Chapter Three

TERMINAL AREA FACILITY REQUIREMENTS

Grand Canyon
NATIONAL PARK AIRPORT
TERMINAL AREA PLAN

CHAPTER THREE

TERMINAL AREA FACILITY REQUIREMENTS

The next step in the terminal area planning process is to translate passenger demand into the specific types and sizes of facilities that can adequately serve the existing and projected demand levels. This chapter utilizes the forecasts outlined in the previous chapter, as well as established planning criteria, to determine facility needs related to the terminal buildings (commercial and general aviation), apron, hangars, vehicle parking and access, and support facilities.

The objective of this effort is to identify the adequacy of the existing terminal area facilities, outline what new facilities are needed, and when they may be needed to accommodate future demand. Once the facility requirements have been established, alternatives based upon these needs can be formulated and evaluated in the next chapter.

PLANNING HORIZONS

Cost-effective, efficient, and orderly terminal development should rely more upon actual demand than a time-based forecast figure. To emphasize this point, a series of planning horizon milestones have been established that take into consideration the reasonable range of the demand projections.

Over time, actual activity may be lower or higher than what the annualized forecasts portray. By planning according to activity milestones, the resultant plan can accommodate shifts or

changes in the passenger demand. As a result, the plan provides flexibility while potentially extending its useful life if demand trends slow over the period. The resultant plan provides airport officials with a financially responsible and need-based program. **Table 3A** presents the planning milestones for each activity demand category.

TABLE 3A
Aviation Demand Planning Horizons
Grand Canyon National Park Airport

	Base Year (2008)	Short Term	Intermediate Term	Long Term
Air Tour Enplanements				
Fixed Wing	151,803	202,000	274,000	409,000
Helicopter	216,869	247,000	274.000	334,000
Annual Total	368,672	449,000	548,000	743,000
Annual Destination Enplanements	0	52,000	114,000	270,000
Based Aircraft	46	52	55	62
Annual Operations				
Air Tour Airline				
Fixed Wing	19,234	22,200	28,800	37,800
Helicopter	77,982	88,400	97,000	116,800
Destination Airline	0	4,000	4,600	8,200
Other Air Taxi	2,374	2,900	3,200	3,800
GA Itinerant	3,763	5,600	6,100	7,300
GA Local	613	2,900	3,200	3,800
Military	929	1,000	1,000	1,000
Total Operations	104,895	125,100	140,600	287,900

PEAKING CHARACTERISTICS

Terminal facility needs analyses typically relates to the level of activity during a peak or design period. The periods used in developing the capacity analyses and facility requirements in this study are as follows:

- **Peak Month** - The calendar month in which traffic activity is highest.

- **Design Day** - The average day in the peak month. For airline activity, this indicator is typically based upon weekday flight schedules, discounting the reduced activity for flights that are scheduled, but not necessarily daily.

- **Design Hour** - The busiest hour within the design day or busy day.

It is important to note that only the peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive.

PEAK AIR TOUR ACTIVITY

Peak activity for air tour operations and passengers is divided into fixed wing and helicopter because their landside operations are essentially segregated on the airport. The fixed wing air tour operators utilize the aircraft apron along the runway as well as the terminal facilities adjacent to the aircraft apron.

For the most part, the helicopter tour companies operate from their own facilities on the airport, east of the terminal and airport access roads. The helicopter peak projections can be used by these private operators to plan for their space requirements to meet future demand.

Fixed Wing Air Tour Design Peaks

Table 3B presents the peak activity projections for the fixed wing air tour airlines. The peak month projections were based upon the average peak month over the past five years. August is typically the peak month for fixed wing air tour activity. An average of 12.1 percent of the enplanements and 12.7 of the operations occur during the peak month. The design day is based upon the average day of the peak month, as activity during the peak month tends to be distributed relatively evenly through any given week.

Hourly activity is examined as a percentage of the daily activity. Air tour activity generally occurs over a 12-hour period each day. A peaking factor of 13 percent was applied to determine the design hour operations. Design hour passengers were based upon the number of operations during the design hour times the average passengers per operation.

Similarly, the helicopter peaking activity forecasts are shown on **Table 3C**. While August is also the peak month for helicopter air tours, the percentage of activity during the month is higher than for the fixed wing tours. Over the past five years, helicopter enplanements during the peak month averaged 15.6 percent, while helicopter tour operations averaged 15.0 percent. The average day of the peak month was also used as the design day, and peak hour operations were based upon 13 percent of the daily activity. Design hour helicopter passengers were also based upon the number of operations during the design hour times the average passengers per operation.

