4 – mile vis. Min.

ROFA length deficient due to FM 2410 and airport perimeter fencing.

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

Land uses within an RPZ that require specific and direct coordination with the FAA include:

- Buildings and structures;
- Recreational land uses;
- Transportation facilities;
- Rail facilities;
- Public road/highways;
- Vehicular parking facilities;
- Fuel storage facilities;
- Hazardous material storage;
- Wastewater treatment facilities; and,
- Above-ground utility infrastructure.

RPZ dimensions are determined by the type/size of aircraft expected to operate at an airport and the type of approach, existing or planned, for each runway end (visual, precision, or non-precision). The recommended visibility minimums for the runway ends are determined with respect to published instrument approach procedures, the ultimate runway RDC, airfield design standards, instrument meteorological conditions, wind conditions, and physical constraints (approach slope clearance) along the extended runway centerline beyond the runway end. **Table 4-7**, *Runway Protection Zone Dimensions*, delineates the RPZ requirements. The current Runway 01 RPZ dimensions are 1,000' x 1,700' x 1,510' while the Runway 19 RPZ dimensions are 500' x 1,000' x 700'.

Not all of the RPZ property is owned or controlled by the City of Killeen as recommended by the FAA. The City does control some of the RPZ property through easements and these easements are based on the data and conditions at the time of acquisition. Acquisition of fee-simple property or avigation easements should be completed as properties/funds are available and should be based on the future runway and approach capabilities.

AIRFIELD LIGHTING AND MARKING REQUIREMENTS

Airport lighting is used to help maximize the utility of the airport during day, night and adverse weather conditions. FAA Order 7021.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services* specify minimum activity levels to qualify for visual and electronic navigational aids and equipment. Recommended lighting systems for the Airport include:

Runway Lighting/Pavement Marking

Currently, Runway 01-19 is equipped with medium intensity runway lights (MIRL). If a precision approach is maintained, high intensity runway lights and an approach lighting system are recommended. The current MIRLs are preset on the lowest intensity setting and are installed with a pilot control switch

TABLE 4-7 | RUNWAY PROTECTION ZONE DIMENSIONS

Approach Visibility Minimums	Facilities Expected to Serve	Length (ft)	Inner Width (ft)	Outer Width (ft)	Acres
Visual and Not Lower than 1-Mile	Aircraft Approach Category B	1,000	500	700	29.465
Not Lower Than ¾-Mile	All Aircraft	1,700'	1,000	1,510	48.978
Lower Than ¾-Mile	All Aircraft	2,500'	1,000	1,750	78.914

Source: FAA Advisory Circular 150/5300-13 (current series).

connected to the common traffic advisory frequency (CTAF) radio. Pilots can increase the brightness of the MIRLs through a series of microphone click transmissions on the CTAF.

Runway pavement markings should follow requirements prescribed in FAA AC 150/5300-13 (current series), and AC 150/5340-1J, *Standards for Airport Markings*. Runway 01-19 pavement has precision markings based on the ILS approach to Runway 01 and visual markings at the Runway 19 end. Future consideration should be to remark the Runway 01 end with non-precision markings in accordance with FAA standards for runway markings identified in Table 3-4 of AC 150/5300-13A. This table prescribes non-precision runway markings for a runway end with a precision approach with not lower than ¾-mile visibility minimums and decision height of 250 feet height above threshold.

Taxiway Lighting/Pavement Marking

Medium intensity taxiway lights (MITL) are the recommended lighting system for all taxiway sections and turning radii. MITL's can also be pilot controlled and wired to the same remote system as the runway lights. In 2010, ILE took advantage of new technology in taxiway lighting converting the MITLs to an LED system. While these lights do have a higher up-front cost, their energy saving potential will pay for the lights over the long term. Additional savings are achieved by the airport by setting the MITLs to normally be off but can be activated through the CTAF system similar to the MIRLs. The useful age for these lights is estimated to be three to four times that of traditional incandescent lighting. Taxiway edge/centerline reflectors can be used as a less expensive lighting alternative. Currently, ILE has LED MITLs along the parallel taxiway, connector taxiways, and in most apron areas.

