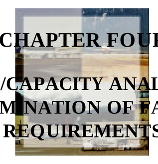


CHAPTER FOUR

DEMAND/CAPACITY ANALYSIS AND DETERMINATION OF FACILITY REQUIREMENTS

In this chapter, airside and landside facility requirements are identified for JIA through the year 2015. Facility deficiencies were determined by comparing the capacity of the Airport, or its ability to process or accommodate activity, to its projected demand. The ability of existing Airport facilities to accommodate existing and future demand is reviewed in the following sections:

C Airfield Demand/Capacity Analysis
C Airfield Facility Requirements
C Passenger Terminal Facility Requirements
C Aircraft Gate and Apron Requirements
C General Aviation Facility Requirements
C Support Facility Requirements
C Airport Access/Circulation and Automobile Parking Requirements
C Basic Infrastructure Requirements

The demand/capacity analysis is discussed in the following section. Subsequent sections describe facility requirements for the airside and landside components of the Airport.

AIRFIELD DEMAND/CAPACITY ANALYSIS

Airfield capacity is defined as the maximum number of aircraft operations that an airfield configuration can accommodate during a specified interval of time, when there is a continuous demand for service (i.e., an aircraft is always waiting to depart or land). This definition is referred to as the ultimate capacity or the maximum throughput rate. This methodology focuses on both peak hour and annual operating capacity. The Annual Service Volume (ASV) of the Airport serves as one quantifiable capacity measure, while hourly operating capacity is utilized as another measure in determining specific facility needs.

Due to the wide range and individual needs of the various aircraft types (i.e., seaplane, helicopter, etc.) that utilize the JIA, demand/capacity will be analyzed based on three separate operational areas. These areas include:

C Runway 8/26 - Operations limited to paved Runway 8/26 usage only
C Floatplane basin - Operations limited to water runway usage only
C Helicopter apron - Operations limited to rotary wing aircraft only

The airfield capacity analysis conducted for this Master Plan Update is described in the following subsections:

C Airfield Layout
C Weather Conditions
C Aircraft Fleet Mix
C Touch-and-Go Operations
C Peak Hour Airfield Capacity

- C Annual Service Volume
- C Range of Delay
- C Demand/Capacity Summary

Factors such as runway and taxiway configuration, weather, and fleet mix are reviewed to determine their influence on operational capacity. Calculated capacity is compared to projected demand to determine potential capacity shortfalls. The implications of additional facilities are also considered.

Airfield Layout

For purposes of determining operational capacity, JIA is subdivided into three separate operational areas: runway, floatplane basin, and helicopter apron.

Runway Layout: JIA has one asphalt concrete paved runway. Runway 8/26 measures 8,456 feet long and 150 feet wide and is equipped with a full-length parallel taxiway. A total of five exit taxiways are provided for Runway 8/26 as shown in **Table 4-A**.

RUNWAY 8/26 EXIT TAXIWAY TYPES AND LOCATIONS
Juneau International Airport

Taxiway Designation	*Type of Exit Taxiway*	*Location of Exit Taxiway*
A	90-degree	Threshold of Runway 8
B	90-degree	2,200 feet from threshold to Runway 8
C	60-degree	4,850 feet from the threshold of Runway 8
D	90-degree	6,050 feet from the threshold of Runway 8
E	90-degree	Threshold of Runway 26

Source: The Airport Technology and Planning Group, Inc., 1997.

Table 4-A

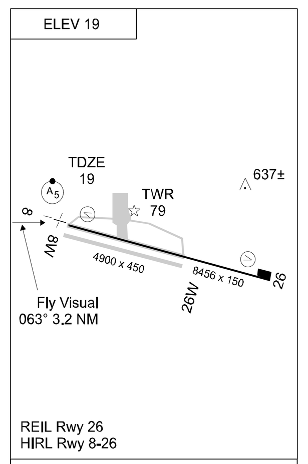
Two of the taxiway exits are located at the runway thresholds, while the remaining three taxiway exits are located at intermediate points between the runway thresholds.

Since the Airport is equipped with one paved runway, it can only be operated in one configuration (see **Figure 4-1**). As shown, there are two variations to the single-use configuration, depending on wind direction. This figure is the most current figure from the U.S. Department of Commerce. Although it does not accurately reflect current airport facilities, it does accurately reflect the configuration.

Floatplane Basin Layout: JIA has a floatplane basin. The basin is located south of and parallel to paved Runway 8/26, and offers arriving and departing aircraft an area measuring 4,800 feet in length and 450 feet in width. Aircraft landing and departing from the basin utilize the middle 200 feet, while taxiing aircraft form a race track pattern on the outside 250 feet (125 feet on either side) of the landing and departing area. This technique allows for a near continuous flow of aircraft operations.

Helicopter Apron Layout: The Airport helicopter landing areas are located north of Runway 8/26 and accommodate the majority of the rotary-wing traffic. The U.S. Army National Guard and Silver Bay Logging both use the apron areas in front of their respective hangars for arrival and departure. TEMSCO Helicopters has full access to the main runway via Taxiway Echo 1. They use Taxiway Alpha and Taxiway Echo 1 for emergency procedures, if any arise. Echo 1 is used by TEMSCO for arrivals, maintenance hovering flights, temporary aircraft landing, and temporary aircraft parking. Finally, there is one small public helicopter pad that is also located north of the paved runway. The total area at the JIA that is utilized by rotary-wing aircraft is 11,600 square yards. Although there is a formal helicopter pad at the Airport (southeast of the terminal), helicopters traditionally arrive and depart from their parking spaces and do not require use of Runway 8/26. It should be mentioned that helicopter departures from the parking area often occur in formations of up to five or more and, therefore, are using the facility to its maximum efficiency.

VARIATIONS OF SINGLE RUNWAY USE CONFIGURATION
Juneau International Airport



Knots	60	90	120	150	180
Min:Sec					

Source: U. S. Department of Commerce, U. S. Terminal Procedures, March 27, 1997

Figure 4-1

Weather Conditions

As it relates to aviation, weather is categorized in one of two ways: IFR (Instrument Flight Rule) or VFR (Visual Flight Rule). VFR conditions are in effect when weather conditions are such that aircraft can maintain safe operations by visual means. IFR conditions prevail when the visibility or cloud ceiling falls below those minimums prescribed for VFR operations and navigation is primarily dependent on instruments.

VFR minimums at JIA, as with the majority of all controlled airports, are 1,000 feet above ground level (AGL) and three nautical miles visibility. During periods of IFR weather, aircraft operating patterns become the responsibility of the Anchorage ARTCC and the JIA ATCT. The distinction between IFR and VFR weather for capacity calculations is important because the separation distance required between aircraft arriving and departing during IFR conditions is greater than that required during VFR conditions. In addition, during IFR conditions, approaches can be made only to those runways that have published precision or non-precision instrument approaches, although, through a "circle to land" maneuver, landings can be made at any approved area on the airfield. Consequently, fewer aircraft operations can occur in the same operating configuration during IFR conditions than during VFR conditions. During periods of IFR weather, only one aircraft may occupy the airspace at a time which results in a lower capacity.[4]

VFR weather occurs at JIA approximately 92.6 percent of the time, while IFR conditions occur approximately 5.6 percent of the time. The Airport is below landing minimums approximately 1.8 percent of the time. These percentages are based on weather data provided by NOAA. During IFR weather, the following types of instrument approaches are available to the Airport: LDA (Localizer type Directional Aid) and NDB (Non-Directional Beacon).

[4] Refers to Class D airspace, which encompasses an area with a radius of three nautical miles around the Airport and up to 2,500 feet AGL.

An explanation of each of these approaches is as follows:

- C LDA-1 Runway 8 - An LDA approach is a non-precision localizer type approach that is not associated with an Instrument Landing System (ILS) approach. Although the LDA approach is not directly aligned with a runway, it is still within parameters to qualify as a straight-in approach. The approach at JIA also offers circling approach minimums which allow approaching aircraft to circle and land on either Runway 26 or at the floatplane basin.
- C NDB-1 Runway 8 - An NDB approach is a non-precision approach. The NDB approach at JIA is a straight-in approach that offers circling minimums.
- C LDA-2 Runway 8 - The LDA-2 approach for JIA offers lower minimums than the LDA-1 approach. Due to the complexity of the approach, it is only available to those pilots who have received specialized training.
- C NDB-2 Runway 8 - The NDB-2 approach offers lower minimums than the NDB-1 approach, and as in the case with the LDA-2 approach, the approach is only available to those pilots that have received specialized training.
- C RNP Runway 8 Approach - The Required Navigational Performance (RNP) approach to Runway 8 is a GPS, Flight Management System (FMS) procedure currently authorized for Alaska Airlines only. It requires special aircrew training and aircraft equipage. The minimums are slightly lower than any other approach to Runway 8. It features a missed approach to the east, as opposed to the course reversal missed approach associated with other Runway 8 approaches. It has circling minimums to Runway 26.
- C RNP Runway 26 Approach - This approach has the same aircrew and aircraft requirements as the RNP approach to Runway 8. It has the lowest minimums of any instrument approach into Juneau and is the only straight in approach to Runway 26. It has circling minimums to Runway 8.

According to NOAA, winds at the Airport are calm (6-knots or less) approximately 27.1 percent of the time. When winds are not directly aligned with a runway, pilots calculate a crosswind component to determine if the type of aircraft they are operating is capable of utilizing the runway. The crosswind component is rarely exceeded at JIA. Based on crosswind components of 10.5 knots and 13 knots, Runway 8/26 is usable 97.7 percent and 99.4 percent of the time, respectively. Since the floatplane basin (8W/26W) parallels the paved runway of the Airport, these crosswind percentages can be applied. The FAA recommends that the runway configuration should provide coverage during approximately 95 percent of all wind conditions. The existing runway configuration of the Airport exceeds this FAA objective for wind coverage; therefore, operational capacity at the Airport is not significantly affected by crosswinds.

Aircraft Fleet Mix

Aircraft operational fleet mix is an important factor in determining the operational capacity of the Airport. For JIA, aircraft fleet mix will only affect operations on Runway 8/26 and will not play a role with regards to either the floatplane basin or the helicopter operating areas.

For the purpose of calculating capacity, aircraft are categorized according to their approach speed and size. Operational capacity decreases as the diversity of approach speeds increases. This is because aircraft following each other, either on landing or departure, are spaced according to the difference in their air speeds. Also, heavy aircraft create larger wingtip vortices that require greater spacing between themselves and trailing aircraft. The greater the difference in size, speed, and configuration of the aircraft in the operating fleet, the greater the space required between aircraft and, therefore, the lower the operational capacity. The projected operational aircraft fleet mix for JIA is presented in Chapter Three, *Projections of Aviation Demand*. Detailed fleet mix projections were developed since the forecasts are used for a variety of analyses within the context of the Master Plan study (noise analysis, capacity analysis, runway length and strength, pavement analysis, etc.). For the airfield capacity analysis, the aircraft fleet mix was grouped into four aircraft classifications, as shown in **Table 4-B**.

AIRCRAFT FLEET MIX BY CLASSIFICATION
Juneau International Airport

Aircraft Classifications	*Takeoff Weight (lbs)*	*Types of Aircraft*	*Estimated Approach Speed (kts)*
A	12,500 or less	Small single-engine aircraft (e.g., Piper Cherokee, Cessna Skyhawk, Grumman Tiger)	95
B	12,500 or less	Small multi-engine aircraft (e.g., Piper Cheyenne, Learjet, Beechcraft Duke)	120
C	12,501 to 299,999	Large aircraft (e.g., Boeing 737 Gulfstream V, Falcon 900)	130
D	300,000 or more	Heavy aircraft (e.g., Boeing 747, MD-11)	140

Source: FAA AC 150/5060-5, Airport Capacity and Delay, September 23, 1983.

Table 4-B

The projected aircraft fleet mix was developed based on both VFR and IFR conditions. This was necessary to adjust for the decrease in operations by noncommercial and less sophisticated GA aircraft during IFR conditions. All aircraft do not have the required equipment to operate under IFR conditions. To develop design hour fleet mix projections for VFR and IFR conditions, it was necessary to review existing fleet mix data and ATCT instrument approach records. Separation criteria between aircraft on the same runway are defined in FAA Order 7110.65, *Air Traffic Control*. An arriving aircraft cannot cross the runway threshold until the aircraft in front of it has landed and is clear of the runway. Similarly, a departing aircraft should not begin its takeoff roll until the other aircraft has departed and crossed the runway end or turned to avert any conflict. Between sunrise and sunset, if distances can be determined, the following separations can be applied:

- C Category I (same as Classification A) Aircraft - 3,000 feet.
- C Category II (same as Classification B) Aircraft - 4,500 feet.
- C Category III (same as Classifications C and D) Aircraft - 6,000 feet.

Touch-and-Go Operations

Touch-and-go operations are defined as operations by a single aircraft that lands and departs on a runway, without exiting. Pilots conducting touch-and-go operations usually remain in the airport traffic pattern, as they are generally performing training or recurrency exercises. Airport capacity increases with the ratio of touch-and-go operations to total operations, primarily since aircraft in the pattern are continually available for approaches. Touch-and-go operations, however, may reduce the availability of the runway for other types of operations. Based on discussions with Juneau ATCT personnel, it is estimated that touch-and-go operations account for approximately 18.2 percent of the total annual operations at JIA.

Peak Hour Airfield Capacity

Peak hour airfield capacity is defined as the number of aircraft operations that can take place on the runway or runway system in one hour with minimal capacity-related delay. Using FAA AC 150/5060-5, *Airport Capacity and Delay*, ultimate hourly operational capacity was computed for the paved runway and floatplane basin at JIA.

Runway 8/26: The input assumptions used for these calculations are summarized as follows:

- C Runway 8/26 is used by all types of aircraft including major/national, regional/commuter, GA, air taxi, and military.
- C Runway 8 has a straight-in, non-precision approach (within 30 degrees of approach course).
- C The number of arrivals equals the number of departures during the peak hour (arrivals equal 50 percent and departures equal 50 percent).
- C Exit taxiway spacing as presented previously in this chapter.
- C Aircraft operate at JIA under VFR conditions approximately 92.6 percent of the time and under IFR conditions approximately 5.6 percent of the time; the Airport is unusable approximately 1.8 percent of the time.
- C Dry runway conditions.
- C The Airport is not served by a radar facility.

Based on these assumptions, hourly capacities were calculated for Runway 8/26 at JIA as follows:

VFR = 98
IFR = 56

Peak hour operations for JIA are presented in Chapter Three, *Projections of Aviation Demand*. To determine the number of operations using the paved runway, the following assumptions were used to separate rotary-wing and floatplane operations from total operations:

- C Approximately 74 percent of all air taxi operations are fixed-wing.
- C Ninety percent of all fixed-wing operations use the paved runway during the peak (summer) period.