TABLE 3B
Peak Fixed Wing Air Tour Activity
Grand Canyon National Park Airport

	Base Year 2008	Short Term	Intermediate Term	Long Range
Enplanements				
Annual	151,803	202,100	274,000	409,000
Peak Month	21,421	24,700	33,200	49,500
Design Day	691	797	1,107	1,650
Design Hour	89	107	127	166
Total Passengers				
Design Hour	178	214	254	332
Operations				
Annual	19,232	23,200	28,800	37,800
Peak Month	2,874	3,020	3,740	4,910
Design Day	93	97	121	158
Design Hour	12	13	16	20
Departures				
Design Day	47	49	61	79
Design Hour	6	7	8	10

TABLE 3C
Peak Helicopter Air Tour Activity
Grand Canyon National Park Airport

	Base Year 2008	Short Term	Intermediate Term	Long Range
Enplanements				
Annual	216,869	247,000	274,000	334,300
Peak Month	37,170	38,300	42,500	51,800
Design Day	1,199	1,235	1,371	1,671
Design Hour	150	157	170	212
Total Passengers				
Design Hour	300	314	340	424
Operations				
Annual	77,982	88,400	97,000	116,800
Peak Month	12,830	13,260	14,550	17,520
Design Day	414	428	469	565
Design Hour	54	56	61	73
Departures				
Design Day	207	214	235	283
Design Hour	27	28	30	37

PEAK DESTINATION AIRLINE ACTIVITY

Since destination airline traffic is minimal at the present time, the base year planning horizon is replaced with an "Initial" horizon to represent the initial activity that could be expected in the first full year of an airline start-up. Peak month operations and enplanements were estimated to average 11.0 percent of the annual totals. This is reflective of air service for a year-round tourism destination. Activity will peak in the summer months, more than at a typical airport, but less than the peak at a seasonal tourist destination.

Design day activity takes into account the potential for service on a less than daily basis. Some carriers today operate with models that provide service on frequencies of two to four times a week rather than the traditional five to seven days. There is a potential for this type of service at Grand Canyon provided the airline can contract either with other airlines, a fixed base operator, or in some cases, the airport to provide ground handling and ticketing services.

Design hour activity was based upon accommodating a portion of the design day operations. This percentage will decline as daily flights increase and was estimated between 30 and 25 percent of the daily flights. Design hour passengers were based upon the number of operations during the design hour times the average passengers per operation with an elevated load factor for the peak period.

TABLE 3D
Peak Destination Airline Activity
Grand Canyon National Park Airport

	Initial	Short Term	Intermediate Term	Long Range
Enplanements				
Annual	31,000	52,000	114,000	270,000
Peak Month	3,410	5,720	12,540	29,700
Design Day	122	204	448	1,061
Design Hour	54	87	158	278
Total Passengers				
Design Hour	103	156	277	473
Operations				
Annual	3,000	4,000	4,600	8,200
Peak Month	330	440	506	902
Design Day	13	17	18	33
Design Hour	4	5	5	8
Departures				
Design Day	7	9	9	17
Design Hour	2	3	3	4

ITINERANT GENERAL AVIATION/OTHER AIR TAXI PEAKS

The peak month for general aviation itinerant operations at GCN is typically May or September, while the peak for air taxi is typically May or August. In the five years from 2004 through 2008, the peak month averaged 11.6 percent of the annual itinerant general aviation operations and 11.5 percent of annual air taxi operations.

Daily operational counts from the ATCT were utilized to determine a design day factor for itinerant general aviation/other air taxi activity. During August and September in 2008, the peak day of each week, typically Sunday, averaged 26.4 percent of the operations for the week. This equates to a design day factor of 1.85 times higher than the average day of the peak month.

The design hour for itinerant general aviation and other air taxi operations was estimated at 20 percent of the design day operations. **Table 3E** summarizes the peak activity projections for each planning horizon.

TABLE 3E
Air Taxi and Itinerant General Aviation Operational Peaks
Grand Canyon National Park Airport

	Base Year (2008)	Short Term	Intermediate Term	Long Term
AIR TAXI				
Annual	2,374	2,900	3,200	3,800
Peak Month	274	334	369	436
Design Day	17	21	23	27
Design Hour	3	4	5	5
ITINERANT GENERAL AVIATION				
Annual	3,763	4,600	5,000	6,000
Peak Month	404	536	582	699
Design Day	25	33	36	43
Design Hour	5	7	7	9

PASSENGER TERMINAL BUILDING REQUIREMENTS

Requirements for the passenger terminal building include aircraft gate positions, departures processing, arrivals processing, concourse facilities, public spaces, as well as building systems and support. This section identifies the facilities required to meet the airport's terminal needs through the planning horizons. The review of the capacity and requirements for various terminal complex functional areas was performed with the guidance of FAA Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, the *TSA Recommended Security Guidelines for Airport Planning, Design and Construction*, and *IATA Level of Service Standards*.