All paved taxiways should be painted with standard taxiway markings as prescribed in FAA Advisory Circular 150/5340 (current series), *Standards for Airport Markings*. Currently, ILE has done an excellent job of having all their taxiway/taxilanes marked appropriately upholding established standards.

Approach Lighting System

An approach lighting system (ALS) provides the basic means to transition from instrument flight to visual flight for landing. Operational requirements dictate the sophistication and configuration of the ALS for a particular runway. Depending on the type of approach, certain ALS are required in aiding pilots in the identification of the airport environment during instrument meteorological conditions. ALS are a configuration of signal lights starting at the landing threshold and extending into the approach area a distance of 2400-3000 feet for precision instrument runways and 1400-1500 feet for non-precision instrument runways. Some systems include sequenced flashing lights that appear to the pilot as a ball of light traveling towards the runway at high speed blinking twice per second. Runway 01 was equipped with an ALS that was recently decommissioned by the FAA due to unresolvable conflicts with elevations resulting from the US 190 improvements completed by TxDOT. A medium intensity approach lighting system with sequenced flashers (MALS-F) was explored as a replacement ALS at ILE; however, it was determined that there would be a 250-foot loss of runway length to implement the MALS-F. The FAA indicated that there was no gain in the IAP minimums through installation of the MALS-F. It was determined that runway length was more important than a new ALS for the Runway 01 IAPs. There are no approach lights for the Runway 19 end. Future consideration for a new ALS will be predicted on user needs, instrument approach minimum requirements, and the restrictions of surrounding property and land use.

Runway End Identifier Lights

This lighting system provides rapid and positive identification of the runway approach end, consisting of a pair of synchronized (directional) flashing white strobes located laterally along the runway threshold. Runway end identifier lights (REIL) are typically installed along with threshold lights at each runway end. REILs are not commonly needed unless an airport is situated within an area of heavy light pollution or adjacent to areas that would deem them necessary at specific times such as a lighted ball field, lighted rodeo grounds, etc. In the future REILs serving both runway ends should be a consideration.

Visual Guidance Slope Indicators

Typical visual guidance slope indicators (VGSI) provide a system of sequenced colored light beams providing continuous visual descent guidance information along the desired final approach descent path (normally at 3 degrees for 3 nautical miles during daytime, and up to 5 nautical miles at night) to the runway touchdown point. The system normally consists of two precision approach path indicator (PAPI-2) or four (PAPI-4) lamp housing units installed 600 to 800 feet from the runway threshold and offset 50 feet to the left of the runway edge. Runway 01 and Runway 19 are equipped with a PAPI-4 system for visual approach guidance.

Aiport Signs

Standard airport signs provide runway and taxiway location, direction, and mandatory instructions for aircraft movement on the ground. As a former commercial service airport, ILE has a system of standard signs installed that indicate runway, taxiway and aircraft parking destinations. FAA Advisory Circular 150/5345-44G, *Specifications for Taxiway and Runway Signs and FAA Advisory Circular 150/5340-18D, Standards for Airport Sign Systems*, outline the specifications for these items and should be followed for proper implementation, upgrades, and upkeep of airport signs.

Wind Cone/Segmented Circle/Airport Beacon

ILE has a segmented circle with a lighted wind cone which is utilized as a standard wind indicator and airport traffic pattern delineator. The airport rotating beacon is used for visual airport identification during nighttime hours and inclement weather conditions. As mentioned in the previous chapter, both these visual aid cues are in good working order.

Main Parking Apron Lighting

It is essential for safety and security that the primary apron/ramp area is provided with adequate lighting to illuminate aircraft parking, fueling area, and hangar taxilane areas. ILE lighting is considered adequate near the fuel tanks and some of the hangars on the field. Future considerations should be to add ramp lighting near the GA terminal building and between T-hangars to increase night visibility and provide a safer operating environment. There are numerous economical light fixtures available that offer enough lighting between hangars and on the main aircraft parking apron at ILE.

NAVIGATION SYSTEMS AND WEATHER AIDS

Airport navigation aids (NAVAIDs) are installed on or near an airport to increase the airport's reliability during night and inclement weather conditions and to provide electronic guidance and visual references for executing an instrument approach to the airport or runway.