Table 4-C summarizes total peak hour operations for Runway 8/26 throughout the planning period. As shown, peak hour fixed-wing operations on Runway 8/26 are projected to increase from approximately 86 in 1995 to 97 in 2015.

The runway is currently operating at 89 percent of its hourly capacity in the peak hour. By the year 2015, it is estimated that Runway 8/26 would be operating at 99 percent of its hourly capacity during the peak hour.

PROJECTED PEAK HOUR AIRCRAFT OPERATIONS
Juneau International Airport

Year	*Total Peak Hour Aircraft Operations*	*Less Peak Hour Helicopter Operations*	*Total Peak Hour Fixed-Wing Operations*	*Less Peak Hour Floatplane Operations*	*Total Peak Hour Fixed-Wing Operations (Land)*
Historical					
1995	121	23	98	12	86
Projected					
2000	128	26	102	13	89
2005	129	26	103	13	90
2015	138	28	110	14	97

Sources: The Airport Technology and Planning Group, Inc., 1997.
JIA ATCT Personnel.
Notes: Approximately 26% of air taxi operations are conducted by helicopters. 10% of summertime (peak period) aircraft operations are conducted in the floatplane basin.

Table 4-C

Floatplane Basin: FAA AC 150/5060-5, *Airport Capacity and Delay,* was used to determine the capacity of the floatplane runway. The following adjustments and assumptions were made:

- C The floatplane basin is used by category A and B type aircraft exclusively.
- C The floatplane basin is not equipped with an instrument approach; however, aircraft may execute a circle-to-land maneuver from either

one of the four instrument approaches intended for the paved runway.

- The number of arrivals equals the number of departures during the peak hour (arrivals equal 50 percent and departures equal 50 percent).
- Aircraft are able to utilize the outsides of the floatplane basin as a parallel taxiway system.
- Arrival-arrival separation of 2,000 feet.
- The average floatplane operation uses the same amount of time as a similar land operation.
- Arrival-arrival separation of three miles for both small and large aircraft during IFR weather.
- Since the floatplane basin is configured in the same manner as the runway, hourly capacities are identical. Therefore, the basin has a theoretical hourly capacity of:

VFR = 98
IFR = 56

Peak hour demand for the floatplane basin is shown in Table 4-C. As shown, peak hour operations for the basin are anticipated to increase from approximately 12 in 1995 to 14 in 2015. Based on this analysis, approximately 12 percent of the hourly operating capacity of the floatplane basin is currently used and that will increase to 14 percent in 2015.

Helicopter Operations Area: Since the FAA does not offer guidelines for peak hour capacity and delay analysis for rotary-wing aircraft, capacity and delay estimates were not computed for the helicopter aprons. It should be mentioned, however, that the helicopter aprons have incorporated their own set of arrival and departure procedures, and these procedures generally do not impact paved Runway 8/26 or floatplane basin operations.

Annual Service Volume

ASV is a reasonable estimate of the annual capacity of the airport. It accounts for the differences in runway use, aircraft mix, weather conditions, etc., that would be encountered during a year. As annual aircraft operations approach the ASV of an airport, annual aircraft delays increase rapidly with relatively small increases in aircraft operations.

As a planning rule of thumb, when the demand of an airport reaches 60 percent of its capacity, new airfield facilities should be planned. When annual operations reach 80 percent of annual capacity, new airfield facilities should be constructed or demand management strategies should be implemented.

The formula for calculating the ASV is as follows:

$$ASV = (\text{Weighted Hourly Capacity})(D)(H)$$

Weighted hourly capacity must first be computed. In addition to the weighted hourly capacity, two additional factors are used to calculate the ASV: The ratio of annual demand to average daily demand in the peak month of the year, referred to as the D factor; and the ratio of average daily demand to average peak hour demand, for the peak month of the year, referred to as the H factor. As discussed in the previous Chapter, hourly capacity is the measure of the maximum number of aircraft operations that can be accommodated on the airport, or by an airport component, in one hour. The weighted hourly capacity is the hourly capacity adjusted for the mix of the operating fleet for a particular airfield operating configuration when compared to the maximum capacity of the airfield. The W factor is also referred to as the FAA weighting factor. Additionally, the percent usage of each airfield configuration is also calculated into the equation. The weighted hourly capacity for an airport is computed as follows:

$$C_w = \frac{(P1xC1xW1) + (P2xC2xW2)}{(P1xW1) + (P2xW2)}$$

Where:

C_w = Weighted hourly capacity
P = Percent airfield operating configuration (IFR/VFR)

C = Hourly capacity for airfield operating configuration
W = FAA weighting factor

$$C_w = \frac{(0.056 \times 56 \times 3)+(0.926 \times 98 \times 1)}{(0.056 \times 3) + (0.926 \times 1)} = 92$$

Based on this calculation, a weighted hourly capacity of 92 operations was computed for the paved runway component of JIA. Additionally, since the floatplane basin has the same essential operating configurations, weighting factor, and hourly capacity, the floatplane component also has a weighted hourly capacity of 92.

The IFR capacity of Runway 8/26 is significantly reduced since the Airport does not have a precision approach or radar control. Due to the terrain surrounding the Airport, the possibility of installing a straight-in precision approach to the facility is complicated and, until recently, unobtainable. Traditionally, a precision approach is directly aligned with the runway centerline. New GPS technology allows aircraft to execute a "curved" straight-in precision approach. The feasibility for JIA to support this type of approach has been proven and Alaska Airlines is now using GPS approaches along the Gastineau Channel to Runway 26. A brief discussion of precision approach options is contained in the Electronic Approach of NAVAIDs section of this chapter.

In addition to the weighted hourly capacity, two additional factors are used to calculate the ASV: The ratio of annual demand to average daily demand in the peak month of the year, referred to as the D factor; and the ratio of average daily demand to average peak hour demand, for the peak month of the year, referred to as the H factor. The ASV for Runway 8/26 is presented below:

Runway 8/26 ASV = (weighted hourly capacity)(D)(H)
= (92)(221.4)(7)
= 142,582

Projected annual demand versus capacity for Runway 8/26 is presented in **Figure 4-2**.

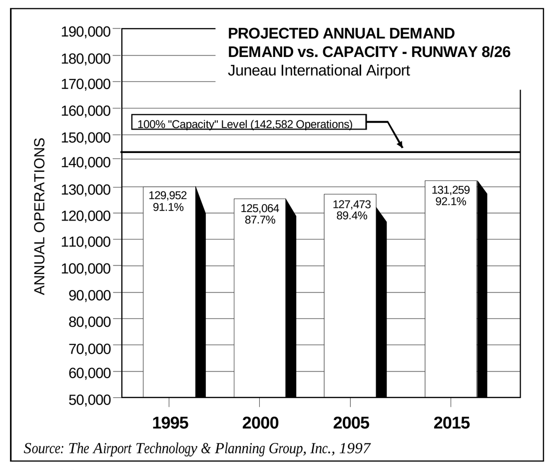
As shown on **Table 4-D**, the annual demand of the floatplane basin is projected to increase from 11,803 operations (27.6 percent of ASV) in 1995 to 12,118 operations (28.3 percent of ASV) in 2015 (see **Figure 4-3**).

PROJECTED TOTAL AIRCRAFT OPERATIONS
Juneau International Airport

Year	*Total Operations*	*Less Helicopter Operations*	*Total Fixed-Wing Operations*	*Less Floatplane Operations*	*Total Fixed-Wing Operations (Land)*
Historical					
1995	171,062	29,307	141,755	11,803	129,952
Projected					
2000	161,712	25,490	136,222	11,158	125,064
2005	164,484	25,662	138,822	11,349	127,473
2015	175,624	32,247	143,377	12,118	131,259

Sources: *The Airport Technology and Planning Group, Inc., 1997.*
JIA ATCT Personnel.
Notes: *Approximately 26% of air taxi operations are conducted by helicopters.*
10% of summertime (May - Sep) aircraft operations, which comprise 6.9% of total annual operations, are conducted in the float plane basin.

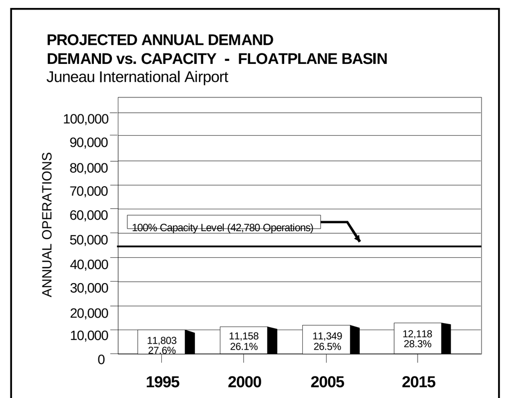
Table 4-D



Source: The Airport Technology & Planning Group, Inc., 1997

Figure 4-2

This level of demand, when compared to the ASV for the floatplane basin, indicates that the Airport should not have to plan or implement capacity-enhancing measures during the planning period.



Source: The Airport Technology & Planning Group, Inc., 1997

Figure 4-3

Range of Delay

Annual aircraft delay, expressed in minutes per aircraft operation, is also an important measure of the ability of the Airport to accommodate projected operations. The relationships between the ratio of annual demand to ASV and average annual aircraft delays are shown in **Table 4-E**. These relationships were derived from FAA AC 150/5060-5, *Airport Capacity and Delay.*

Runway 8/26 Projected Delay: Average annual aircraft delay for paved Runway 8/26 at JIA was estimated for the planning period and is presented in **Table 4-F**.

As shown, average delay is expected to increase from a level of 1.4 minutes per aircraft operation in 1995 to a level of 1.6 minutes per aircraft operation by 2015. Peak aircraft delay is estimated to increase from 7.0 to 14.0 minutes per aircraft in 1995 to 9.0 to 18.0 minutes per aircraft by the year 2015. If these estimates come to fruition, total annual delay experienced by aircraft using Runway 8/26, based on average aircraft delay per operation, will reach 3,500 hours in 2015.

Floatplane Basin Projected Delay: Average annual aircraft delay for the floatplane basin at JIA was calculated for the 20-year planning period and is depicted in **Table 4-G**.

As shown, average delay is expected to increase from a level of 0.19 minutes per aircraft operation in 1995 to a level of 0.2 minutes per aircraft operation by 2015. Peak aircraft delay is estimated to increase from 0.8 to 1.2 minutes per aircraft in 1995 to 1.0 to 2.0 minutes per aircraft by the year 2015. Total annual delay, based on average delay per operation, will reach approximately 40 hours by 2015.

FAA ESTIMATED DELAY RANGES
Juneau International Airport

Ratio of Annual Demand To ASV	Average Aircraft Delay (min/op)	Peak Delay Range for Individual Aircraft (min)
0.1	0.0	0.0 - 0.5
0.2	0.1	0.5 - 1.0
0.3	0.2	1.0 - 2.0
0.4	0.3	1.5 - 3.0
0.5	0.4	2.0 - 4.0
0.6	0.5	2.5 - 5.0
0.7	0.7	3.5 - 7.0
0.8	0.9	4.5 - 9.0
0.9	1.4	7.0 - 14.0
1.0	2.6	13.0 - 26.0
1.0	5.4	27.0 - 54.0

Source: FAA, AC 150/5060-5, Airport Capacity and Delay, September 23, 1983.

Table 4-E

Demand/Capacity Summary

As described in the preceding sections, the weighted hourly capacity of the runway and floatplane basin at JIA are individually estimated at 92.6 hourly operations. The existing ASVs for paved Runway 8/26 and the floatplane basin are calculated at 142,582 and 42,780 operations, respectively. The floatplane basin will reach an estimated 28.3 percent of ASV by 2015 and is not anticipated to require the planning or implementation of capacity enhancing measures.

Paved Runway 8/26 is currently operating at 91.1 percent of ASV (1995) and is estimated to reach 92.1 percent of ASV by 2015 (see Table 4-F). At these levels, delay will become an increasingly important issue and the Airport will have to determine the level of delay that is acceptable or tolerable to the traveling public. The estimated annual delay of 3,500 hours in 2015 represents a cost to the airport users. Based on sound planning principles, airfield capacity-enhancement measures should be planned over the next 20 years.

RUNWAY 8/26 PROJECTED DELAY
Juneau International Airport

Year	ASV	Annual Demand	Ratio of Annual Demand to ASV	Average Aircraft Delay (min)	Peak Aircraft Delay (min)
Historical					
1995	142,582	129,952	0.911	1.4	7.0 - 14.0
Projected					
2000	142,582	125,064	0.877	1.2	7.0 - 12.0
2005	142,582	127,473	0.894	1.3	7.0 - 13.0
2015	142,582	131,259	0.921	1.6	9.0 - 18.0

Source: The Airport Technology and Planning Group, Inc., 1997.

Table 4-F

FLOATPLANE BASIN PROJECTED DELAY
Juneau International Airport

Year	*ASV*	*Annual Demand*	*Ratio of Annual Demand to ASV*	*Average Aircraft Delay (min)*	*Peak Aircraft Delay (min)*
Historical					
1995	42,780	11,803	0.276	0.19	0.8 - 1.2
Projected					
2000	42,780	11,158	0.261	0.19	0.8 - 1.2
2005	42,780	11,349	0.265	0.19	0.8 - 1.2
2015	42,780	12,118	2.283	0.20	1.0 - 2.0

Source: The Airport Technology and Planning Group, Inc., 1997.

Table 4-G

AIRFIELD FACILITY REQUIREMENTS

Airfield facility requirements were developed for each of the following functional areas at the Airport:

- Runway Length
- Runway Width
- Pavement Strength
- Taxiway System
- Airfield Safety Areas
- Navigational Aids

The planning and design of an airport is based on the role of the airport and the critical aircraft that use the facility. The FAA provides guidance for planning and design through FAA ACs that promote airport safety, economy, efficiency, and longevity.

For airport design purposes, it was necessary to establish applicable design standards for future runway and taxiway development. Information from FAA AC 150/5300-13 (Change 5), *Airport Design*, was used to determine the ARC for JIA. The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at an airport.

The ARC has two components relating to the design aircraft of the airport (see **Table 4-H**). The first component, depicted by a letter, is the aircraft approach category, as defined by aircraft approach speed. The second component, depicted by a roman numeral, is the airplane design group, as determined by aircraft wingspan. Generally, aircraft approach speed applies to runways and runway-related facilities. Aircraft wingspan relates primarily to separation criteria involving taxiways, runways, and taxilanes.