A spreadsheet model was used in the terminal analysis. The model was based on industry standards and cali-

brated for GCN based upon the existing use of facilities and the type of traffic anticipated. The model utilizes the standard queuing theory which can be defined as: passengers arriving minus passengers processed equals passengers in queue. The evaluation of individual processing elements is based on industry standards and formulas.

The model considers the level of service standards established by the International Air Transport Association (IATA). Level of service (LOS) defines the comfort and quality of the passenger experience. Some are related to crowding in queuing areas, while others define the amount of time a passenger must wait for processing. **Table 3F** outlines the basic level of service standards.

TABLE 3F
Level of Service Standards (IATA)
Grand Canyon National Park Airport

AREA PER OCCUPANT

Level of Service Standards	A	B	C+	C	C-	D	E	F
	Ft^2	Ft^2	Ft^2	Ft^2	Ft^2	Ft^2	Ft^2	Ft^2
Check-in Queue Area	19.4	17.2	16.1	15.1	14.0	12.9	10.8	-
Wait/Circulate	29.1	24.8	22.6	20.4	18.3	16.1	12.8	-
Hold Room	15.1	13.5	12.8	12.0	11.3	10.5	8.0	-
Bag Claim Area (excl. claim device)	21.5	19.4	18.3	17.2	16.1	15.1	12.9	-
Federal Inspection Services	15.1	12.9	11.8	10.8	9.7	8.6	6.5	-

A – Excellent levels of service; conditions of free flow; excellent level of comfort.
B – High level of service; condition of stable flow; very few delays; high level of comfort.
C – Good level of service; condition of stable flow; acceptable delay; good level of comfort.
D – Adequate level of service; condition of unstable flow; acceptable delays for short periods of time; adequate level of comfort.
E – Inadequate level of service; condition of unstable flow; unacceptable delays; inadequate levels of comfort.
F – Unacceptable levels of service; conditions of cross flows, system breakdown and unacceptable delays; unacceptable levels of comfort.

In general, LOS C is a typical design goal for most airports. LOS B would be a preferred goal if the budget allows it. LOS A is generally too expensive to achieve, and thus prohibitive to implement. For purposes of this analysis, an LOS C+ was used to represent a median between LOS B and C.

Because the air tour airlines and the destination airlines have some different terminal requirements, this section is divided into two areas. The first examines the fixed wing air tour airline terminal requirements. The second examines the requirements for the destination airlines. Depending upon the final recommendations, these could be served by one or separate terminal facilities. Since the hel-

icopter air tours operate from three private leaseholds, their requirements are subject to their own planning and development within those leaseholds, thus are not included here.

FIXED WING AIR TOUR TERMINAL REQUIREMENTS

The fixed wing air tour airlines primarily operate out of the existing terminal at GCN, with the exception of Grand Canyon Airlines, which does handle a portion of the fixed wing air tour activity from its FBO terminal north of the main terminal. **Table 3G** presents a functional breakdown of the existing terminal building space for comparison to the current and future demand requirements.

The functional space requirements for the air tour operators do not include security screening as their flights typically do not operate under Federal Aviation Regulation (FAR) Part 139. Since most flights are short and for air tour purposes only, baggage handling is also minimal.

As can be seen from the table, most of the functions in the terminal are being taxed beyond the desirable level of service during the design periods. This is relieved somewhat with a portion of the activity being handled at the Grand Canyon Airlines FBO terminal. As fixed wing air tour traffic increases, the spatial needs will also increase as presented on the table.

For 2008 activity levels, a 15,700 square foot terminal is needed. At the short term planning horizon, this will grow to 18,400 square feet. In the long term, a 28,600 square-foot terminal will be needed for the fixed wing aircraft activity.

DESTINATION AIRLINE TERMINAL REQUIREMENTS

The functional requirements for a terminal to serve destination airlines are more in line with the traditional passenger terminal. The review of the requirements for various functional areas of the terminal was performed to reflect the planning horizon milestones for enplanements. This included an initial level (31,000) as well as advanced milestone levels of 52,000, 114,000, and 270,000 annual enplaned passengers. **Table 3H** summarizes these requirements.

The most visible space for the airline is the ticket counter. Airline ticket counter length, counter area, and airline ticket office (ATO), TSA bag screening, and outbound baggage make-up and operations were calculated based upon design hour activity. The amount of space needed in this area could be reduced with extensive curb and/or parking lot check-in.

Public waiting lobby is typically available for passengers and visitors to comingle prior to departure as well as for greetings upon arrival. Since most of the traffic will be non-local, local "meeters and greeters" will be limited.

The processing rate at current security levels is 200 passengers per hour. A single station should be adequate through the 114,000 enplanement level, but a second station will be needed for the long term horizon level.