FAA Order 7021.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services*, specifies minimum activity levels to qualify for instrument approach equipment and approach procedures. As forecasted in the previous chapter, approximately 4,100 operations, or 2.7 percent of operations, will be conducted under instrument conditions by the end of the 20-year planning period. The following describes the status of existing and new NAVAIDs used at general aviation airports.

Instrument Landing System

An instrument landing system (ILS) system is composed of two primary land-based components, the localizer and glideslope. The ILS system enables an appropriately equipped and piloted aircraft to be flown to a runway end with visibility as low as ½-mile and cloud ceilings at or near 200 feet above ground level. The localizer provides lateral (horizontal) alignment guidance while the glideslope provides descent (vertical) guidance. Often functioning with these two components are marker beacons and non-directional beacons that provide identification of interim points on the approach, and an ALS that provides for rapid identification of the runway environment during inclement weather conditions. The airport has a localizer and glideslope system serving Runway 01. The visibility and decision height minimums on the approach are higher than the minimums described above due to the location of the south T-hangar and terrain west of the runway end. The FAA has deemed the current null-reference glideslope unusable and plans to remove it in the future without replacement.

Distance Measuring Equipment

Distance measuring equipment (DME) provides a continuous readout of the distance remaining to the touchdown point at an airport or to the equipment location when not at an airport. DME are often co-located with Very High Frequency Omni-Directional Radio Range (VOR/VORTAC) systems. See VOR/VORTAC information below for ILE approaches.

Very High Frequency Omni-Directional Radio Range

The Very High Frequency Omni-Directional Radio Range (VOR/VORTAC) system emits a very high frequency radio signal utilized for both enroute navigation and non-precision approaches. It provides the instrument rated pilot with 360 degrees of azimuth information oriented to magnetic north. Due to the recent development of more precise navigational systems it is planned to be phased-out by the FAA (no additional enroute units installed after 1995/deactivation by 2010). ILE is served by the Gray VOR/DME, located on Gray Army Airfield, seven miles southwest of ILE and used for the VOR-A instrument approach procedure to ILE; the Temple VOR/DME located approximately 15 miles east-northeast of ILE; and the Gooch Springs VOR/DME, located 24 miles west-northwest of the field.

Global Positioning System

Global positioning system (GPS) is a highly accurate worldwide satellite navigational system that is unaffected by weather and provides point-to-point navigation by encoding transmissions from multiple satellites and ground-based data-link stations using an airborne receiver. GPS is presently FAA-certified for en-route and non-precision instrument approach navigation with precision instrument approaches based on GPS being developed for commercial airports and coming on-line in the near future. The current program provides for GPS stand-alone and overlay approaches (GPS overlay approaches published for runways with existing VOR/DME, RNAV and NDB approaches). Recently, the selective availability segment of the channel was decommissioned, thereby enhancing the accuracy of the GPS signal. The Wide Area Augmentation System (WAAS) is being installed at or near airports to provide a signal correction enabling these GPS precision approaches. A straight-in area navigation instrument approach is available to Runway 01 utilizing GPS signals and on-aircraft receivers to guide aircraft to a safe landing at ILE.

Weather Observing System

Automated weather observation systems (AWOS) and automated surface observation systems (ASOS) consist of various types of sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast minute-by-minute weather data from a fixed location directly to the pilot. The information is transmitted over the voice portion of a local NAVAID (VOR or DME), or a discrete VHF radio frequency. The transmission is broadcast in 20-30 second messages in standard format, and can be received within 25-nautical miles of the automated weather site. AWOS/ASOS are significant for non-towered airports with instrument procedures to relay accurate and invaluable weather information to pilots. At airports with instrument procedures, an AWOS/ASOS weather report eliminates the remote altimeter setting penalty, thereby permitting lower minimum descent altitudes (lower approach minimums). These systems should be sited within 500 to 1,000 feet of the primary runway centerline. FAA Order 6560.20B, *Siting Criteria for Automated Weather Observing Systems*, assists in the site planning for AWOS/ASOS systems. According to all pertinent airport related information (Airport Facilities Directory, AirNav.com, FAA Form 5010), as well as a windshield survey, the Airport is equipped with an AWOS-3 that meets all of the parameters of FAA Order 6560.20B.