FAA AIRCRAFT CLASSIFICATIONS
Juneau International Airport

Approach Category	***Approach Speed (Knots)***	***Typical Aircraft Type***
A	Less than 91	Beech Baron 55, Cessna 172
B	91 but less than 121	King Air, Citation II, Metroliner
C	121 but less than 141	B727, B737, DC-9
D	141 but less than 166	B777, MD-11

Design Group	***Wingspan (Feet)***	***Typical Aircraft Type***
I	Less than 49	Beech Baron 55, Cessna 172, Cessna 414, King Air F90
II	49 but less than 79	Falcon 50, Beech King Air E-90, Gulfstream I, Citation II, DHC-6
III	79 but less than 118	B727, B737, BAC-111, DC-9, Convair 580
IV	118 but less than 171	A-300, B707, DC-8, B757, B767, L-1011, DC-10
V	171 but less than 197	B747, B777
VI	197 but less than 262	Lockheed C-5B

Source: *FAA AC 150/5300-13-Change 5, Airport Design.*

Table 4-H

Figure 4-4 presents examples of typical critical aircraft that could control the design parameters for JIA. As shown, all of the aircraft fall within an ARC of C-III or lower. The B737-200/300/400/900, B727, and MD-87 currently operate at the Airport on a regular basis and perform the majority of the major/national operations. The MD-87 series and the B737-400/900 are projected to account for the majority of the major/national operations throughout the 20-year planning period.

The runways and taxiways at the JIA should be designed in accordance with the standards developed by the FAA using the ARC system. **Table 4-I** shows the FAA design criteria for Runway 8/26 using the ARC system. As shown in Table 4-I, requirements set forth by the FAA regarding C-III airports are not met by existing airport facilities.

FAA DESIGN CRITERIA
Juneau International Airport

Criteria	***Existing Runway 8/26***	***ARC C-III Design Standards Typical Aircraft Type***
Runway Width	150	100
Runway Centerline to		
- Parallel Runway Centerline	575	700
- Taxiway Centerline	400	400
- Aircraft Parking Area	310 [1]	500
- Holdline	250	250
Runway Object Free Area		
- Width	330	800
- Length Beyond Runway End	200	200
Runway Safety Area		
- Width (west 5,000 feet)	480	500
- Width (east 3,456 feet)	228	500
- Length Beyond Runway End (R/W 8)	200	1000
- Length Beyond runway End (R/W 26)	200	1000
Taxiway Width	75	50
Taxiway Object Free Area (Width)		186
Taxiway Safety Area (Width)		118

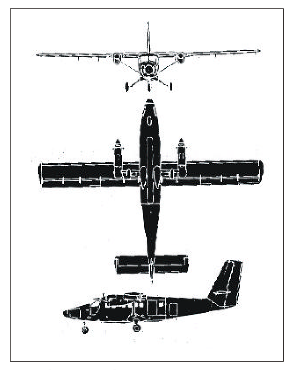
Note: [1] Floatplane Moorings

Source: *The Airport Technology and Planning Group, Inc., 1997.*

Table 4-I

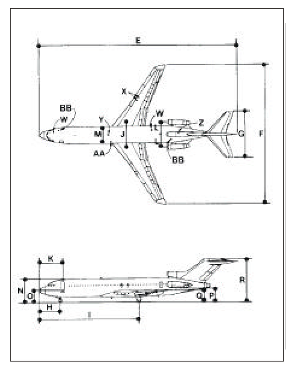
TYPICAL OPERATING AIRCRAFT
Juneau International Airport

CESSNA 172 RG
Wing Span: 36 ft 0 in
Length: 27 ft 5 in
Max T-O Weight: 2,650 lbs
ARC: A-I



DHC TWIN OTTER
Wing Span: 65 ft 0 in
Length: 51.7 ft 0 in
Max T-O Weight: 12,500 lbs
ARC: A-II

BOEING 737-400
Wing Span: 94 ft 9 in
Length: 119 ft 7 in
Max T-O Weight: 139,000 lbs
ARC: C-III



BOEING 727-200
Wing Span: 108 ft 0 in
Length: 153 ft 3 in
Max T-O Weight: 209,500 lbs
ARC: C-III

Source: Derek Wood "Jane's World Aircraft Recognition Handbook", Fourth Edition

Figure 4-4

Runway Length

Runway length requirements are determined by analyzing the runway length needs of the design aircraft for the Airport. The recommended length for Runway 8/26 is determined by considering either a family of airplanes having similar performance characteristics or a specific airplane that is projected to use the runway on a regular basis. A "regular basis" is defined as a minimum of 500 operations annually. To identify the runway length needed to accommodate aircraft operating (or anticipated to operate) at JIA, aircraft manufacturers' data for several major/national aircraft were obtained and analyzed.

Required runway length is a function of many factors, including, but not limited to, temperature, runway elevation, runway gradient, length of haul performed by the aircraft, wet/dry runway conditions, and engine/airframe combination. Although scheduled commercial aircraft departing from the Airport do not fly stage lengths greater than 1,000 miles, consideration is given to providing the capability for stage lengths up to 1,500 miles, should airlines choose to pursue service to more distant markets. The distance of 1,500 miles was chosen due to the remoteness of the CBJ.

Airplane Characteristics for Airport Planning manuals published by the Boeing Airplane Company were consulted in order to compute required takeoff runway lengths. This is considered a typical methodology for conducting runway length analyses within the context of an airport master plan. Manufacturers' specifications for several large commercial aircraft, operating at 60, 90, and 100 percent of maximum structural payload, are presented in **Table 4-J**, below. Specifications for the DC-9 aircraft, however, were provided by Evergreen Airlines, which operates cargo flights at JIA.

RUNWAY LENGTH REQUIREMENTS
Juneau International Airport

		Maximum	*Runway Length Requirements (ft.)*		
Aircraft	*Engine*	*Takeoff (lbs.)*	*60% Payload*	*90% Payload*	*100% Payload*
B737-200	JT8D-9/9A	115,500	5,500	7,500	8,500
B737-300	CFM56-3B1	135,500	4,000	4,900	5,000
B737-400	CFM56-3C1	150,000	4,200	5,500	6,100
B737-800	CFM56-7B24	172,500	4,900	6,000	6,800
B737-900	CFM56-7B24	174,200	6,700	8,400	8,700
MD-87	JT8D-17C	140,000	4,100	4,900	5,300
DC-9-33	JT8D-7	108,000	--	--	8,000

Assumptions:
- Standard Day (59EF); DC-9 assumes 80EF
- 19 feet sea level pressure
- Fuel requirements are based on a stage length of 1,500 miles
- Zero runway gradient, zero wind
- No engine bleed for air conditioning

Sources: Boeing Airplane Company.
Evergreen International Airlines.

Table 4-J

Based on the takeoff runway lengths documented in Table 4-J, it is recommended that the existing Runway 8/26 length of 8,456 feet is adequate to accommodate the aircraft which currently operate or are projected to operate from the Airport on a regular basis. It is significant to note that, for the aircraft listed in Table 4-J, there are scenarios in which they will operate with some payload limitation. This limitation could be based on hot day performance (which generally requires greater runway length), wet runway conditions, and high wind conditions.

Based on the takeoff runway length requirements documented in Table 4-J, it is recommended that the existing Runway 8/26 length of 8,456 feet be maintained to accommodate the aircraft which currently operate at the Airport on a regular basis (i.e., the Boeing 737-200), or are projected to operate at the Airport on a regular basis (i.e., the Boeing 737-900, which Alaska Airlines has ordered). This recommendation recognizes the fact that, for the aircraft listed in Table 4-J (such as the Boeing 737-200 and 737-900) there are scenarios in which they will operate with some payload limitation. This limitation could be based on hot day performance (which generally requires greater runway length), wet runway conditions, and high wind conditions. Furthermore, it is recommended that the existing runway length be maintained based on the landing length requirements of the aircraft operational fleet. Discussions with Alaska Airlines Flight Operations personnel indicate that the full runway length is needed at JIA, based on margin of safety requirements during periods of inclement weather when aircraft braking action is less than ideal. However, additional capacity enhancement measures, including development of an additional runway should be considered, based on projected demand in aircraft operations. The FAA runway length computer program, Airport Design 4.2A, indicates that aircraft that would likely use a second paved runway at JIA would require an operating length of 4,090 feet. Options to provide such a runway at JIA are explored in Chapter Five, *Alternative Development Concepts*.

Floatplane Basin: The floatplane basin measures 4,900 feet in length and has a landing area that measures 200 feet wide. FAA AC 150/5395-1, *Seaplane Bases*, recommends that a floatplane basin offer a water operating area that measures at least 2,500 feet long. Based on this criteria, the length of the existing floatplane basin is adequate throughout the planning period.

Runway Width

The width of a paved runway is calculated in a similar manner as the length. The width of the landing area is calculated as a function of the approach speed and wing span of the critical aircraft utilizing the paved runway. With regards to the floatplane basin, the width is calculated as a function of the weight of the critical aircraft.

Runway 8/26: FAA design criteria require a runway width of 100 feet for an ARC of C-III. Based on these criteria, the 150-foot width of Runway 8/26 is considered more than adequate throughout the planning period and beyond.

Floatplane Basin: Design criteria outlined in FAA AC 150/5395-1, *Seaplane Bases*, recommend that all floatplane facilities serving small aircraft have a landing area that measures 100 feet or more with a 200-foot turning basin at each end.[5] The floatplane basin at JIA measures 200 feet in width and, therefore, satisfies the requirement for both the landing area and the turning basins.

Runway Pavement Strength

Runway pavement strength is defined as single-wheel loading, twin-wheel loading, single-tandem wheel loading, twin-tandem wheel loading, and double-dual-tandem wheel loading. The aircraft gear type and configuration dictate how the aircraft weight is distributed to the pavement and determines pavement response to loading. Examination of gear configuration, tire contact areas, and tire pressure in common use indicate that the pavement strength requirement is related to aircraft maximum takeoff weight. As stated in Chapter 2, *Existing Conditions,* the runway currently has a pavement strength of 75,000 pounds for single-wheel loading, 300,000 pounds for twin-wheel loading, 175,000 pounds for single-tandem wheel loading, 340,000 pounds for twin-tandem wheel loading, and 500,000 pounds for double-dual-tandem wheel loading. Runway 8/26 is composed of grooved asphalt concrete. **Table 4-K** depicts aircraft either currently operating, or projected to operate, at the Airport, along with maximum takeoff weight and gear configuration of the aircraft. It should be noted that pavement strengths do not prohibit aircraft that weigh in excess of the limit

[5] Small aircraft are defined by the FAA as all aircraft that have a maximum certificated takeoff weight of 12,500 lbs or less.

from utilizing the facility. Pavement strength requirements call for aircraft that exceed the limit to gain permission prior to using the facility. The heaviest aircraft projected to operate at the JIA on a regular basis is the B737-900 with a maximum takeoff weight of 174,200 pounds and landing gear with dual wheel configuration. Runway 8/26 is currently capable of supporting this aircraft; therefore, runway pavement strength is considered to be adequate throughout the 20-year planning period. Although the Boeing 727-200 does not currently operate at the Airport, it has operated there in the past and may operate at the Airport in the future. The runway pavement strength is adequate for the B727-200.

PAVEMENT STRENGTH REQUIREMENTS
Juneau International Airport

Aircraft	*Maximum Takeoff Weight(lbs.)*	*Landing Gear Configuration*
B737-200	115,500	Dual-Wheel
B737-300	135,500	Dual-Wheel
B737-400	150,000	Dual-Wheel
B737-800	172,500	Dual-Wheel
B737-900	174,200	Dual-Wheel
B727-200	209,500	Dual-Wheel

Source: Boeing

Table 4-K

Runway Depth (Floatplane Basin)

The FAA states that a depth of 6 feet is preferred for the landing area of a floatplane basin, although, a minimum depth of 3 feet is adequate for most operations. The depth of the floatplane basin at the Airport varies throughout the year, primarily based on weather conditions and tides. At the west end of the floatplane basin, the pond is not deep enough. Alternative improvements to the floatplane basin infrastructure should be explored to make the water level more consistent.

Taxiway and Taxi Channel System

FAA AC 150/5300-13, *Airport Design*, requires that taxiways serving a C-III runway be at least 50 feet wide. In addition, the runway centerline to taxiway centerline separation should measure at least 400 feet. All taxiways that serve air carrier aircraft measure 75 feet wide and the distance between the parallel taxiway and runway centerline is 400 feet. The current taxiway system meets FAA requirements for these criteria. However, it is recommended that exit taxiways "B" and "D" be improved as acute-angle exit taxiways to increase the runway acceptance rate. This will improve airfield capacity, especially as it relates to small aircraft.

FAA AC 150/5395-1, *Seaplane Bases*, recommends that taxi channels for small seaplanes measure at least 125 feet wide; however, a width of 150 feet is desirable. The two taxi channels (one on each side of the landing area) are 125 feet wide, which meets the minimum requirements set forth by the FAA. Therefore, no taxi channel improvements are recommended for the floatplane basin.

Airfield Safety Areas

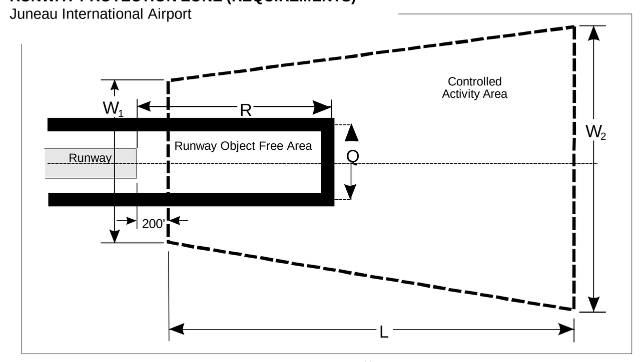
This section presents the FAA airfield safety standards as they relate to the JIA. The following airfield safety standards are reviewed in this section:

- Runway Protection Zone (RPZ)
  - Runway OFA (Object Free Area)
  - Controlled Activity Area
- RSA (Runway Safety Area)
- OFZ (Obstacle Free Zone)
  - Runway OFZ
  - Inner-Approach OFZ
  - Inner-Transitional OFZ

Runway Protection Zone: The RPZ is trapezoidal in shape and is centered on the extended runway centerline (**Figure 4-5**). The RPZ begins 200 feet beyond the end of the runway pavement usable for takeoffs and landings. The actual length and width of the RPZ is contingent on the size of the aircraft operating on the runway, as well as on the type of approach available. Generally, as the aircraft size increases and the type of approach becomes more precise, the dimensions of the RPZ increase. Figure 4-5 depicts the dimensions of the existing and future RPZs for Runway 8/26. A precision GPS approach to Runway 26, with approach visibility minimums of less than 3/4 mile, will increase the size of the RPZ on the Runway end 26.

The runway OFA and the controlled activity area are discussed as follows.