TABLE 3G
Fixed Wing Air Tour Terminal Facility Requirements
Grand Canyon National Park Airport

			Annual Enplanement Planning Horizons			
		Available	Current 151,803	Short 202,000	Intermediate 274,000	Long 409,000
DEPARTURES PROCESSING						
Ticket Counters						
Utilization Factor	100%		89	107	127	166
Agent Positions	#	10	6	7	8	10
Frontage	LF	86	36	42	48	60
Area	SF	513	380	440	500	630
Ticket Lobby						
Queuing Area	SF	443	480	570	680	890
Airline Ticket Office	SF	1,034	756	882	1,008	1,260
Ticket Lobby Circulation	SF	636	414	483	552	690
Public Area						
Waiting Lobby/Circulation	SF	1,498	1,562	1,864	2,225	2,901
CONCOURSE FACILITIES						
Passenger Holdrooms						
Gates	#	5	6	7	8	10
Holdroom Area	SF	1,619	2,839	3,348	3,907	4,986
Airline Operations	SF	0	3,600	3,900	4,800	6,000
Concourse Circulation						
Circulation Area	SF	0	852	1,004	1,172	1,496
PUBLIC SPACES						
Restrooms						
Area	SF	600	857	1,022	1,221	1,591
Concessions						
Food & Beverage	SF	0	493	657	891	1,329
Retail	SF	575	304	404	548	818
Support	SF	0	239	318	432	644
Rental Car						
Counter Frontage	LF	20	5	6	8	10
Counter and Office Area	SF	171	80	96	114	149
Counter Queuing Area	SF	80	43	51	61	80
Airport Administration						
Administration/Operations	SF	288	893	1,065	1,272	1,658
FUNCTIONAL AREA TOTAL						
Total Programmed Functional Area	SF	7,457	13,791	16,104	19,383	25,122
BUILDING SYSTEMS/SUPPORT						
Mechanical/HVAC	SF	253	552	644	775	1,005
General Circulation/Stairwells/Storage	SF	784	1,379	1,610	1,938	2,512
TOTAL TERMINAL						
Gross Building Area	**SF**	**8,494**	**15,721**	**18,359**	**22,096**	**28,639**

An airline gate represents an aircraft parking position adjacent to a terminal building and is used by a single aircraft for the loading and unloading of passengers and baggage. Initially, all aircraft may be ground-boarded, but as the number of flights by jets with 60 or more seats increase, it will be desirable to add loading bridges. Five of the six long term gates should ultimately be planned for loading bridges.

TABLE 3H
Destination Terminal Facility Requirements
Grand Canyon National Park Airport

		Annual Enplanement Planning Horizons			
		Initial 31,000	Short 52,000	Intermediate 114,000	Long 270,000
DEPARTURES PROCESSING					
Ticket Counters					
Utilization Factor	90%	49	78	143	251
Agent Positions	#	3	4	7	10
Frontage	LF	18	24	42	60
Area	SF	200	260	460	660
Ticket Lobby					
Queuing Area	SF	270	440	800	1,410
TSA Baggage Check	SF	360	480	840	1,200
Outbound Baggage	SF	860	1,150	2,020	2,880
Airline Ticket Office	SF	380	500	880	1,260
Ticket Lobby Circulation	SF	210	280	480	690
Public Area					
Circulation	SF	2,870	4,380	7,760	13,250
Security Stations					
Number	#	1	1	1	2
Queuing Area	SF	170	280	510	900
Station Area	SF	360	360	360	720
TSA Administration/Operations	SF	700	700	700	1,400
CONCOURSE FACILITIES					
Passenger Holdrooms					
Gates	#	2	3	4	6
Holdroom Area	SF	1,620	2,510	3,990	6,900
Airline Operations	SF	2,000	2,500	2,500	4,000
Concourse Circulation					
Circulation Area	SF	490	750	1,200	2,070
ARRIVALS PROCESSING					
Baggage Claim					
Passengers claiming bags	85%	46	74	135	237
Claim Display Frontage	LF	40	60	110	190
Claim Device Floor Area	SF	200	300	550	950
Inbound Baggage	SF	640	960	1,760	3,040
Baggage Service Office	SF	80	120	220	380
Claim Lobby					
Area Excl. Device Area	SF	1,090	1,760	3,200	5,630
Circulation Area	SF	660	1,060	1,930	3,380
PUBLIC SPACES					
Restrooms					
Area	SF	490	750	1,330	2,270
Concessions					
Food & Beverage	SF	370	620	1,370	3,240
Retail	SF	160	260	570	1,350
Support	SF	110	180	390	920
Rental Car					
Counter Frontage	LF	10	16	28	47
Counter and Office Area	SF	150	230	420	710
Counter Queuing Area	SF	80	130	220	380
Airport Administration					
Administration/Operations	SF	800	1,300	2,200	3,800
FUNCTIONAL AREA TOTAL					
Total Programmed Functional Area	SF	15,320	22,260	36,660	63,390
BUILDING SYSTEMS/SUPPORT					
Mechanical/HVAC	SF	610	890	1,470	2,540
General Circulation/Stairwells/Storage	SF	1,530	2,230	3,670	6,340
TOTAL TERMINAL					
Gross Building Area	**SF**	**17,460**	**25,380**	**41,800**	**72,270**