LANDSIDE FACILITIES

Terminal Area Requirements

The terminal building serves both a functional and social capacity central to the operation, promotion and visible identity of any airport. Key terminal area requirements are developed in consideration of the following general landside design concepts:

- Future terminal area development for general aviation airports serving utility and larger than utility aircraft should be centralized;
- Planned development should allow for incremental linear expansion of facilities and services in a modular fashion along an established flightline;
- Major design considerations involve minimizing earthwork/grading, avoiding flood-prone areas and integrating existing paved areas to reduce pavement (taxilane) costs;
- Future landside expansion should allow sufficient maneuverability and accessibility for appropriate types (mix) of general aviation aircraft within secured access areas; and,
- Future terminal area development should enhance safety, visibility, and be aesthetically pleasing.

The GA terminal, approximately 1,350 square feet, provides adequate service. However, there is need for improvements and possibly future expansion/redevelopment. It accommodates existing airport staff needs along with a lounge, restrooms, flight planning room, and crew rest area. An estimate of building/space needs based on forecast operational levels and design hour passengers indicates GA terminal building growth as outlined in **Table 4-8**. Public space is allocated for lounge/waiting area, flight planning, restrooms, concession, utility/equipment room, and administrative/management offices. The optional lease area could accommodate a fixed base operator, executive meeting/conference room, leased office space, classrooms, and a restaurant/kitchen space.

Aircraft Storage (Hangars)

Future hangar areas should achieve a balance between maintaining an unobstructed expansion area, minimizing pavement development, and allowing convenient airside and landside access. For planning purposes, hangars should accommodate at least 95 percent of all based general aviation aircraft. Typically, single-engine aircraft demand 1,000 to 1,200 square feet, twin-propeller aircraft require 1,200 to 3,000 square feet, and business turboprop/jet aircraft require approximately 3,000 square feet. General hangar design considerations include the following:

- Construction of aircraft hangars beyond an established building restriction line (BRL) surrounding the runway and taxiway areas and built beyond the runway OFZ, runway and taxiway OFAs, and remain clear of the FAR Part 77 and Threshold Siting Surfaces;
- Maintaining the minimum recommended clearance between T-hangars of 75 feet for one-way traffic, and 125 feet for two-way traffic. Taxilanes supporting T-hangars should be no less than 25 feet wide. Individual paved approaches to each hangar stall are typically less costly, but not preferred to paving the entire T-hangar access/ramp area;
- Construction of additional hangar space to accommodate 95 percent of the current based aircraft, hangar waiting list, and forecast need;
- Interior and exterior lighting and electrical connections on new hangar construction. Enclosed hangar storage with bi-fold doors is recommended;
- Adequate drainage with minimal slope differential between the hangar door and taxilane. A hard-surfaced hangar floor is recommended, with less than one percent downward slope to the taxilane/ramp; and,
- Segregate hangar development based on the hangar type and function. From a planning standpoint, hangars should be centralized in terms of auto access, and located along the established flight line to minimize costs associated with access, drainage, utilities and auto parking expansion.

Today, ILE has T-hangar storage (51,000 square feet) for 40 aircraft and all these T-hangars are occupied. ILE has approximately 37,800 square feet of common/box hangar storage to accommodate all of the twin-engine aircraft, helicopters, and small, single-engine aircraft. Central Texas College occupies two of these hangars, 25,000 square feet, and uses them for aircraft maintenance and storage of their fleet of multi-engine piston aircraft and small, single engine aircraft. Genesis Aero, a commercial operator on the field, performs aircraft storage and maintenance in their 6,400 square foot hangar. An additional 6,400 square foot hangar stands open

TABLE 4-8 | GA TERMINAL BUILDING SPACE/NEED

Facility	Existing 2014	Phase 1 (0-5 Years)	Phase 2 (6-10 Years)	Phase 3 (11-20 Years)
Total Building Space	1,350 ft^2	3,500 ft^2	4,300 ft^2	5,900 ft^2
Design Hour Passenger	27.5	29.5	33.8	46.1
Public Use Space	1,000 ft^2	2,000 ft^2	2,600 ft^2	3,500 ft^2
Lease Use Space	350 ft^2	1,500 ft^2	1,700 ft^2	2,400 ft^2

Source: Garver, 2015

with ILE negotiating a new tenant lease. There are 60 based aircraft on the field with another 40 on an active hangar waiting list. Ten of those on the hangar waiting list are currently based at ILE but desire newer, upgraded T-hangar unit in the future. From this waiting list it is presumed another 15 aircraft could be on the airfield provided enough hangar space existed. Forecast demand takes this need into account and is shown in **Table 4-9**.

