Flagstaff Pulliam Airport

Airport Master Plan

AIRPORT MASTER PLAN

FOR

FLAGSTAFF PULLIAM AIRPORT
Flagstaff, Arizona

Prepared For
THE CITY OF FLAGSTAFF, ARIZONA
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FLAGSTAFF
PULLIAM AIRPORT

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INTRODUCTION & SUMMARY

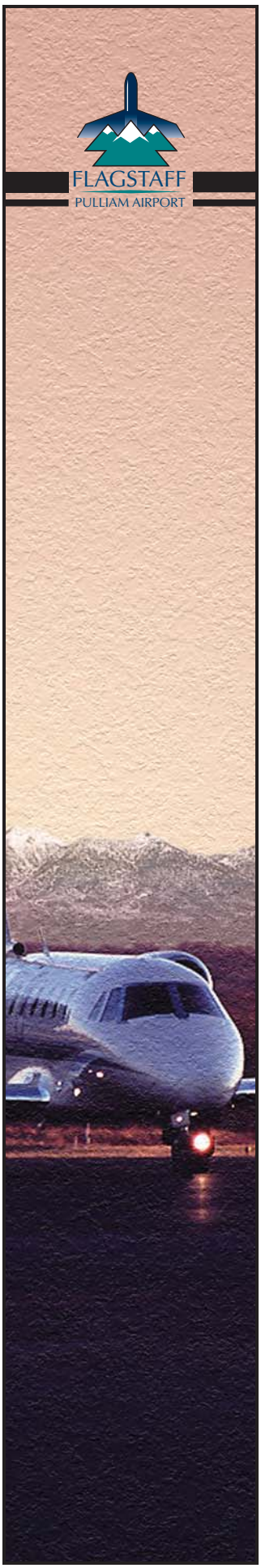
Introduction & Summary

The Flagstaff Pulliam Airport Master Plan study was undertaken to evaluate the airport's capabilities and role, to forecast future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet that demand. The ultimate goal of the master plan is to provide systematic guidelines for the airport's overall maintenance, development, and operation.

The master plan is intended to be a proactive document which identifies and then plans for future facility needs well in advance of the actual need for the facilities. This is done to ensure that the City of Flagstaff can coordinate project approvals, design, financing, and construction in a timely manner prior to experiencing the detrimental effects of inadequate facilities.

An important result of the master plan is the reservation of sufficient areas for future facility needs. This protects development areas and ensures they will be readily available when required in the future. The intended result is a detailed land use concept which outlines specific uses for all areas of airport property.

The preparation of this master plan is evidence that the City of Flagstaff recognizes the importance of air transportation to the community and the associated challenges inherent in providing for its unique operating and improvement needs. The cost of maintaining an airport is an investment which yields impressive benefits to the community. With a sound and realistic master plan, Flagstaff Pulliam Airport can maintain its role as an important link to the national air transport-



ation system for the community and maintain the existing public and private investments in its facilities.

MASTER PLAN OBJECTIVES

The primary objective of the master plan is to formulate and maintain a long term development program which will yield a safe, efficient, economical, and environmentally acceptable air transportation facility. The accomplishment of this objective requires the evaluation of the existing airport and determination of what actions should be taken to maintain an adequate, safe, and reliable airport facility to meet the needs of the area. This master plan will provide an outline of necessary development and give those responsible an advance notice of future airport funding needs so that appropriate steps may be taken to ensure that adequate funds are budgeted and planned.

Specific objectives of the Flagstaff Pulliam Airport Master Plan include:

- To preserve and protect the public and private investments in existing airport facilities;
- To enhance the safety of aircraft operations;
- To be reflective of community goals, needs, and plans;
- To ensure that future development is environmentally compatible;
- To establish a schedule of development priorities and a program to meet the needs of the proposed improvements in the master plan;
- To develop a plan that is responsive to air transportation demands;
- To develop an orderly plan for use of the airport;
- To coordinate this master plan with local, regional, state, and federal agencies; and
- To develop active and productive public involvement throughout the planning process.

The master plan will accomplish these objectives by carrying out the following:

- Determining projected needs of airport users through the year 2025;
- Identifying existing and future facility needs; and
- Evaluating future airport facility development alternatives which will optimize airport capacity and aircraft safety.

MASTER PLAN ELEMENTS AND PROCESS

The Flagstaff Pulliam Airport Master Plan is being prepared in a systematic

fashion following FAA guidelines and industry-accepted principles and practices. The master plan for Flagstaff Pulliam Airport has six chapters that are intended to assist in the discovery of future facility needs and provide the supporting rationale for their implementation.

Chapter One - Inventory, summarizes the inventory efforts. The inventory efforts are focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information is collected on existing airport facilities and operations. Local economic and demographic data is collected to define the local growth trends. Planning studies which may have relevance to the master plan are also collected.

Chapter Two - Forecasts, examines the potential aviation demand for aviation activity at the airport. This analysis utilizes local socioeconomic information, as well as national air transportation trends to quantify the levels of aviation activity which can reasonably be expected to occur at Flagstaff Pulliam Airport though the year 2025. The results of this effort are used to determine the types and sizes of facilities which will be required to meet the projected aviation demands for Flagstaff Pulliam Airport through the planning period.