Departure lounge requirements depend upon the number of passengers in the departure areas during peak periods. This can also be dependent upon the size of aircraft as well. Departure lounge requirements have tended to increase since the events of 9-11 as passengers prefer to move through the security process and wait in the departure area.

Baggage claim facilities are based upon the number of arriving passengers during peak periods. As a tourist destination, most passengers are anticipated to have bags, but few meters and greeters will occupy the bag claim area with the passengers.

Public spaces include passenger and visitor-oriented amenities, concessions, and services other than those provided by the airlines. Restrooms, concessions, and rental car facilities have been shown as well as the space necessary for airport administration and operations related to the terminal. Because this is a tourist destination airport, demands for rental cars and shuttle services could be higher than normal ratios. Retail and restaurant space is shown at average levels, but may need to be expanded beyond the normal standards.

As indicated on **Table 3H**, a 17,500 square-foot terminal could accommodate the 31,000 initial enplanement milestone. A 25,400 square foot building would accommodate the short term horizon of 52,000 enplanements. For the long term horizon of 270,000 enplanements, capability to expand to 72,000 square foot should be planned for destination passengers.

GROUND ACCESS REQUIREMENTS

The passenger terminal building serves as the primary interface between air and ground transportation. Ground access to the terminal area is an important consideration as access and convenience can positively influence the overall growth of an airport. The primary components to be examined are:

- Airport and Terminal Access Roadway
- Terminal Curb Frontage
- Terminal Vehicle Parking
- Multi-Modal Considerations

AIRPORT AND TERMINAL ACCESS ROADWAY

In terminal facility planning, both on- and off-airport vehicle access is important. For the convenience of the traveler (and to provide maximum capacity), access to the terminal should include (to the extent practical) connections to the major arterial roadways near the airport.

The capacity of the airport access and terminal area roadways is the maximum number of vehicles that can pass over a given section of a lane or roadway during a given time period. It is normally preferred that a roadway operate below capacity to provide reasonable flow and minimize delay to the vehicles using it.

State Route 64 is the primary airport access road to both the airport and Grand Canyon National Park. It is a

two-lane highway south of the airport and is a four-lane roadway with a center turn lane as it passes through the commercial area of Tusayan. As it passes the airport, there are two southbound lanes and a single northbound lane. The right southbound lane generally serves as a right turn lane into the airport's two entrances. There are also left turn lanes for northbound traffic at both airport intersections. According to ADOT traffic count data, the SR 64 AADT (annual average daily traffic) was 6,235 vehicles in 2008.

As with the terminal, the means for describing the operational efficiency of a given roadway segment is defined in terms of six descriptive service levels. These levels of service (LOS) range from A to F and are defined as follows:

- **LOS A** – Free flowing traffic with minimal delays.
- **LOS B** - A stable flow of traffic, with occasional delays due to the noticeable presence of others in the traffic stream.
- **LOS C** – Still stable flow, but operations become more significantly affected by the traffic stream. Periodic delays are experienced.
- **LOS D** – Flow becomes more high density with speed and freedom to maneuver becoming severely restricted. Regular delays are experienced.
- **LOS E** – Maximum capacity operating conditions. Delays are extended and speeds are reduced to a low, relatively uniform level.
- **LOS F** – Forced flow with excessive delays. A condition where more traffic is approaching a point than can traverse the point.

Level of Service "C" is generally considered as the threshold of acceptable traffic conditions during peak periods in a generally rural area near an airport.

With the growth in visitors projected by the Park Service, the AADT on SR 64 could be expected to increase to 9,000 by the long term planning horizon. Airport-generated traffic was projected using Institute of Traffic Engineers (ITE) methodology. Based upon current and projected air tour, general aviation, and other air taxi activity, the airport would contribute 469 vehicles per day to this increase, growing from 792 to 1,261 vehicles per day. Destination airline traffic would generate 2,078 additional vehicles per day during the peak month. It was assumed that approximately half of the destination airline traffic would be newly generated airport traffic. Therefore, the AADT on the highway could increase to 10,000 by the long term planning horizon.