Aircraft Storage (Based Aircraft/ Itinerant Aircraft Apron)

Paved aircraft parking and tie-down areas should be provided for approximately 40 percent of the peak/design day itinerant aircraft, plus approximately 25 percent of the based aircraft. FAA airport planning criteria recommends 360 square yards (3,240 square feet) per itinerant aircraft space and approximately 400 square yards (3,600 square feet) per based aircraft. Other site specific apron planning and design considerations include:

- Maintaining the apron area beyond all airfield safety areas per airport design requirements (RSA, OFA, RPZ, and OFZ); and,
- Preserving the minimum runway centerline to aircraft parking apron separation of 500 feet for ARC B-II with approach visibility minimums not lower than ¾ mile;
- Planning for sufficient aircraft taxiing and maneuvering space, for entering and exiting the aircraft parking apron without risk of structural damage;
- Allowing two-way passing of aircraft leading to the runway and taxiway system; and,
- Locating the main aircraft apron near the mid-section of the primary runway with sufficient space to allow for a continuation of building and hangar expansion adjacent to the flight line.

As reported in the Inventory chapter, ILE has approximately 627,000 square feet of apron and taxilane of which approximately 490,000 square feet is apron area for aircraft parking and maneuvering that conforms to the previously mentioned design considerations. The remaining apron and taxilane area is associated with the various T-hangars at ILE. Based on the recommended design parameters set by the FAA, ILE needs an estimated 144,000 square feet of apron/ taxilane under existing conditions. Forecasts for 10- and 20-years indicate a need for 165,900 and 180,300 square feet of additional apron and taxilane, respectively. Apron and taxilane need and layout will be examined during the alternatives evaluation phase of the plan.

Fuel Storage Requirements

Fuel storage requirements are based on the forecast of annual operations, aircraft utilization, average fuel consumption rates, and the forecast mix of GA aircraft anticipated at ILE. On average, the typical single-engine airplane consumes 12.0

TABLE 4-9 | AIRCRAFT HANGAR STORAGE DEMAND

Facility	Existing 2014	Phase 1 (0-5 Years)	Phase 2 (6-10 Years)	Phase 3 (11-20 Years)
Based Aircraft	60	72	77	83
T-Hangar Demand	44	52	55	58
T-Hangar Area Demand	51,000 ft^2	52,500 ft^2	55,300 ft^2	58,800 ft^2
Common/Box Hangar Demand	12	16	18	21
Common/Box Hangar Area Demand	37,800 ft^2	41,900 ft^2	56,000 ft^2	78,400 ft^2
Total Hangar Demand	56	68	73	79
Total Hangar Space Area Demand	88,800 ft^2	94,400 ft^2	111,300 ft^2	137,200 ft^2

Source: Garver, 2015

gallons of fuel per hour and flies approximately 100 nautical miles (1.0 to 1.5 hours) per flight. This figure is slightly higher at ILE due to the flight training conducted by based operators. Turbine aircraft generally will fly greater distances averaging 300 nautical miles and approximately 1.5 – 2.0 hours. Market conditions will determine the ultimate need for fuel tanks and their size. The following guidelines should be implemented when planning future airport fuel facilities:

- Aircraft fueling facilities should remain open continually (24-hour access), remain visible and be within close proximity to the terminal building or FBO to enhance security and convenience;
- Fuel storage capacity should be sufficient for average peak-hour month activity, which normally occurs during the summer months;
- Fueling systems should permit adequate wing-tip clearance to other structures, designated aircraft parking areas (tie-downs), maneuvering areas, and OFAs associated with taxilane and taxiway centerlines;
- Locating the fuel facilities beyond the RSA and BRL;
- Equipping all fuel storage tanks with monitors to meet current state and federal environmental regulations, and be sited in accordance with local fire codes;
- Have a dedicated fuel truck for Jet-A delivery to minimize the liability associated with towing and maneuvering expensive aircraft up to and in the vicinity of fueling facilities;
- Maintaining adequate truck transport access to the fuel storage tanks for fuel delivery; and,
- Capable of storing at least a month's supply of fuel to minimize delivery charges.