RUNWAY PROTECTION ZONE (REQUIREMENTS)
Juneau International Airport



RUNWAY	W_1	W_2	L	R	Q
8	500 FT	1,010 FT	1,700 FT	1,000 FT	800 FT
26 Existing	500 FT	1,010 FT	1,700 FT	1,000 FT	800 FT
26 Future	1000 FT	1,750 FT	2,500 FT	1,000 FT	800 FT

W_1 = RUNWAY PROTECTION ZONE - Inner Width
W_2 = RUNWAY PROTECTION ZONE - Outer Width
L = RUNWAY PROTECTION ZONE - Length
R = OBJECT FREE AREA - Length
Q = OBJECT FREE AREA - Width

Source: FAA, Advisory Circular 150/5300-13, Airport Design, September 29, 1989

Figure 4-5

Runway Object Free Area: The runway OFA is a two-dimensional ground area surrounding the runway. The runway OFA clearing standard requires clearing the OFA of aboveground objects protruding above the RSA edge elevation. FAA standards prohibit parked aircraft and objects, except NAVAIDs and objects with locations fixed by function, from locating within the OFA. For both ends of Runways 8/26 the OFA is required to extend 1,000 feet from the runway end and measure 800 feet in width. The OFA for Runway 8/26 is impacted by several of the larger floatplanes that penetrate this surface. Since parked planes are not allowed in the OFA, alternative ways to comply with the OFA clearing criteria must be examined. Potential solutions to this issue will be explored in Chapter Five, *Alternative Development Concepts*.

Controlled Activity Area: The controlled activity area is that portion of the RPZ beyond and to the sides of the runway OFA. It is recommended that the controlled activity area be owned by the Airport. This area should be free of land uses that create glare and smoke. Also, the construction of residences, fuel-handling facilities, churches, schools, and offices are not recommended in the controlled activity area. While it is desirable to clear all objects from this area, some uses are permitted provided that those uses: do not attract wildlife, are outside of the runway OFA, are below the approach surface, and do not interfere with NAVAID operation of the Airport. Golf courses (but not club houses) and agricultural operations, in particular, are permitted within the controlled activity area. Even these activities, however, should not be permitted in the OFA or RSA.

The controlled activity areas for each runway end at the Airport, as well as any hazards that may exist, include:

- **Runway end 8** - The Mendenhall River currently flows through the controlled activity area to Runway 8.
- **Runway end 26** - The Gastineau Channel is located in the controlled activity area to Runway 26.

Since both the Mendenhall River and the Gastineau Channel are attractions to wildlife, they are in violation of the requirements set forth for the controlled activity area.

Runway Safety Area: The RSA is a critical two-dimensional safety area surrounding the runway. Based on FAA design criteria for ARC C-III, the RSAs for Runway 8/26 should be 500 feet wide and extend 1,000 feet beyond each runway end. In addition, RSAs should be:

- Cleared, graded, and free of potentially hazardous surface variations.
- Properly drained.
- Capable of supporting SRE (snow removal equipment), ARFF equipment, and aircraft (without causing damage to the aircraft).
- Free of objects, except for objects mounted on low-impact resistant supports (frangible mounted structures) whose location is fixed by function.

RSAs in the following areas do not meet the aforementioned FAA design criteria:

- **Runway end 8 -** The Mendenhall River crosses through the RSA approximately 270 feet from the runway end. The access road to the floatplane docks crosses the RSA approximately 200 feet from the runway end.
- **Runway end 26** - The Gastineau Channel fully surrounds Runway end 26. The channel will only allow the RSA to extend 200 feet beyond the runway end.
- **Runway 8/26 width** - The channel combined with the steep gradient from the runway surface to the water, only allows an RSA of approximately 228 feet in width for 3,456 feet from the east. At 5,000 feet from the west, the width is 480 feet.

Options for addressing the aforementioned impacts to Runway 8/26 RSA will be discussed in detail in Chapter 5, *Alternative Development Concepts*.

Obstacle Free Zone: The OFZ is a three-dimensional volume of airspace that supports the transition of ground to airborne operations or vice versa. The OFZ clearing standards prohibit taxiing and parked airplanes and other objects, except frangible NAVAIDs or fixed-function objects, from penetrating the OFZ. For Runway 8/26 at JIA, the runway OFZ, the inner approach OFZ, and the inner-transitional OFZ comprise the OFZ.

Runway OFZ: As defined by the FAA, the runway OFZ is an area of airspace centered above the runway centerline. The runway OFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. There are no penetrations to the runway OFZ.

***Inner-Approach OFZ*:** The inner-approach OFZ is a defined volume of airspace centered on the approach area that applies only to runways with approach lighting. For this reason, the inner-approach OFZ currently applies to Runway end 8 and will apply to Runway end 26 if approach lights are installed on that runway end. The inner-approach OFZ begins 200 feet from, and at the same elevation as, the runway threshold and extends 200 feet beyond the last unit in the approach lighting system. It is the same width as the runway

OFZ and rises at a slope of 50:1 away from the runway end. There are currently no objects that violate the inner approach OFZ for Runway end 8.[6]

***Inner-Transitional OFZ*:** The inner-transitional OFZ is a defined volume of airspace along the sides of the runway OFZ and inner-approach OFZ. It applies only to runways with lower than 3/4-statute-mile approach visibility minimums. Should the JIA runway approach visibility minimums be reduced to less than 3/4 mile, the inner-transitional OFZ would begin at the edges of the runway OFZ and inner-approach OFZ, rise vertically for a height "H," then slope 6 (horizontal) to 1 (vertical) out to a height of 150 feet above the established airport elevation.[7]

FAR Part 77 Surfaces

FAR Part 77, *Objects Affecting Navigable Airspace*, establishes standards for determining which structures pose potential obstructions to air navigation. This is accomplished by defining specific airspace areas around an airport that cannot contain any protruding objects. These airspace areas are often referred to as imaginary surfaces. Objects affected include existing or proposed objects of natural growth; terrain; or permanent or temporary construction, including equipment. The imaginary surfaces outlined in FAR Part 77 include:

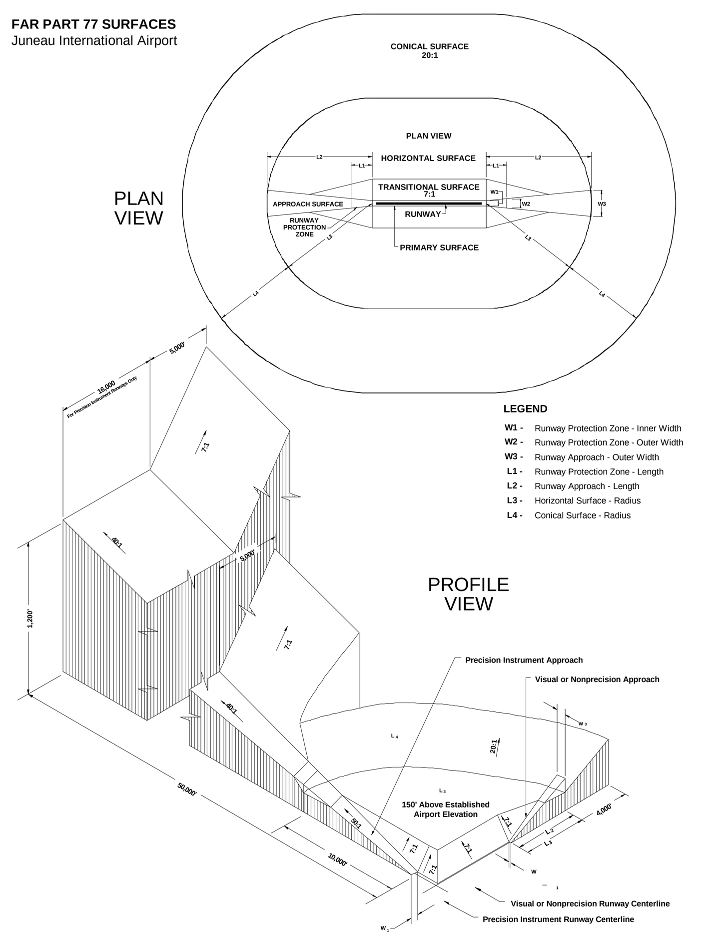
- Primary Surface
- Transitional Surface
- Horizontal Surface
- Conical Surface
- Approach Surface

Dimensions of FAR Part 77 surfaces, like the RPZ, vary depending on the type of runway approach. The existing Part 77 surfaces at JIA are currently designed for a 34:1 approach slope to Runway 8 and a 34:1 approach slope to Runway 26. A 34:1 approach is required for non-precision instrument approaches that provide azimuth (left and right) and descent profiles. **Figure 4-6** graphically illustrates the FAR Part 77 surfaces in both plan and profile view.

Although the FAA can determine which structures are obstructions to air navigation, the FAA is not authorized to regulate tall structures. Under FAR Part 77, an aeronautical study can be undertaken by the FAA to determine whether the structure in question would be a hazard to air navigation. However, there is no specific authorization in any statute that permits the FAA to limit structure heights or determine which structures should be lighted or marked. In fact, in every aeronautical study determination, the FAA acknowledges that state or local authorities have control over the appropriate use of property beneath an airspace of the Airport.

[6] Source: National Ocean Service, *Airport Obstruction Chart 1191*, May 1991.

[7] "H" = 50.4 feet based on a Boeing 737-800 wingspan of 112.6 feet.



Source: Federal Aviation Regulations Part 77

Figure 4-6

Definitions of key FAR Part 77 surfaces are as follows.

Primary Surface: The primary surface is longitudinally centered on a runway. When the runway has a hard surface, the primary surface extends 200 feet beyond each end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width of a primary surface ranges from 250 feet to 1,000 feet, depending on the existing or planned approach and runway type (i.e., visual, non-precision, or precision). For JIA, the primary surface for Runway 8/26 is 500 feet wide in order to accommodate a non-precision 34:1 approach. In the event that approach visibility minimums to Runway 26 are less than ¾ statute mile, the primary surface would be 1,000 feet wide. There are no obstructions that penetrate the existing primary surface to Runway 8/26, other than certain NAVAIDs that are fixed by function (i.e., wind sock).

Approach Surface: Longitudinally centered on the extended runway centerline, the approach surface extends outward and upward from the end of the primary surface. An approach surface is applied to both ends of each runway based upon the type of approach. The approach slope is 34:1 for both Runways 8 and 26.

The inner edge of the approach surface is the same width as the primary surface and it expands uniformly to a width of 3,500 feet for runways with a 34:1 approach slope. The approach surface extends for a horizontal distance of 10,000 feet for runways with a 34:1 approach slope. In order to allow for the heights of vehicles on roadways, the approach surface must clear rail lines by 23 feet, interstate highways by 17 feet, and all other roads by 15 feet. According to the most recent *Airport Obstruction Chart* (OC 1191, May 1991) as verified by field survey 1998; there are several trees, bushes, and poles that penetrate the existing approach surfaces for Runway 8 at JIA. The field survey included consideration of old obstructions and verified that no new obstructions exist. The two poles on the Runway 8 approach are lighted, and the trees in the Runway 8 approach surface are located on the Mendenhall Peninsula, which itself represents a significant obstruction. For this reason, Runway 8 has a non-standard approach through The Cut with a curved approach lighting system. The cut in Mendenhall Peninsula is lighted with several beacons. The Runway 26 approach surface is located over the Lynn Canal tidal flood plain and is clear of obstructions except for the REILs. Based on the introduction of a GPS approach to Runway 26, the Airport should plan for a 50:1 approach surface.

Navigational Aids (NAVAIDs)

NAVAID requirements for JIA are based on recommendations contained in the U.S. Department of Transportation/FAA Handbook 7031.2B, *Airway Planning Standard Number One* and FAA AC 150/5300-13, *Airport Design*.

NAVAIDs provide services related to airport operations, precision guidance to a specific runway end, and non-precision guidance to a runway or an airport itself. The distinction between a precision and a non-precision NAVAID is that a precision approach provides the pilot with electronic glide slope (descent) and distance and runway alignment information, while a non-precision approach does not offer glide slope and may or may not offer distance information. An airport, when outfitted with an approach, is equipped with either precision or non-precision capability in accordance with design standards that are based on safety considerations and the operational needs of the Airport. The type, mission, and volume of aeronautical activity used in association with meteorological airspace and capacity data determine eligibility of the Airport and need for various NAVAIDs.

The existing instrumentation and lighting systems at JIA, as well as those proposed for the Airport, are summarized on **Figure 4-7**. For this study, NAVAIDs are divided into three general categories: terminal area NAVAIDs, electronic approach NAVAIDs, and visual NAVAIDs. These three categories of NAVAIDs are discussed in the following subsections.

Terminal Area NAVAIDs: NAVAIDs classified in this category provide positive control to aircraft and maintain an orderly flow of air traffic within a specified area. Terminal area NAVAIDs are provided to prevent collisions between aircraft during the landing and takeoff sequence, as well as to support sufficient maneuvering. Terminal area NAVAIDs, currently located at the Airport include the JIA ATCT and Anchorage ARTCC.

MINIMUMS BY APPROACH CATEGORY
Juneau International Airport

Instrument Approach	***A***	***B***	***C***	***D***
NBD-1 R/W 8	1801-4	2001-4	2581-4	3101-4
LDA-1 R/W 8	2101-4	2681-4	2681-4	3181-4

Source: The Airport Technology and Planning Group, Inc., 1997.

Table 4-L

NAVAIDS REQUIREMENTS
Juneau International Airport

■ Existing
□ Future

RUNWAY	LDA	NDB	Precision GPS	MALSR	VASI	PAPI[1]	HIRL	REIL	CL
8	■	■		■	■	□	■		■
26			■	□	■	□	■	■	■

NAVAIDS/LIGHTING

LDA: Localizer Type Direction Aid
GPS: Global Positioning System
NDB Non Directional Beacon
MALSR: Medium Intensity Approach Lighting System With Runway Alignment Indicator Lights
VASI: Visual Approach Slope Indicator
PAPI: Precision Approach Path Indicator
HIRL: High Intensity Runway Lights
REIL: Runway End Identifier Lights
CL: Runway Centerline Lighting

Note: [1] To be installed at the end of the useful life of the VASI on Runway ends 8 & 26.
Source: The Airport Technology and Planning Group, Inc., 1997

Figure 4-7

The ATCT at JIA is operated by the FAA and is located in the terminal. The Juneau ATCT operates from 6:00 a.m. to 10:00 p.m. during months spanning from the beginning of May through September, and 7 a.m. to 8 p.m. the remainder of the year. An ATIS is also broadcast from the ATCT during this same time frame. En route control for aircraft to and from JIA is initially provided by Anchorage ARTCC. As aircraft approach the Airport, the responsibility for control is then transferred to ATCT personnel.