Primary access roads to an airport in the type of setting described above can typically provide a capacity of 700 to 800 vehicles per hour in at-grade interrupted flow conditions. With the available turn lanes, it is estimated that the highway in front of the airport has a capacity of approximately 1,600 to 1,800 vehicles per hour. This would be marginally adequate for the long term. As traffic continues to develop, it may become necessary to consider extending the four-lane roadway with center turn lane design south

from Tusayan past the airport entrances. In addition, signalization of the airport's intersections may also need to be considered by the long term.

According to the ITE model, traffic entering the airport can be expected to grow from 800 to 3,400 vehicles per day at the long term planning horizon. Peak hour traffic would grow from 120 to as much as 500 in the long term. The lanes in front of the current terminal are sufficient to handle up to 900 vehicles per hour. The combination of the two entrances should have the capability to accommodate this level of traffic. Access to the terminal or terminals will need to be evaluated based upon the final proposed concept.

TERMINAL CURB FRONTAGE

The curb element is the interface between the terminal building and the ground transportation system. The length of curb required for the loading and unloading of passengers and baggage is determined by the type and volume of ground vehicles anticipated in the peak period on the design day. A typical problem for terminal curb capacity is the length of dwell time for vehicles utilizing the curb. At airports where the curb front has not been strictly patrolled, vehicles have been known to be parked at the curb while the driver and/or riders are inside the terminal checking in, greeting arriving passengers, or awaiting baggage pickup. Since most curbs are not designed for vehicles to remain curbside for more than two to three minutes, capacity problems can ensue. Since the events of September 11, 2001, most airports police the curb front much more strictly for security reasons. This alone has reduced the curb front capacity problems at most airports.

The existing terminal building curb is approximately 315 feet in length. The mix at the curb during peak periods can include buses, shuttles, as well as individual vehicles. Taking into account this mix, **Table 3J** presents terminal curb needs through each planning horizon for the fixed wing air tour terminal operations.

TABLE 3J
Fixed Wing Air Tour
Terminal Curb and Parking Requirements
Grand Canyon National Park Airport

	Available	Current	Short Term	Inter-mediate	Long Term
Annual Enplanements		151,803	202,100	274,000	409,000
Terminal Curb Length (ft.)	315	240	290	350	460
Air Tour Parking (spaces)					
Auto Parking	125	112	134	160	209
Shuttle Parking	0	12	13	18	27
Bus Parking	34	17	20	27	40
Rental Car	20	21	24	32	48
Employee Parking	30	17	20	24	31
Total Vehicle Parking	209	179	211	261	355

The current length should be adequate through the short term horizon, but additional curbfront will be needed as activity approached 274,000 annual enplanements. For the long term planning horizon, 460 feet of terminal curb is estimated.

Table 3K provides an estimate of the curbfront that will be required for the destination airline activity horizons. While less than 200 feet of curb would be adequate through the short term, 580 feet should be planned for the long term planning horizon.

TABLE 3K
Destination Airline Terminal Curb and Parking Requirements
Grand Canyon National Park Airport

	Initial	Short Term	Inter-mediate	Long Term
Annual Enplanements	31,000	52,000	114,000	270,000
Terminal Curb Length (ft.)	110	180	330	580
Destination Parking (spaces)				
Auto Parking				
Short Term	15	23	42	71
Long Term	33	55	121	286
Total Auto Parking	48	78	163	357
Shuttle Parking	3	5	10	24
Bus Parking	1	1	2	5
Rental Car Ready/Return	20	33	72	170
Employee Parking	16	23	46	81
Total Vehicle Parking	88	40	293	637

TERMINAL VEHICLE PARKING

Vehicle parking in the passenger terminal area of the airport includes those spaces utilized by passengers, visitors, rental car agencies, and employee parking for those working in the terminal complex. Parking spaces can be classified as public, employee, and rental car.

There are a total of 209 terminal building parking spaces for patrons and employees, including 20 spaces for rental cars, and 34 spaces for buses and shuttle vans.

As an airport located in a remote tourist location, most GCN passengers are visitors to the area. Subsequently, the ratio of public parking to enplaned passengers will be significantly lower than might be expected in typical airport settings.

At the fixed wing air tour terminal, public parking requirements were based upon a ratio to peak hour passengers. These would involve persons visiting the area that drive and park at the airport to take an air tour. The other key parking factor for the air tour terminal is bus parking. Space is provided for staging buses waiting for tour passengers to arrive on a flight. The requirements for bus and shuttle parking are based upon a ratio of design day passengers that will utilize buses. Rental car requirements at the air tour terminal are limited as most air tour passengers already have other ground transportation upon arrival.

The parking requirements for the air tour terminal are outlined in **Table 3J.** The current parking will be generally adequate through the short term planning horizon. Up to 355 spaces could be needed in the long term.