As reported in the Inventory chapter, ILE is equipped with two 12,000 gallon above-ground fuel storage tanks (Jet-A and AvGAS), a 500 gallon diesel tank, and a fuel truck for Jet-A deliveries. Both stationary aviation fuel tanks area equipped with 24-hour credit card systems for customer convenience and ease of operations. The tanks are located on the east side of the GA apron near the mid-point but are separated from the GA terminal building by more than 600 feet with no direct line-of-sight for airport staff. Storage levels should be able to accommodate monthly fueling needs without more than one delivery per month. An analysis of current fuel needs based on historic deliveries indicates that existing storage capacity meets the monthly demand. Estimates of future fueling demand does not show a need for expanding the fuel storage capacity. **Table 4-10** depicts the existing and phased fuel storage projections for ILE.

Auto Parking, Circulation, and Access Requirements

Automobile parking requirements are calculated using 1.5 spaces per design hour passenger, which is typical for non-towered general aviation airports with similar levels of flight training. Based aircraft owners commonly park in their individual hangars while flying. Maintaining a dedicated public auto parking lot in close proximity to the terminal building to provide convenient access for pilots and passengers is essential. Currently, with the empty former commercial terminal building, there is ample parking only a short walk from the GA terminal. As this area is considered for redevelopment as well as the area occupied by the GA terminal and ARFF station, potential areas for new auto parking will be reviewed and taken into consideration in the Alternatives chapter of this report.

SUMMARY OF AIRPORT TERMINAL AREA FACILITY REQUIREMENTS

Table 4-10, *Summary – Aviation Facility Requirements*, summarizes terminal area facility requirements to accommodate the general aviation activity projected for the Airport for each of the three phases spanning the 20-year planning period. As the numbers indicate, based aircraft will increase by more than 20 across the 20-year planning period. This brings the need for additional hangar and apron space for based and itinerant aircraft storage. Additional hangar development is needed to accommodate the hangar waiting list and forecast demands. Expansion or redevelopment of a new GA terminal building is an identified need to provide the level of service and amenities that allow ILE to compete in the regional GA marketplace. Future development options will be explored in the Alternatives chapter of this report.

TABLE 4-10 | SUMMARY – AVIATION TERMINAL FACILITY REQUIREMENTS

Facility	2015	Phase 1 (0-5 Years)	Phase 2 (6-10 Years)	Phase 3 (11-20 Years)
Based Aircraft	60	72	77	83
Annual Operations	31,100	31,900	33,700	36,900
TERMINAL BUILDING Public Use Space Lease Use Space Total Building Space	 21,000 ft^2 1,400 ft^2 3,500 ft^2	 2,600 ft^2 1,700 ft^2 4,300 ft^2	 3,000 ft^2 1,900 ft^2 4,900 ft^2	 3,600 ft^2 2,300 ft^2 5,900 ft^2
Paved Auto Parking Auto Parking Spaces	17,400 ft^2 44	19,900 ft^2 51	22,700 ft^2 58	27,200 ft^2 70
AIRCRAFT PARKING APRON Based Apron Itinerant Apron	 27,600 ft^2 61,400 ft^2	 28,400 ft^2 66,800 ft^2	 29,300 ft^2 75,500 ft^2	 30,400 ft^2 84,600 ft^2
HANGARS T-Hangars Executive/Corporate Total Hangar Demand	 51,000 ft^2 37,800 ft^2 88,800 ft^2	 63,300 ft^2 41,885 ft^2 105,185 ft^2	 66,500 ft^2 55,900 ft^2 122,400 ft^2	 70,800 ft^2 78,300 ft^2 149,100 ft^2
ANNUAL FUEL FLOWAGE AvGAS (100LL) Jet-A Total Fuel Flowage	 62,400 gallons 63,200 gallons 125,600 gallons	 73,800 gallons 68,600 gallons 194,700 gallons	 86,900 gallons 76,500 gallons 163,400 gallons	 112,000 gallons 88,200 gallons 200,200 gallons

Source: Garver, 2015; FAA Advisory Circular 150/5300-13 (current series).