Electronic Approach NAVAIDs: This category of NAVAIDs assists aircraft executing an instrument approach to an airport. An instrument approach is a series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from en route or local flight to a point from which a landing may be made visually.

The availability of instrument approach procedures at an airport permits aircraft landings during periods of poor weather. The extent to which approach minimums, in terms of ceiling and visibility, can be lowered is dependent on a number of factors. These include the instrumentation available upon which the approach procedure may be developed and obstructions in the approach and/or missed approach areas. At times, instrument approaches are restricted to certain aircraft and flight crews which have been certified to conduct the procedure by the FAA.

The physical setting of the JIA is a major contributing factor in the establishment of an instrument approach procedure, due to the high terrain surrounding the facility. Currently, the following instrument approaches have been published by the Airport for instrument-rated pilots and appropriately equipped aircraft.

Briefly, these values are interpreted as follows: For Category A aircraft (with approach speeds of less than 90 knots), the LDA-1 straight-in approach to Runway 8 may be flown when the ceiling (height of the cloud layer above the runway *threshold*) is 2,101 feet or greater and the visibility (measured along the runway surface) is 4 statute miles or greater (shown in **Table 4-L**). These minimums generally increase as the approach category of the aircraft increases. For reference, most light GA aircraft are classified as Approach Category A, with the Boeing 737 and McDonnell Douglas MD-80 series aircraft classified as Approach Category C (approach speeds of 121 knots through 140 knots). The acronym LDA refers to a localizer type directional aid which provides an alignment in excess of 3 degrees of the runway heading. The NDB acronym is used to designate a nondirectional radio beacon.

Consequently, the location of obstacles in either or both approach and missed approach surfaces (the latter in case of a "go-around" or balked landing procedure) contributes to the high approach minimums at JIA.

FAA regulations do, however, provide the potential for lower than published minimums for specific operators. In such cases, the operator's crew and aircraft must meet certain specified requirements. These serve to enhance an operator's ability to utilize an airport and accounts for the fact that certain users such as scheduled airlines or others operating for commercial purposes make a higher investment in aircraft equipage and crew training. This is the case at JIA. The procedures, listed in **Table 4-M**, are authorized for certain certified operators at the Airport.

Each of these procedures provide for lower than published minimums and are authorized only for certain operators, aircraft, and crew. Additionally, all ground systems which provide visual reference to the runway end environment, such as lead-in and approach lighting systems to Runway 8, must be operational.

The term RNP refers to required navigational performance which implies a level of accuracy in the preciseness of a procedure. Note that RNP.2 offers lower approach minimums than RNP.3 to Runway 26. In order to fly the RNP.2 procedure to Runway 26, Alaska Airlines must demonstrate that its aircraft can perform at the specifications assigned to an RNP.2 designation, which are more stringent that those for an RNP.3 designation.

It should be noted that the RNP procedures listed above are in a trial stage and the expectation is that approach minimums of 200-foot ceiling and ½ mile visibility can be achieved in the near term.[8] In order to use the RNP procedure, the FAA and Alaska Airlines have been cooperating in the use of technology which provides a high degree of accuracy and reliability. The equipment includes color weather radar display and dual GPS receivers coupled to an FMS. Wind profilers, which are strategically located along the Gastineau Channel, will provide wind speed and direction data at 200-foot increments in elevation up to 12,000 feet above the ground. The wind profilers will establish wind shear algorithms in the approach and departure environment east of the Airport. Research indicates that this is the only type of approach of its kind in the world and reflects the commitment to provide the Airport with a reliable means of operating in poor weather conditions, a situation which occurs with a high degree of frequency in Juneau year-round. Other aircraft operators electing to make the same level of investment as Alaska Airlines in terms of aircraft equipage and crew certification can be authorized by the FAA to fly these RNP procedures. Therefore, such procedures should not necessarily be considered as private-use.

APPROACH MINIMUMS BY AIRCRAFT CATEGORY
Juneau International Airport

Instrument Approach	***Certified for:***	***Approach Minimums (all category aircraft)***
NBD or GPS-3 R/W8	FAA-designated commercial operators	1481-2
LDA-1 R/W 8	FAA-designated commercial operators	981-2
RNP.3 R/W 8	Alaska Airlines	731-1
RNP.3 R/W 26	Alaska Airlines	671-1
RNP.2 R/W 26	Alaska Airlines	350-1

Source: QED, 1997.

Table 4-M

The FAA and Alaska Airlines have also evaluated RNP procedures to Runway 8. However, lower minimums either published or authorized for certain operators cannot be achieved due to requirements associated with missed approach procedures. It is also recommended that runway visual range (RVR) equipment be installed near Runway end 8 to enhance departure visibility minimums.

8 Approach minimums achieved as of August 1998 are 377 feet ceiling and 1 mile visibility. The Airport should plan for approach visibility minimums below ¾ statute mile.

Visual NAVAIDs: Visual NAVAIDs provide aircraft guidance once the aircraft is within sight of the Airport and they aid aircraft maneuvering on the ground. Numerous visual NAVAIDs are provided at JIA, including:

- MALSR - Runway 8
- Sequenced Strobe Lead - In lights in Engineers Cutoff Road
- Lead - In lights on Battle Ship Island
- Visual Approach Slope Indicator (VASI) - Runways 8 and 26
- HIRL (High Intensity Runway Lighting) - Runway 8/26
- HITL (High Intensity Taxiway Lighting) - Taxiways associated with Runway 8/26
- Runway Centerline Lighting - Runway 8/26
- Lighted Wind Cone
- Rotating Beacon

Both runway ends are currently equipped with VASIs. It is expected that the precision approach path indicator (PAPI) will replace the VASI in all future FAA NAVAID recommendations. Therefore, it is recommended that the existing VASIs be replaced by PAPIs after the VASIs have exceeded their useful lives. It is also recommended that an MALSR system be installed on the Runway end 26 to aid with approaches from the east, especially those conducted for the Special CAT I GPS approach.

For the floatplane basin, it is recommended that pulse light approach slope indicators (PLASI), which were utilized during the recent Runway 8/26 overlay project, should be installed. A standard air marker for seaplane bases should also be provided.

Summary: Based on the airfield facility requirements discussed in the previous sections, the following major improvements are recommended for the Airport over the 20-year planning period:

- Install acute-angle exit taxiways on Runway 8/26.
- Plan for a 4,090-foot parallel GA runway.
- Enhance Runway 8/26 RSA.
- Plan for precision GPS (Runway 26) approach visibility minimums below ¾ statute mile.
- Replace all the existing VASIs at the end of their useful lives with PAPIs.
- Install MALSR on Runway end 26.
- Install RVR near Runway end 8.
- Install PLASIs at the floatplane basin.
- Install Standard Air Marker at the floatplane basin.

PASSENGER TERMINAL FACILITY REQUIREMENTS

The existing passenger terminal is divided into two functional levels: The first level contains airline operational space (i.e., ticketing counter, air taxi gates), concessions (including a gift shop), lobby, baggage claim area, and public space. The second level contains additional concession space (i.e., restaurant, bar/lounge), airport administration offices, FAA offices, and a concourse providing access to three second-level boarding positions. The passenger terminal contains a total of approximately 72,544 square feet, not including the ATCT space.

Space requirements for the passenger terminal at JIA are based on an analysis of ratios reflecting enplaned passengers per square foot. Previous planning efforts have indicated a direct correlation between the terminal requirements and passenger enplanement levels. The ratio of passengers per square foot typically increases as annual activity levels rise. As activity increases, peak demand periods tend to become less concentrated; for example, rather than having one or two peak demand periods during the day, several peaks will occur. Increased utilization rates result in higher enplanement levels being processed in any given sized terminal. However, at JIA, it is anticipated that the peak passenger loads in the busy (i.e., summer) season will continue to be more extreme than other airports with similar activity levels. Terminal space requirements for planning purposes, as delineated by functional areas, were developed for the Airport (see **Table 4-N**). As shown, overall terminal square footage is currently inadequate to meet existing demand and will require additional expansion to accommodate future demand as well.

The following sections provide a discussion of the functional areas required to process passengers within the terminal and any surpluses or deficiencies that exist within those functional areas:

- Airline Support
- Public Space
- Concessions
- Other Airport Space

Airline Support

Airline support space consists of the ticket counter and ticket counter area, the passenger queuing area, airline offices, passenger holdrooms, baggage hold area, and baggage claim.

Ticket Counter

Air Carrier: The ticket counter is the primary location for passengers to complete ticket transactions and baggage check-in. The ticket counter area is comprised of three components: the ticket counter, the space behind the counter to accommodate airline personnel and baggage, and the queuing space for passengers in front of the counter. These areas are leased by airlines for their exclusive use; therefore, plans for future modifications or expansion should be closely coordinated with each airline.

A total of 83 linear feet of air carrier ticket counter is currently provided in the terminal. A total of approximately 126 linear feet of airline ticket counter is required in the base year (indicating an existing shortage) and 216 linear feet will be required by 2015 based on the size, type, and seating configuration of the aircraft that currently operate and are projected to operate at JIA during the design hour.

An area of approximately 500 square feet is provided behind the air carrier ticket counters for airline personnel. The required area behind the airline ticket counter was computed to provide a 5-foot depth behind the counter. Using this ratio, a total of 630 square feet of airline ticket counter area is required in the base year and 1,080 square feet is projected to be needed by 2015.

TERMINAL SPACE REQUIREMENTS

Juneau International Airport

Functional Area	*1995 Existing*	*1995 Required*	*2000*	*2005*	*2015*
Annual Enplanements [1]	312,381	312,381	362,245	414,888	542,788
Peak Hour Enplaned Pax	405	405	472	540	755
Peak Hour Deplaned Pax	405	405	472	540	755
Peak Hour Total Pax	810	810	943	1,079	1,510
Air Carrier Space					
Air Carrier Counter - LF	83	126	126	144	216
Air Carrier Counter Area	500	630	630	720	1,080
Air Carrier Queue Area	830	2,520	2,520	2,880	4,320
Operations/Office	3,250	3,360	3,360	3,840	5,760
Passenger Holdroom	6,000	7,200	9,600	9,600	12,000
Number of Air Carrier Gates	3	3	3	3	4
Number of Commuter Gates	2	0	2	2	2
Subtotal Air Carrier Space	*10,580*	*13,710*	*16,110*	*17,040*	*23,160*
Air Taxi Space					
Air Taxi Counter - LF	155	156	240	275	344
Air Taxi Counter Area	1,370	1,560	2,395	2,746	3,436
Air Taxi Queue Area	775	2,340	3,593	4,119	5,154
Operations/Office	3,335	3,744	5,749	6,590	8,246
Passenger Holdroom	1,860	1,872	2,874	3,295	4,123
Number of Gates	1	2	3	3	4
Subtotal Air Taxi Space	*7,340*	*9,517*	*14,611*	*16,750*	*20,959*
Baggage Handling Space					
Baggage Hold Area	5,635	6,882	8,018	9,174	12,833
Baggage Claim Area	2,450	4,375	4,952	5,667	7,926
Baggage Claim Device - LF	112	125	141	162	226
Subtotal Baggage Handling Space	*8,085*	*11,257*	*12,970*	*14,841*	*20,759*
Public Space					
Public Meeting Room [2]	1,100	2,500	2,500	2,500	2,500
Nursery	155	155	155	155	155
Security Screening	150	150	150	300	300
Restrooms	1,510	2,672	3,113	3,562	4,982
Public Circulation	15,683	26,534	31,359	34,316	42,609
Subtotal Public Space	*18,598*	*32,011*	*37,277*	*40,833*	*50,546*
Concessions					
Rental Auto Concessions	4	3	4	4	4
RAC Counter - LF	40	30	40	40	40
RAC Office/Counter Area	360	750	1,000	1,000	1,000
RAC Queue Area	200	150	200	200	200
Food and Beverage Services	11,265	12,295	12,995	12,995	12,995
News/Gift/Other	1,170	1,250	1,449	1,660	2,171
Telephones	107	125	145	166	217
Subtotal Concession Space	*12,742*	*13,819*	*14,789*	*15,021*	*15,583*
Other					
Airport Administration	1,235	1,250	1,449	1,660	2,171
Airport Security	685	240	240	360	480
FAA [2]	7,057	8,468	9,315	10,247	11,271
Customs	230	760	760	760	760
Janitorial/Storage	2,561	2,561	2,898	3,319	4,342
Subtotal Other	*11,768*	*13,279*	*14,662*	*16,345*	*19,025*
Mechanical/Electrical	4,361	12,764	15,017	16,554	20,554
Totals	***73,474***	***106,358***	***125,436***	***137,384***	***170,587***
FAA rule-of-thumb (peak requirements)	*121,444*	*121,444*	*141,486*	*161,902*	*226,461*
FAA rule-of-thumb (average requirements)	*37,486*	*37,486*	*43,469*	*49,787*	*65,135*
Airline/Concession Revenue Space	59.0%	49.3%	50.1%	49.7%	49.1%
Non-Revenue Space	41.0%	50.7%	49.9%	50.3%	50.9%

Sources: *The Airport Technology and Planning Group, Inc., November 1997.*
FAA, AC 150/5360, Planning and Design Guidelines for Airport Terminal Facilities, April 22, 1988.

Notes: [1] *Does not include passenger enplanements associated with helicopter operations.*
[2] *Existing 1995 square footage for these areas are updated for 1997 based on recent significant changes in space usage.*
LF - linear feet

Table 4-N

Approximately 830 square feet of queue area is currently provided in front of the airline ticket counter. The area needed for the airline ticket counter queue area was calculated based on a 20-foot passenger queue depth in front of the airline ticket counter. This resulted in a total requirement of 2,520 square feet for the airline ticket counter queue area in the base year and 4,320 square feet in 2015. Based on existing and projected demand, an increased airline ticket counter queue area is required.

Airline ticket counter, ticket counter area, and queuing area requirements for the planning period are listed in Table 4-N. As shown, existing space provided in each of these areas is inadequate for the base year (1995) and for future planning years.

Air Taxi: Air taxi terminal space requirements are also presented in Table 4-N. Based on a ratio of 1.25 linear feet per Peak Hour Enplaned Passenger (PHEP), a total of approximately 156 linear feet of airline ticket counter is required in 1995 and 344 linear feet will be required by 2015. With an existing counter length of 155 linear feet, additional counter will be required in the future.

An area of approximately 1,370 square feet is provided behind the air carrier ticket counters for air taxi personnel. Based on existing utilization patterns and discussions with air taxi operators, the required area behind the airline ticket counter was computed to provide a 10-foot depth behind the counter. Using this ratio, a total of 1,560 square feet of airline ticket counter area is required in the base year and 3,436 square feet is projected to be needed by 2015.