The destination terminal parking requirements can be expected to have a much higher rental car requirement, as many destination passengers will be looking for vehicles to tour the area. **Table 3K** presents forecast destination airline terminal vehicle parking needs. Total parking requirements are projected at 140 for the short term planning horizon, but growing to 637 by the long term horizon, 170 of which will be rental car ready/return spaces.

MULTI-MODAL CONSIDERATIONS

The airport's proximity to the South Rim in Grand Canyon National Park has generated consideration of several multi-modal opportunities for mass transit between the two. The air/bus tour packages already offered by the operators on the airport are examples of the mass transit connection potentials.

The National Park Service's *South Rim Visitor Transportation Plan* includes among its primary objectives:

- Improve private vehicle parking as needed to meet current and future visitor demand.
- Reduce overall vehicle traffic through Grand Canyon Village in 202 by 15 to 20 percent during peak periods.
- Work with gateway communities to achieve mutual transportation goals.

The preferred alternative of the *South Rim Visitor Transportation Plan* includes increasing parking within the park but also expanding the park's shuttle bus system to four to six stops in Tusayan and the airport.

The plan calls for the development of up to 400 visitor parking spaces and a shuttle bus transfer station on Kabib National Forest Land outside the South Rim Gate. The Shuttle Bus System would also serve the lodges in Tusayan as well as the airport as a means of reducing the parking need within the park.

This plan would provide bus service to the airport and could potentially reduce other vehicle parking needs. It also has the potential for increasing parking needs at the airport, particularly during overflow periods in the park.

While included in the current plan, other modes of transportation between the airport and the park have been considered, including a rail spur and a monorail system. Both would require a route within the airport for their rail line as well as a terminus near the passenger terminal.

Additional parking would also be required to meet the needs of non-air visitors utilizing either rail mode to access the park. While it is difficult to quantify space requirements without more details, these remain alternate modes that should be given consideration within the terminal area plan.

GENERAL AVIATION FACILITIES

General aviation (GA) facilities are those necessary for handling general aviation and other air taxi aircraft and passengers while on the ground. This section is devoted to identifying future GA facility needs during the planning period for the following types of facilities normally associated with general aviation terminal areas:

- Hangars
- Aircraft Parking Apron
- General Aviation Terminal Services
- General Aviation Parking

HANGARS

The demand for hangar facilities typically depends on the number and type of aircraft expected to be based at the airport. Hangar facilities are generally classified as T-hangars, or conventional hangars. Conventional hangars can include individual box hangars or larger, multi-aircraft hangars. These different types of hangars offer varying levels of privacy, security, and protection from the elements.

Typical utilization of hangar space varies across the country as a function of local climate conditions, airport security, and owner preferences. The larger, more sophisticated and more expensive aircraft all tend to be stored in hangars. Owners of these types of aircraft normally desire hangar space to protect their investment. General aviation based aircraft at Grand Canyon National Park Airport is limited, with most of the based aircraft involved in air tour operations. The current general aviation based aircraft are on the parking apron. The National Park Service has the only true storage hangar on the airport, a 3,600 square-foot hangar south of the new ARFF building. At GCN, hangar space for overnight itinerant aircraft, especially turbine aircraft, may add some demand.

The final step in the process of determining hangar requirements involves estimating the area necessary to accommodate the required hangar space. A varying space requirement based upon based and itinerant aircraft activity to be hangared was applied.

A fixed base operator (FBO) hangar would include space for maintenance and overnight transient aircraft storage. Requirements for this hangar were estimated again based upon based aircraft, as well as itinerant GA and air taxi activity. The estimated hangar requirements are presented in **Table 3L**.

TABLE 3L
General Aviation Requirements
Grand Canyon National Park Airport

		Planning Horizons			
	Available	Current	Short Term	Inter-Mediate	Long Term
Fixed Wing Based Aircraft					
Single Engine Piston		6	7	7	8
Multi-Engine Piston		8	10	10	11
Turboprop		0	0	1	4
Jet		0	0	0	0
Total Based Aircraft		14	17	18	23
Hangar Space Requirements					
Conventional Hangar Space (s.f.)	3,600	4,800	5,900	7,400	12,500
Service Hangar Space (s.f.)	10,000	8,500	9,300	9,500	10,800
Total Hangar Space	13,600	13,300	15,200	16,900	23,300
Aircraft Parking Positions					
Based GA Aircraft		2	2	2	2
Transient GA/Air Taxi Parking		19	25	26	31
Corporate Jet Parking		2	2	3	4
Total Parking Positions	60	23	29	31	37
Total Apron Area (s.y.)	65,600	18,300	22,500	25,700	31,700
GA Design Hour Passengers					
Design Hour Itinerant Operations		8	11	12	14
Passengers per Operation		2.1	2.2	2.3	2.5
Design Hour Passengers		18	24	27	35
Terminal Services Building(s) (s.f.)	5,473	1,600	2,200	2,400	3,200
General Aviation Parking Spaces	NA	14	19	22	28

GENERAL AVIATION TERMINAL SERVICES

The general aviation terminal space is based upon the number of persons per aircraft during the design hour. Building space requirements were then estimated at 90 square feet per design hour passenger. There is currently 5,473 square feet of space in the Grand Canyon Airlines terminal. This area is also currently shared with the airlines' air tour operations. Because most general aviation activity is transient general aviation parking was estimated at 0.8 spaces per busy day operation. These requirements are also outlined on **Table 3L**.

GENERAL AVIATION PARKING AREA

Parking apron is utilized both by transient and based aircraft. The number of spaces required was estimated considering busy day activity by general aviation and other air taxi. Space planning criterion was related to the types of transient aircraft to be parked.

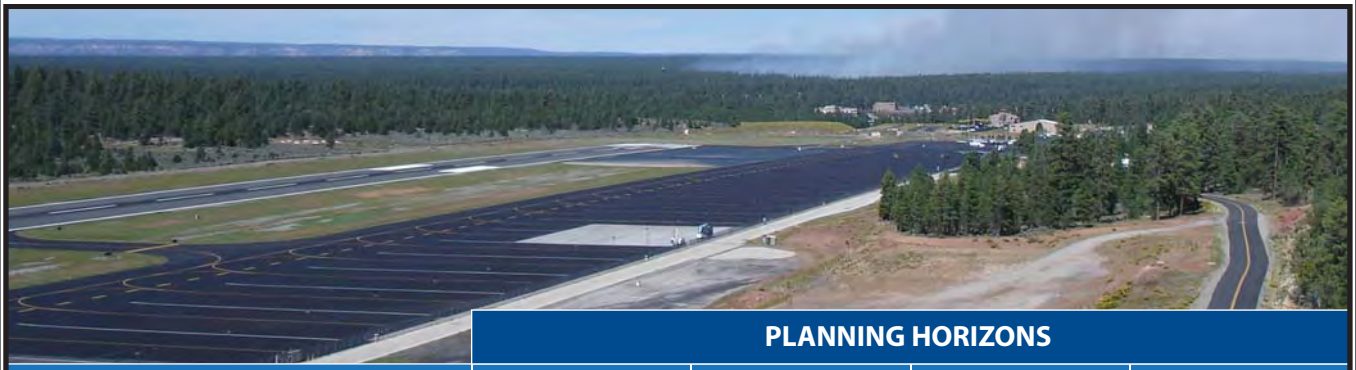
The results of this analysis are also presented in **Table 3L**. The 14,600 square-yard general aviation ramp at the north end of the terminal currently has 21 tie-down spaces. There is an additional 51,000 square yards of apron south of the terminal that is used by transient GA and air taxi air-

craft that do not tie-down or need access to the FBO. The combined 65,600 square yards is adequate for the planning periods, but space may need to be reorganized for better access to terminal services.

SUMMARY

The intent of this chapter has been to outline the terminal facilities required to meet the demands projected for Grand Canyon National Park Airport. A summary of the terminal area requirements is presented on **Exhibit 3A**. Following the facility requirements determination, the next step is to develop a direction for development to best address the potential needs. The remainder of the Terminal Area Plan will be devoted to conceiving a direction, its schedule, and its cost.

AVAILABLE		PLANNING HORIZONS CURRENT	SHORT TERM	INTERMEDIATE	LONG TERM
AIR TOUR TERMINAL					
Aircraft Gates:	5	6	7	8	10
Building Area (sf):	8,500	15,700	18,400	22,100	28,600
Curb Length (ft):	315	240	290	350	460
Vehicle Parking (spaces):	209	179	211	261	355
DESTINATION TERMINAL					
Aircraft Gates:	N/A	2	3	4	6
Building Area (sf):	N/A	17,500	25,400	41,800	72,300
Curb Length (ft):	N/A	110	180	330	580
Vehicle Parking (spaces):	N/A	88	140	293	637



AVAILABLE		PLANNING HORIZONS CURRENT	SHORT TERM	INTERMEDIATE	LONG TERM
GENERAL AVIATION					
Terminal Services Building (sf):	5,473	1,600	2,200	2,400	3,200
Aircraft Parking Apron (sy):	65,600	18,300	22,500	25,700	31,700
Conventional Hangars (sf):	3,600	4,800	5,900	7,400	12,500
Service (FBO) Hangars (sf):	10,000	8,500	9,300	9,500	10,800
Auto Parking (spaces):	N/A	14	19	22	28

Exhibit 3A
TERMINAL AREA
REQUIREMENTS SUMMARY