Approximately 775 square feet of queue area is currently provided in front of the air taxi ticket counter (5 feet in front of the ticket counter is currently leased to tenants; area beyond that is considered public area). The area required for the air taxi ticket counter queue area was calculated based on a 15-foot passenger queue depth in front of the air taxi ticket counter. This resulted in a total requirement of 2,340 square feet for the airline ticket counter queue area in 1995 and 5,154 square feet in 2015. Based on this analysis, increased air taxi ticket counter queue area is required to meet current and future demand levels.

Airline Operations/Office

Air Carrier: The air carrier airline operations/office provides space for a number of airline support activities, including accounting and safekeeping of receipts, agent supervision, communications, information display equipment, and personal areas. Existing airline office space within the terminal encompasses approximately 3,250 square feet which includes a spare parts storage room. To estimate airline office space requirements, a ratio of 12 square feet per PHEP was used. This ratio results in a total airline office space requirement of approximately 3,360 square feet in 1995 and 5,760 in 2015. Future airline office requirements are listed in Table 4-N.

Air Taxi: The air taxi operations/office provides space for a number of air taxi support activities, similar to those for the air carriers. Existing air taxi office space within the terminal includes approximately 3,335 square feet. To estimate airline ticket office space requirements, a ratio of 30 square feet per air taxi PHEP was used. This approach results in a total air taxi office space requirement of approximately 3,744 square feet for the base year and a requirement of 8,246 in 2015. Future air taxi office requirements are listed in Table 4-N.

Passenger Holdrooms

Air Carrier: The air carrier passenger holdrooms are the waiting or holding areas used by passengers immediately prior to boarding an aircraft. The holdroom includes space for airline ticket agents, aircraft seat assignment, additional baggage check-in, a seating and waiting area, a queuing area for passengers boarding aircraft, and an area for aircraft deplaning. The existing passenger holdrooms in the terminal encompass approximately 6,000 square feet and serve major/national airlines. Passenger holdrooms are currently sized at 2,000 square feet per narrow-body gate. Using this figure does not allow for the two ground level (commuter aircraft) boarding gates. Since the holdroom experiences overcrowded conditions during periods when flight times are either scheduled close together or if flights are delayed, the future planning standard is increased to 2,400 square feet per air carrier gate and 1,200 square feet per commuter gate. Using this ratio, existing air carrier holdroom requirements are for 7,200 square feet while future (2015) requirements are for 12,000 square feet. Future terminal improvements should also consider the need for restrooms and concessions in the passenger holdroom area.

Air Taxi: The existing 1,860-square-foot air taxi passenger holdroom area, which is located on the ground level of the terminal, is not a well-defined space. During periods of peak demand, this holdroom space expands to include public circulation space, thereby impeding the efficient flow of passengers throughout the terminal. Using a planning ratio of 15 square feet per air taxi PHEP, the existing requirement is for 1,872 square feet of holdroom space and the future (2015) requirement is for 4,123 square feet of holdroom space. Future terminal expansion should consider improvements to the air taxi holdroom area in terms of increased square footage and more efficient layout.

Baggage Hold Area: The outbound baggage area is used to prepare and sort baggage for loading onto departing aircraft. This area receives baggage by a mechanical conveyor from the ticket counter area. From here, baggage is sorted, loaded onto carts, and transported to the aircraft. The outbound baggage facilities are located directly behind the airline ticket counter and office areas. The inbound baggage area is a non-public area used by the air carrier (FAR Part 121) airlines to off-load baggage from carts onto a baggage claim device for passenger pickup.

Total baggage hold area in the terminal encompasses approximately 5,635 square feet. To project future outbound baggage requirements for JIA, a ratio of 17 square feet per PHEP was used. As presented in Table 4-N, 6,882 square feet of baggage hold area is required in 1995, while 12,833 square feet is required in 2015.

Baggage Claim Area: The baggage claim lobby provides public circulation space for access to baggage claim facilities and for egress from the claim area to the deplaning curb and ground transportation. It also should provide space for passenger amenities such as telephones, restrooms (which do not currently exist in this area), etc. The existing baggage claim area encompasses approximately 2,450 square feet. The baggage claim device currently provides 112 linear feet of bag display area.

Based on a ratio of 0.3 linear feet of bag claim device per peak hour deplaned passenger (PHDP), JIA requires 125 linear feet of bag claim device in 1995 and 226 linear feet of device in 2015. Using a ratio of 35 square feet of bag claim area per linear foot of bag claim device, JIA requires 4,375 square feet of bag claim circulation area in 1995 and 7,926 square feet in 2015. Based on this analysis, the current space is inadequate for existing and projected demand levels. The results of this analysis are confirmed by visual observation of this area during periods of peak demand, during which the observer is quick to conclude that this functional area of the terminal is undersized.

An option for reducing some of the congestion related to baggage would be to implement curbside check-in. This applies to enplaning passengers only and would not relieve the arriving baggage area congestion.

Public Space

A number of elements make up public space in an airport terminal. Some of these elements are directly related to peak hour passenger volumes, while some are a percentage of the total estimated square footage of the terminal. Public space within the JIA terminal consists of a public meeting room, a nursery, security screening, restrooms, and public circulation areas. These functional spaces are discussed in the following sections and requirements are presented in Table 4-N.

Public Meeting Room: As of the base analysis year, the Taku Room was used for various public meetings and activities. The 2,500-square-foot space was leased to the FAA in 1997 for use as the Flight Standards District Office (FSDO). At that time, a 1,100-square-foot room (Aurora Room) was designated as the public meeting room. Based on anticipated needs for such purposes, a 2,500-square-foot space should be programmed into future terminal improvement plans.

Nursery: The size of the existing 155-square-foot nursery, located on the first level of the terminal, is considered adequate to meet existing and future requirements.

Security Screening: The security screening area for the air carrier holdroom is approximately 150 square feet in size. Although FAA design standards indicate that one screening station can process 500 to 600 persons per hour, the peaking characteristics at JIA may warrant facilities beyond this standard. Based on existing and projected air carrier PHEP levels and adding a factor for other persons accompanying the passengers, an additional security screening station should be provided in the mid- to long-term (2005) time frame.

Restrooms: A number of restroom facilities are located at various points throughout the terminal, encompassing a total of 1,510 square feet. Restroom space is determined based on total peak hour passengers. Restrooms in the terminal should have a proportionately appropriate number of toilets and/or urinals for women and men. According to FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, total restroom space requirements are estimated based on a ratio of 1,500 to 1,800 square feet per 500 total peak hour passengers (1,650 was used for calculation purposes). For planning purposes it was assumed that peak-hour enplanements equal peak-hour deplanements. This results in a total restroom space requirement of 2,672 square feet in 1995 and 4,982 square feet in 2015. Based on this analysis, additional restrooms are needed to accommodate existing and future demand. From a functional perspective, it is important to plan for future restroom facilities to be accessible in the secure areas (i.e., passenger departure lounge) as well as the unsecured areas.

Public Circulation: Public circulation consists of general passenger circulation space between the various terminal functional areas. Currently, public circulation accounts for approximately 15,683 square feet or approximately 22 percent of the total terminal space. Ideally, public circulation space should account for approximately 25 percent of the total terminal area. Using this percentage, approximately 26,534 square feet of public circulation space is required in 1995 and 42,609 square feet is required in 2015.

Concessions

Concession services at the JIA include rental auto, food and beverage, news and gift, and telephone space. The existing and future space requirements for these functional areas are presented in Table 4-N and are discussed in the following sections:

Auto Rental Concessions: Existing office and counter area in the terminal totals approximately 360 square feet of space and 40 linear feet of counter space. This space is designed for four auto rental agencies and is currently occupied by three. For future planning purposes, it is recommended that each auto rental agency be provided with 250 square feet of office/counter space and a counter at least 10 linear feet long. Based on these ratios, approximately 750 square feet of office/counter area and 30 linear feet of counter are required for auto rental facilities for the base year (1995). Approximately 1,000 square feet of office/counter area and 40 linear feet of counter are required in the year 2000 through 2015. In addition to this area, a customer queue area approximately 5 feet deep, is required in front of the counter. This queue area is currently 200 square feet in size, which is adequate through 2015.

Food and Beverage Services: Existing food and beverage service space within the terminal includes a public restaurant, a bar/lounge, a flight kitchen for preparing in-flight meals, and associated storage areas. The two public eating areas are located on the second floor of the terminal. In total, food and beverage areas encompass approximately 11,265 square feet (does not include freezers located on the tarmac). The sizing of food and beverage services depends in part on the number and turnover rate for customers using the restaurant on a daily basis. The flight kitchen is also a unique consideration. Based on discussions with the concession operator, it is estimated that an additional 1,030 square feet of storage space is needed to accommodate existing demand and an additional 700 square feet is needed to develop self-serve stations (beverage, salads, short order, etc.) in the near term

News, Gift, Other: The Airport currently has one primary gift shop that also serves as an apparel, news, and candy shop. There is also a video arcade located in close proximity that is included in this functional group. Based on a planning ratio of 0.003 square feet per enplaned passenger (which assumes the current space is generally adequate to meet current demand), approximately 1,683 square feet of news, gift, and other concessions will be required in 2015.

Telephones: Approximately 107 square feet of terminal space is dedicated to telephone concessions. Using a ratio of 400 square feet per million enplanements, which is higher than the standard FAA planning ratio (due to the extreme peaking characteristics at JIA), approximately 125 square feet is required in 1995 and approximately 217 square feet is required in 2015.

Other Airport Space

Other airport space within the terminal includes JIA administration offices, airport security, the FAA, U.S. Customs Service and U.S. Immigration and Naturalization Service, janitorial/storage space, and mechanical/maintenance space. The existing and future space requirements for these functional areas are presented in Table 4-N and are discussed in the following sections.

Airport Administration Offices: Airport administration space includes the area needed by the Airport Manager and staff to accomplish their specific job duties. Office space requirements vary greatly from airport to airport. Airport management office space at JIA is located on the second level of the terminal, adjacent to the restaurant. One staff office is separated from the main office area by the hallway that leads to the tower, in what used to be the Airport security office. A second staff office is on the first level behind the airline ticket counter (formerly Delta Airlines operations/office). The administration office space encompasses about 1,235 square feet. This space has been determined to be inadequate and inefficient. A conference/meeting room is needed in the administration area. Staff offices should all be next to the reception area for efficiency. Combining the administration space into one area and adding a conference/meeting room are estimated to require 1,250 square feet. Using this ratio as it relates to overall passenger demand, future requirements are for 2,171 square feet of airport administration space in 2015.

Airport Security: A private company provides airport security. The security area consists of office space and holding cells for prisoner transfers. The office space and one holding cell are behind the unused portion of the airline ticket counter (formerly Delta Airlines operations/office). The second holding cell is in the administration office space on the second level of the terminal. The total area used by Airport security is about 685 square feet. Discussions with Airport management indicate that, based on increased passenger and employee demands, this space should be adequate for the next 20 years. However, Airport security will need to be relocated when expanded or additional air carrier operations require this space behind the ticket counter. Also, the holding cells should be combined in one area.

FAA: In 1997 the FAA leased the 2,500-square-foot Taku room for expanded FSDO operations which brings the total current FAA lease space (including FSDO, air traffic, and airways and facilities) to 7,057 square feet. This figure does not include the ATCT cab located on top of the terminal. Discussions with FAA personnel from the various branches indicate that approximately a 20 percent increase in space is required to meet existing needs. This results in a base year requirement of 8,468 square feet which will be adequate for the next 10 years. An additional 20 percent increase will be required to meet 2015 requirements and will result in the need for a total of 11,271 square feet.

U.S. Customs and U.S. Immigration and Naturalization Services: The U.S. Customs Service and the INS share an office that is located between the FAR Part 121 and FAR Part 135 carriers on the first level of the terminal. International passenger and cargo clearance procedures are conducted from this office. Personnel at U.S. Customs and the INS were contacted to determine existing and future facility requirements. The report titled *Airport Federal Inspection Facilities Guidelines - 1994 Edition* (DOT&PF), was also consulted to determine requirements. An increase from 230 square feet to 760 square feet of space is required to meet U.S. Customs and INS facility needs in 1995 and in 2015.

Janitorial/Storage: Approximately 2,561 square feet of terminal space is currently used for janitorial and storage purposes. Discussions with Airport management indicate that this space should be increased in the future commensurate with the increase in the overall passenger terminal activity. Such space needs are anticipated to grow from 2,561 square feet in 1995 to 4,342 square feet in 2015.

Mechanical/Maintenance Area: Mechanical/maintenance areas within a terminal typically account for 5 to 15 percent of the total terminal space. Currently, the mechanical/maintenance areas are 4,361 square feet or 6.0 percent of the total square footage of the terminal. Using a factor of 12 percent, a total of approximately 20,554 square feet of mechanical/electrical space will be needed in 2015.

Conclusion

As shown in Table 4-N, the total terminal space at JIA (including airline space, concessions, public space, and other space) is considered inadequate to meet base year (1995) demand as well as demand for most functional areas throughout the 20-year planning period. Because of the age of the terminal, a significant factor related to future expansion will be whether to continue expanding the existing structure or build a new terminal.

AIRCRAFT GATE AND APRON REQUIREMENTS

The following sections discuss the aircraft gate and apron requirements for JIA.

Aircraft Gates

The JIA terminal currently has a total of five air carrier gates, three of which are equipped with loading bridges. The fourth and fifth air carrier gates require passengers to exit the terminal and board the aircraft using stairs. These gates are located on the second level of the terminal. The Airport also has one air taxi gate which is located on the ground level of the terminal.[9] Gate requirements were determined separately for each carrier type (see Table 4-N) because of the inherent differences between air carrier and air taxi gate requirements.

The number of air carrier gates required is based on the current ratio of approximately 80,000 annual air carrier enplanements per gate. According to FAA AC 150/5360-13, *Planning and Design of Airport Terminal Facilities*, an airport similar in size to JIA should be able to accommodate up to 130,000 annual enplanements per gate. The 80,000 ratio is used to reflect the severe peak demand levels as well as the combi flights and the unique route schedules that occur at the Airport. Based on this criteria, the Airport requires three air carrier gates in the base year (1995) and four air carrier gates in 2015. Therefore, one

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9 This analysis addressed only fixed wing air taxi activities. A significant amount of air taxi activity is conducted by helicopters at locations other than the passenger terminal.

additional fully functional gate (with a loading bridge) will be required at the end of the planning period. Based on the projected introduction of service by larger commuter aircraft, it is recommended that access be maintained from two gates in the FAR Part 121 gate area to a ground level commuter parking position (similar to the existing configuration of the fourth and fifth gates).

The air taxi operations conducted at JIA are unique and planning guidelines based on national trends will not provide an appropriate analysis methodology. Therefore, a closer look at the efficiency of the existing facilities as related to the existing demand is warranted. In the base year, approximately 80,000 air taxi enplanements were handled per gate. Observations indicate that this ratio worked; however, the facilities were strained during intensive peak demand periods. Based on this observation, a lower ratio of 30,000 enplanements per air taxi gate is used to plan for future facility needs. It is believed that such a ratio offers a good balance between relieving congestion during peak demand periods without overbuilding facilities. This is an important consideration for Juneau because it is not affordable to build facilities to satisfy every peak demand requirement, and then allow those facilities to remain idle for the majority of the year. Based on this ratio, the Airport should plan for three air taxi gates in the year 2000 (two more than current) and four air taxi gates in 2015 (three more than current).

Terminal Apron: The existing terminal apron covers approximately 46,000 square yards. Approximately 21,000 square yards of this apron area are designated for air carrier aircraft parking and maneuvering, while the remaining 25,000 square yards are used for air taxi parking and maneuvering. Air carrier/commuter aircraft apron area requirements were developed based on the gate requirement projections and air taxi apron requirements were developed based on projected passenger demand levels.

Table 4-O depicts future terminal apron requirements for both air carrier and air taxi aircraft. Apron requirements for air carrier aircraft were determined based on an average area of 7,000 square yards per aircraft; apron requirements for commuter aircraft were determined based on an average area of 3,000 square yards per aircraft. These areas account for aircraft parking as well as extra areas for service vehicles, separation between aircraft and tugs, and maneuvering (taxilane) area. Air taxi apron requirements are calculated based on 600 square yards per aircraft (an increase over existing utilization patterns) and includes areas for aircraft parking, servicing, and maneuvering.

As shown in Table 4-O, by 2015 approximately 34,000 square yards of terminal apron will be required for air carrier and commuter aircraft, while 49,200 square yards of terminal apron will be required for air taxi aircraft. Therefore, the existing apron of the Airport will require expansion to accommodate future demand.

FUTURE TERMINAL APRON REQUIREMENTS FOR AIR CARRIER AND AIR TAXI AIRCRAFT
Juneau International Airport

	Air Carrier + Commuter		*Air Taxi*		*Total*	
Year	*Parking Spaces*	*Apron Area (Sq. Yds.)*	*Parking Spaces*	*Apron Area (Sq. Yds.)*	*Parking Spaces*	*Apron Area (Sq. Yds.)*
Existing						
1995	3	21,000	50	25,000	53	46,000
Required						
1995	2	14,000	50	30,000	52	44,000
2000	3+2	27,000	54	32,400	59	59,400
2005	3+2	27,000	63	37,800	68	64,800
2015	4+2	34,000	82	49,200	88	83,200

Table 4-O

GENERAL AVIATION FACILITY REQUIREMENTS

GA facility requirements were developed for JIA based on projected GA demand. Possible options for accommodating the projected demand will be identified in Chapter Five, *Alternative Development Concepts*. GA facility needs were developed for the following functional areas and are presented in **Table 4-P**:

- Aircraft Storage Buildings and Apron
- Transient/Based Aircraft Tie-Downs
- Floatplane Basin Slips
- Helicopter Parking Spaces
- General Aviation Auto Parking

Aircraft Storage Buildings and Apron

Storage requirements for GA aircraft reflect local weather conditions as well as the size and sophistication of the based aircraft fleet at the Airport. Typically, aircraft with higher values are more likely to be stored in larger, more secure facilities.

There are two types of hangar storage in use at JIA: conventional hangars and T-hangars. Of the 355 GA (non-military) aircraft based at the Airport, approximately 67 are FAR Part 135 air taxi aircraft. These aircraft are stored at various locations around the Airport, including the apron area west of the passenger terminal and at the floatplane basin (during the summer season). Approximately 10 percent of the based aircraft are currently stored in T-hangars, 12 percent are stored in conventional hangars, and the remaining are stored via tie-down facilities. All of the based jet aircraft are stored in conventional hangars.

GENERAL AVIATION AIRCRAFT STORAGE REQUIREMENTS
Juneau International Airport

	1995 Existing	*1995 Required*	*2000*	*2005*	*2015*
Based Aircraft [1]					
Single Engine-Land	238	238	251	257	270
Multiengine-Land	21	21	22	23	24
Jet	1	1	2	2	2
Floatplane	64	64	67	69	73
Helicopter	31	31	34	36	39
Total Based Aircraft	**355**	**355**	**376**	**387**	**408**
Based Aircraft Storage Facilities:					
Conventional Hangars					
Aircraft Stored [2]	41	52	69	70	74
Square Feet	*58,600*	*72,100*	*97,600*	*99,100*	*105,100*
T-Hangars					
Units	34	52	69	70	74
Square Feet	*41,500*	*63,100*	*83,089*	*85,254*	*89,344*
Based Tie-Downs [3, 4]					
Spaces	141	152	161	165	173
Square Yards	*77,800*	*106,680*	*112,626*	*115,589*	*121,185*
Floatplane Slips [5]	67	64	74	81	89
Helicopter Parking Spaces	31	31	34	36	39
Total Based Aircraft Storage Spaces	**314**	**400**	**430**	**447**	**474**
Transient Aircraft Storage Facilities:					
Transient Tie-Downs					
Spaces	21	28	30	32	34
Square Yards	*9,000*	*19,600*	*21,000*	*22,400*	*23,800*
Floatplane Slips [5]	6	6	8	10	14
Helicopter Parking Spaces	1	3	4	5	7
Total Transient Aircraft Storage Spaces	**28**	**37**	**42**	**47**	**55**
Total Aircraft Storage Spaces	**342**	**437**	**472**	**494**	**529**
Auto Parking Spaces					
Total (assume 1 per based a/c)	355	355	376	387	407
Public Lot (25% of total)	24	90	96	98	103
Fixed Base Operator [6]	42,910	42,910	71,860	86,232	103,478

Sources: *1995 Existing - USKH, Inc.*
Requirements - The Airport Technology and Planning Group, Inc., 1997.

Notes:
[1] *Military aircraft not included in this analysis.*
[2] *Existing 1995 data include nine new executive hangars and assumes storage practices of two planes per unit.*
[3] *Tie down data include air taxi apron west of the passenger terminal building.*
[4] *It is assumed that 70% of floatplane aircraft also require tie-down apron during the winter.*
[5] *Floatplane slip planning requirements are based on Airport personnel estimates; implementation will be based on actual demand.*
[6] *1995 existing numbers reflect 1997 building square footages. Future needs based on FBO input.*
[7] *Numbers may not add up due to rounding.*

Table 4-P

As shown in Table 4-P, there are currently not enough officially designated aircraft storage spaces at the Airport to accommodate the based fleet. This results in storage practices that result in cramped and Floatplanes are stored in slips in the floatplane basin, although it is assumed that approximately 70 percent of those that use the slips in the summer require tie-down apron in the winter. Helicopters are stored in close proximity to the various helicopter air taxi and air charter operators, primarily on the east end of the Airport.

Conventional/Executive Hangar Storage: Approximately 41 aircraft are currently stored in conventional hangars (including nine new executive hangars built in 1997). Based on a total of 58,600 square feet of storage space, the current ratio is approximately 1,500 square feet per aircraft. The new executive hangars, at 2,400 square feet in size, will generally store two aircraft per unit. Taking into consideration the new executive hangars, as well as the overall ratio of square feet of storage space per aircraft, a ratio of 1,500 square feet per aircraft is used for long-range planning. This indicates that approximately 105,100 square feet of conventional hangar space is needed to meet projected based aircraft demand through the year 2015. This will provide hangar storage for a total of approximately 74 based aircraft.

Conventional hangar apron is required to allow aircraft room to maneuver into and out of hangar facilities. Typically, the amount of required hangar apron is equal to the amount of storage space inside the hangar.

T-Hangar Storage: There are currently 34 T-hangar units at the Airport, with a total of approximately 41,500 square feet of storage. Based on local storage practices and a T-hangar size of approximately 1,200 square feet, it is projected that approximately 74 T-hangar units, totaling approximately 89,344 square feet of storage space, will be required through 2015. Any new T-hangar development should also include an equal size area for associated apron/access in front of the T-hangar.

Transient/Based Aircraft Tie-Downs

Transient Aircraft Tie-Downs: Tourist activities, area businesses and industries, and the availability of maintenance and FBO services attract transient aircraft to an airport. Transient ramp areas are used for loading and unloading passengers, for short-term parking by aircraft utilizing the facilities at the Airport, or for those visiting the area. Total transient apron parking requirements, presented in Table 4-P, were developed based on several factors.

Discussions with Airport and FBO personnel indicate that the amount of existing GA transient apron, which include 21 spaces totaling approximately 9,000 square yards, is inadequate to accommodate existing demand. Therefore, existing transient tie-down requirements were increased by approximately 50 percent in terms of total space to provide 28 spaces totaling 19,600 square yards. The planning factor of approximately 700 square yards per tie-down, which includes taxilanes, reflects the diverse mix of transient aircraft, including large corporate and military aircraft, which use the Airport on a regular basis. Future requirements are based on increased GA transient operations. Based on modest projected growth, a total of 34 transient parking spaces with 23,800 square yards of space are required by 2015.

***Based Aircraft Tie-Downs*:** In addition to transient aircraft requirements, FAA planning guidelines recommend that tie-down space is provided for all based aircraft not stored in hangar facilities. Approximately 40 percent of the based aircraft are currently tied down at the Airport. There are 141 existing tie-down spaces, in an area of approximately 77,800 square yards. It is significant to note that this includes the air taxi apron located west of the passenger terminal. Using a planning ratio of 700 square yards per tie-down, which includes taxilanes, a total of 199 based aircraft tie-down spaces, totaling 138,953 square yards, are required in 2015. It is significant to note that the tie-down requirements also assume that 70 percent of the based floatplane fleet, which are stored in slips during the summer, will also require tie-down apron in the winter.

Table 4-P presents based aircraft tie-down requirements. As shown, the existing based aircraft apron area requires significant expansion to meet existing and projected future demand.

Floatplane Basin Slips/Facilities

There are currently 73 floatplane slips at the Airport: 67 are leased for based aircraft use, and 6 are reserved for transient aircraft. Future requirements for this facility are presented in Table 4-P. A project is currently underway to add an additional 30 floatplane slips which should satisfy the requirement through 2015.

To enhance overall operations and the Airport customer's experience, additional facilities that should be built in the vicinity of the floatplane basin, include electricity, water, toilets, telephones, and possibly camping sites. These should be constructed within the short-term (i.e., five-year) planning time frame. Also, it is important that the floatplane access ramp near the Runway end 8 should be maintained through the long-term planning period. This access ramp is used to bring the floatplanes moored in salt water during the winter to the Airport for maintenance. A new ramp is under construction at the northeast corner of the pond. The new ramp will be oriented in a southeasterly direction, which is more favorable for prevailing weather conditions.

Helicopter Facilities

There are currently 31 helicopters based at the Airport. They are generally parked in spaces near the owners/operators such as TEMSCO Helicopters, Alaska Coastal, NorthStar Trekking, and Silver Bay Logging. These aircraft typically operate to and from their own facilities. As these operators increase their fleet, it is anticipated they will increase the size of the area they require for such storage and operations. This is reflected in Table 4-P which presents helicopter parking space requirements. As shown, the number of projected based helicopters in 2015 (39) is anticipated to require one parking space for each based aircraft. During the course of developing this Master Plan Update, one of the helicopter operators at the Airport, TEMSCO Helicopters, submitted a plan to expand their operations. As part of the proposed expansion, they have requested from the Airport to lease two lots directly east of their existing operation. The expansion would increase their operations area by two thirds, and is considered to be a facility requirement in addition to those defined as part of the formal facility requirements analysis presented in Table 4-P. This type of development is typical for airports of the magnitude and diversity of JIA and represents the type of development that is difficult to predict with a great degree of certainty. Therefore, the ALP should factor in a certain amount of flexibility in the layout and timing of improvements to allow for developments that are driven by changing market forces to take place. To consolidate all helicopter operations on the northeast quadrant of the Airport, a public helipad with some transient helicopter parking spaces (3 to 7) should be planned.

General Aviation Auto Parking

Automobile parking facilities for GA users are currently inadequate. There is minimal parking (approximately 24 spaces) in the east tie-down area and virtually no formal auto parking areas in the west tie-down area. As such, the local practice is to park the car in the hangar or on the tie-down space when taking an airplane. For efficiency purposes, it can be assumed that this practice is reasonable and will continue. However, a portion (e.g., 25 percent) of the GA auto parking requirements should be met with a typical parking lot on the public side. It is believed that this will enhance overall security and operations in the GA areas.

Fixed Base Operators

FBOs at the Airport, including Aero Services (a full-service FBO), Coastal Helicopters, and Silver Bay Logging, currently occupy approximately 42,910 square feet of building space. Discussions with the FBOs indicate that a minimum of approximately 60,000 square feet of additional building space is needed to accommodate FBO requirements through 2015. A major portion of the projected needs (approximately 29,000 square feet) is required in the near term or by the year 2000. Similar to the development of helicopter facilities at the Airport, it would not be unusual for FBOs at JIA to desire additional growth based on market opportunities. The fact that several of the FBOs also provide a diverse range of aviation services (i.e., transporting workers and supplies for various industries) makes it more difficult to predict with a great degree of certainty how, and in what form, growth will occur. Therefore, the ALP should factor in a certain amount of flexibility in the layout and timing of improvements to allow for additional FBO development to take place.

SUPPORT FACILITY REQUIREMENTS

Ancillary facilities needed to support the operation of the Airport were also identified. Requirements were developed for the following support areas:

- Airport Rescue and Firefighting
- Aircraft Maintenance/Snow Removal Equipment Building
- Fuel Storage
- Air Cargo

Airport Rescue and Firefighting

The existing ARFF facility, which is in a structure shared with the CBJ Fire Department, is located north of Taxiway C-2, near Yandukin Drive. The building is constructed with access doors that open onto both the landside and airside. Requirements for ARFF facilities at airports with scheduled commercial air service are established under FAR Part 139. Airports are indexed according to the length of the longest aircraft that operates at the Airport on a regular basis. JIA is currently included in Index C for facilities serving aircraft up to 159 feet long. The index is determined by the largest aircraft that departs from the airport five or more times per day. To meet this requirement, the Airport currently has the following ARFF equipment:

- One 1979 Walter's ARFF Unit (to be replaced in 2003) - 1,500-gallon water, 150-gallon AFFF capacity.
- One 1982 Oshkosh ARFF Unit (to be replaced in 2012) - 1,500-gallon water, 35-gallon AFFF, and 700 pounds of dry chemical capacity.
- One 1993 Oshkosh ARFF Unit (to be replaced in 2023) - 1,500-gallon water, 35-gallon AFFF, and 700 pounds of dry chemical capacity.

Based on the activity projections previously presented and discussions with the airlines at the Airport, the B737-900 is projected to be the critical aircraft for the Airport. This aircraft is 137 feet, 6 inches long, and requires that the Airport have ARFF Index C capabilities. Therefore, the Airport should maintain ARFF equipment as needed to meet Index C requirements.

Aircraft Maintenance/Snow Removal Equipment Building

The existing Airport maintenance building, located immediately north of the FAR Part 135 (i.e., air taxi) aircraft apron, is approximately 5,200 square feet in size. It has served as the SRE storage and maintenance building since the early 1950s with only minor repairs done over the past 40 years. The existing building was designed to provide storage for three pieces of airfield equipment: a grader, loader, and plow truck. A 19,500-square-foot hangar, located immediately east of the terminal currently serves as a storage building for sand, pavement deicing/anti-icing compounds, and other materials and supplies. The hangar was built in the 1940s and is in a general state of disrepair. The current value of the inventory of heavy equipment at the Airport is approximately $6.5 million and growing.[10] A list of main line SRE is provided in **Table 4-Q**.

A new SRE facility is needed at the Airport for several reasons. The primary justification for a new SRE facility is based on the current fleet of snow removal and maintenance equipment. The Airport and the FAA have invested heavily in this equipment that is critical to the safe operation of the Airport.

[10] Source: CBJ Engineering Department, March 1997. This estimate does not include additional value of three new high speed plow trucks that will enter line service by 1999.

The current storage facilities are inadequate to house the important and valuable SRE listed in Table 4-Q. Moreover, the existing buildings are marginal, at best, in responding to local building codes, employee accessibility laws, and worker safety (per the Occupational Safety and Health Administration [OSHA]) codes. Much of the Airport SRE is left outdoors and exposed to the elements. Normal winter weather conditions for this northern marine climate typically include a large number of freeze/thaw cycles and freezing precipitation (moisture-laden snow and/or freezing rain and ice). In order to maintain the runway in a safe condition, maintenance equipment must be prepared to mobilize on short notice.

FUTURE INVENTORY OF AIRPORT SNOW REMOVAL EQUIPMENT
Juneau International Airport

Unit	*Description*
2	1999 Dodge 4x4 Pickup Snow Supervisor Braking Test
5	1997 Ford 4x4 Pickup Field Maintenance Snow Removal
9	1986 Ford 4x4 Pickup Chemical Spreader for Roadside Chemicals
10	1997 International Truck Deicer for Runway, Taxiways
11	1998 Oshkosh High Speed Plow Truck with Dump Body
12	1998 Oshkosh High Speed Plow Truck with Dump Body
13	1998 Oshkosh High Speed Plow Truck with Dump Body
14	1981 Oshkosh High Speed Plow Truck with Dump Body
18	1987 CAT Grader for Snow Removal
19	1982 CAT Grader for Snow Removal
20	1983 CAT Snow Removal Loader 966D
21	1997 CAT Snow Removal Loader 966B
22	1992 CAT Snow Removal Loader 980F
24	1992 Oshkosh High Speed Runway Broom
25	1992 Oshkosh High Speed Runway Broom
26	1992 Oshkosh High Speed Runway Broom
32	1989 International 10 yd Sand Truck
33	1981 International 10 yd Sand Truck
38	1979 SMI High Speed Snow Blower
39	1992 Oshkosh High Speed Snow Blower

Sources: *CBJ Engineering Department, March 1997; and discussions with Airport personnel on pending equipment purchases and replacement.*

Table 4-Q

Modern heavy equipment has a significant amount of sensitive electronic controls which fail much more rapidly when exposed to inclement weather. The heavy equipment that is stored outside, under tarps or in the open air, is subject to freeze-up and significant long-term damage. While the airfield operations and maintenance crew is trained to respond quickly and efficiently to changing weather conditions on the airfield, they spend a significant amount of time performing tasks such as thawing engine blocks on the heavy equipment. This delays the critical work they must accomplish to ensure safe Airport operations. This also represents a severe handicap, especially when considering the importance of JIA in Southeast Alaska.

The Alaskan Region office of the FAA has emphasized that a vehicle storage facility is critical to the long-term operation of the $6.5 million inventory of equipment they have provided and will continue to fund. In addition to the SRE listed in Table 4-Q, the Airport has 11 maintenance vehicles and some miscellaneous equipment that will not require indoor storage. Space requirements for storing and maintaining the critical SRE the Airport has in its current fleet, or on firm order, are shown in **Table 4-R**.

In addition to the SRE building requirements, a new facility is needed to store sand. Sand is used extensively as part of the snow removal operation. A building of approximately 9,500 square feet, which has a capacity of 5,000 cubic yards of sand, should be sufficient for current operations as well as emergency reserve.

Fuel Storage

Fuel storage facilities at JIA are currently located in two areas. The primary fuel farm is located just northwest of the existing maintenance and SRE building, across Alex Holden Way. Additional fuel tanks are located near Ward Air. The capacity of the existing fuel tank system is 120,000 gallons for Jet A and 53,000 gallons for AvGas. Fuel is transported primarily from the fuel farm to aircraft via fuel trucks. In addition to the on-Airport fuel farm, a downtown facility can accommodate 450,000 gallons of Jet A fuel and 120,000 gallons of AvGas.

To project future fuel storage needs, existing fuel usage was compared to GA and commercial aircraft operations levels. The number of gallons per operation was used as a general guide for estimating future usage. The analysis is presented in **Table 4-S**.

As shown, the gallons per operation ratio is projected to increase from an existing (1995) level of 24.0 to a future (2015) level of 28.0. This accounts for the increased size of certain aircraft anticipated to operate at the Airport in the future, including the B737-900 and commuter aircraft. The analysis presented in Table 4-S indicates a modest increase in 2015 fuel sales as compared to the 1995 existing figures. Nonetheless, based on the capacity of the existing fuel storage tanks and the additional supply downtown, no additional fuel storage tanks are required at the Airport through the planning period. Security fencing has recently been installed around the perimeter of the main fuel farm area. Also, Airport tenants that provide fueling services should be subject to minimum standards which address the U.S. Environmental Protection Agency (EPA) and fire code requirements.

SPACE REQUIREMENTS FOR SNOW REMOVAL EQUIPMENT BUILDING
Juneau International Airport

Functional Area	***Size (SF)***
Vehicle Storage	22,800
Vehicle Wash Bay	700
Chemical Storage Area	1,600
Vehicle Repair Area	2,800
Parts Storage	900
Tire Repair and Storage	1,100
Electrical Shop	600
Paint Booth/Sign Making Area	1,000
Toilet/Locker Room	700
Training/Safety Room	600
Administrative Area	700
Mechanical/Electrical	300
Mezzanine Storage	1,500
Circulation/Structure	1,800
Total	**37,100 SF**

Source: CBJ Engineering Department, March 1997 (modified for two less vehicles per purchasing plans).

Table 4-R

Air Cargo

Air cargo requirements for JIA are addressed from two perspectives: First, the volume of air cargo must be considered. Second, the nature and logistics of the air cargo operation must be considered. From a volume standpoint, cargo growth at JIA, as documented in Chapter Three, *Projections of Aviation Demand*, is projected to increase at a modest rate over the 20-year planning period. Most air cargo is currently being moved by Alaska Airlines (air freight) and Evergreen International (air mail), although Wings of Alaska does provide cargo services as well. The freight being moved by Alaska Airlines in primarily belly-hold or on combi flights, while Evergreen has a cargo plane dedicated to the air mail service.

For planning purposes, although the cargo operators may change in the future, the nature and logistics are assumed to remain unchanged. Therefore, a minimum of one hardstand (with the option to add a second) capable of accommodating B737/DC-9 size aircraft, in the general vicinity of the passenger terminal building, should be provided through the planning period.

AIRPORT ACCESS/CIRCULATION AND AUTOMOBILE PARKING REQUIREMENTS

An inventory of existing surface access and parking capacity at JIA was conducted as part of this Master Plan to aid in determining future access/circulation and parking requirements. This analysis is discussed in the following sections:

C Airport Access and Circulation
C Auto Parking

FUEL SALES
Juneau International Airport

Year	*Jet A*	*Fuel Sales AvGas*	*Total*	*Annual Operations*	*Gallons per Operation*
Existing					
1995	3,530,433	574,300	4,104,733	171,062	24.0
Projected					
2000	3,476,808	565,992	4,042,800	161,712	25.0
2005	3,677,862	598,722	4,276,584	164,484	26.0
2015	4,229,026	688,466	4,917,472	175,624	28.0

Sources: *1995 data - USKH, Inc.*
Projected - The Airport Technology and Planning Group, Inc., 1997.

Table 4-S

Airport Access and Circulation

Vehicular access to the Airport is currently provided from Yandukin Drive, which extends from the Egan Expressway to the Airport. A secondary access road, Shell Simmons Drive, extends from Glacier Highway to the Airport terminal and joins with Yandukin Drive. Shell Simmons Drive is used as both an access road to the Airport passenger terminal and as a bypass road between the residential areas northwest of the Airport and Egan Expressway. This existing condition is less than ideal because it mixes airport traffic and non-airport traffic, all in front of the terminal.

In addition to being a congestion issue, the mix with pedestrian (passenger) traffic crossing the road from the parking lot also raises safety concerns. The alternatives analysis will explore options for segregating the airport traffic from the non-airport traffic in an effort to resolve some of these congestion and safety issues.

Auto Parking

Visitor parking facilities are located directly in front of the passenger terminal and are accessed via Shell Simmons Drive. Two separate parking areas currently provide 264 long-term spaces and 89 short-term spaces. The eight accessible spaces currently exceed ADA requirements. On the south side of this parking lot, the toll plaza provides two stacking lanes that exit directly onto Shell Simmons Drive. There are also 130 auto rental spaces located east of the terminal and 90 employee parking spaces located near the long-term parking lot.[11] Existing and future parking requirements are presented in **Table 4-T** and are discussed in the following sections:

- Public Parking
- Auto Rental Parking
- Employee Parking

Public Parking: Based on discussions with Airport management, as well as guidance published in FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, the total required number of public parking positions was calculated based on a ratio of 0.8 spaces per PHEP.

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[11] Of the 130 existing spaces, only 110 are currently allocated for auto rental use. The remaining 20 spaces are being held for an additional auto rental agency.

AUTOMOBILE PARKING REQUIREMENTS
Juneau International Airport

	1995 (Existing)	1995 (Required)		2000		2005		2015	
Auto Parking Spaces	*Spaces*	*SY*	*Spaces*	*SY*	*Spaces*	*SY*	*Spaces*	*SY*	*Spaces*
Public Parking									
Short-Term	89	4,277	107	4,984	125	5,702	143	7,973	199
Long-Term	264	8,683	217	10,120	253	11,578	289	16,187	405
Subtotal Public Spaces	353	12,960	324	15,104	378	17,280	432	24,160	604
Non-Public Parking									
Rental Car	130	5,005	143	5,833	167	6,673	191	9,330	267
Employees	90	3,150	90	3,671	105	4,200	120	5,872	168
Subtotal Non-Public Spaces	220	8,155	233	9,504	272	10,873	311	15,202	434
Total Auto Parking Spaces	**573**	**21,115**	**557**	**24,608**	**650**	**28,153**	**743**	**39,362**	**1,039**

Sources: *FAA, AC 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, April 22, 1988.*
The Airport Technology and Planning Group, Inc., November 1997.

Notes: *Based on discussions with Republic Parking Company personnel, a ratio of 0.8 public spaces per PHEP are required.*
40 SY per passenger/employee vehicle; includes lanes.
35 SY per rental car vehicle; includes lanes.
Long-term parking spaces (3 hours or more) comprise 75% of inventory; facility planning assumes 67% long term.
Analysis does not include parking spaces required for helicopter operations.
Employee parking requirements, based on discussions with Airport management, assume a ratio of 0.22 spaces per PHEP.
Rental car requirements, based on discussions with agency personnel, assume a ratio of 0.35 spaces per PHEP.
SY - square yards

Table 4-T

Short-term parking is defined by a duration of less than three hours. Approximately 70 to 80 percent of all parking lot users are short-term parking lot users, mainly greeters and well-wishers. Although short-term parkers typically account for 70 to 80 percent of the parking activity, they occupy approximately 20 to 30 percent of the parking stalls. The existing mix of public parking reflects 25 percent short-term public parking spaces and 75 percent long-term public parking spaces. Based on recent usage patterns, the current parking operator is in the process of realigning the public parking lot to approximately 33 percent short-term parking and 67 percent long-term parking. They also indicated that the existing number of spaces is adequate to accommodate demand through approximately the year 2000.

Based on existing and projected PHEPs, the Airport requires a total of 324 public parking spaces in the base year (1995), including 107 short-term spaces and 217 long-term spaces. This indicates a current shortfall in short-term spaces and a current surplus of long-term spaces at the Airport. The Airport should plan for a total of 604 public parking spaces in 2015, including 199 short-term spaces and 405 long-term spaces. The Airport will comply with ADA standards and include the required number of accessible spaces.

Auto Rental Parking: Based on discussions with the auto rental agencies located at the Airport, an additional 33 spaces are required to meet current demand. Using this increased number as the base year requirement (110 existing spaces plus 33 additional), a ratio of 0.35 spaces per PHEP is used to determine future auto rental space requirements. Based on projected PHEPs, it is estimated that a total of approximately 267 auto rental spaces will be required by 2015.

Employee Parking: Employee parking requirements are based on a ratio of 0.22 spaces per PHEP. Using this planning factor, a total of 168 employee spaces are required by 2015.

Total auto parking requirements, including public, auto rental and employee parking, call for approximately 719 spaces (a 25 percent increase over current capacity) to meet base year demand and 1,340 parking spaces (a 134 percent increase over current capacity) to meet demand in 2015.

BASIC INFRASTRUCTURE REQUIREMENTS

Basic infrastructure at the Airport includes access roadways, parking, and utilities (water, sanitary sewer, storm water drainage, electrical, and telephone). Parking and access are addressed in previous sections. Upgraded and new utility infrastructure should be provided to support existing and future airport development. Some areas of current deficiencies include the helicopter operations area on the east end of the Airport (no sanitary sewer) and the floatplane basin aircraft parking area (no water, electric, sanitary sewer, or telephone).

Additional utilities/infrastructure should be implemented as needed in areas where future landside facilities are constructed. In addition, future demands may require expanding the capacity of certain existing utilities.