Chapter Three - Facility Requirements, comprises the demand capacity and facility requirements analyses. The intent of this analysis is to compare the existing facility capacities to forecast aviation demand and determine where deficiencies in capacities as well as excess capacities) may exist. Where deficiencies are identified, the size and type of new facilities to accommodate the demand are identified. The airfield analysis focuses on improvements needed to serve the type of aircraft expected to operate at the airport in the future, as well as navigational aids to increase the safety and efficiency of operations. This element also examines aircraft storage hangar and apron needs.

Chapter Four - Alternatives, considers a variety of solutions to accommodate the projected facility needs. This element proposes various facility and site plan configurations which can meet the projected facility needs. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a single direction for development.

Chapter Five - Airport Plans, provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport. An environmental overview is also provided. The master plan also includes the official Airport Layout Plan (ALP) and detailed technical drawings depicting related airspace, land use, and property data. These drawings are used by the Federal Aviation Administration (FAA) in determining grant eligibility and funding.

Chapter Six - Financial Plan, focuses on the capital needs program, which defines the schedules, costs, and funding sources for the recommended development projects.

COORDINATION

The Flagstaff Pulliam Airport Master Plan is of interest to many within the local community. This includes local citizens, community organizations, airport users, airport tenants, area-wide planning agencies, and aviation organizations. As an important component of the regional, state, and national aviation systems, the Flagstaff Pulliam Airport Master Plan is of importance to both state and federal agencies responsible for overseeing air transportation.

To assist in the development of the Flagstaff Pulliam Airport Master Plan, a cross-section of community members and interested persons were identified to act in an advisory role during the process. As members of the Planning Advisory Committee (PAC), the committee members reviewed phase reports and provided comments throughout the study to help ensure that a realistic, viable plan was developed.

To assist in the review process, draft working papers were prepared at the milestones in the planning process. The draft working paper process allowed for input and review during each step to ensure that all master plan issues were fully addressed as the recommended program evolved.
A series of public information workshops were also included as part of the plan coordination. The public information workshops allowed the public to provide input and learn about general information concerning the master plan.

RECOMMENDATIONS

The proper planning of a facility of any type must consider the demand that may occur in the future. For Flagstaff Pulliam Airport (FLG), this involved updating forecasts to identify potential future aviation demand. Because of the cyclical nature of the economy, it is virtually impossible to predict with certainty year-to-year fluctuations in activity when looking five, ten, and twenty years into the future.

Recognizing this reality, the master plan is keyed more to potential demand "horizon" levels than future dates in time. These "planning horizons" were established as levels of activity that will call for consideration of the implementation of the next step in the master plan program. By developing the airport to meet the aviation demand levels instead of specific points in time, the airport will serve as a safe and efficient aviation facility which will meet the operational demands of its users while being developed in a cost efficient manner. This program allows the City to adjust specific development in response to unanticipated needs or demand. The forecast planning horizons are summarized in **Table A**.

The Airport Layout Plan set has also been updated to act as a blueprint for everyday use by management, planners, programmers, and designers. These plans were prepared by computer to help ensure their continued use as an everyday working tool for the City.

TABLE A
Aviation Demand Planning Horizons
Flagstaff Pulliam Airport

	Base Year	Short Term	Intermediate Term	Long Term
ANNUAL OPERATIONS				
Airline	3,324	4,800	8,200	14,200
Air Taxi	5,965	6,400	7,100	8,200
Military	824	800	800	800
General Aviation				
Itinerant	27,447	31,300	34,600	39,800
Local	16,033	20,400	21,900	24,300
TOTAL OPERATIONS	53,593	63,700	72,600	87,300
Annual Enplanements	37,257	70,000	124,000	227,000
BASED AIRCRAFT	116	131	139	154

This master plan is an update of the previous master plan completed in 1991. Improvements at the airport since then have included a new 21,700-square-foot passenger terminal building, loop road, and parking lot. To meet safety design standards, the parallel taxiway was relocated farther away from the runway. To accommodate this relocation, much of the general aviation area had to be relocated farther from the runway as well. This included the aircraft parking apron, T-hangars, private hangars, and a new fixed base operator (FBO) facility. Most of these older structures were replaced with new facilities in the new locations.

Exhibit A depicts the updated plan. A major focus of the plan recommendations is to respond to the need for additional runway length to better accommodate both corporate and regional jets. Many current corporate aircraft are severely limited in their flight range from FLG due to the current 7,000-foot runway length. The extension of Runway 3-21 to a length of 8,800 feet will optimize their capabilities.

The existing runway length also effectively prohibits regional jet service. Regional jet service may become imperative for the airport to be able to maintain and improve upon its current level of commercial airline service. The proposed runway extension of 8,800 feet will also meet this need.

The extension is needed solely for takeoff, so the landing thresholds will remain in their current locations. This will preserve the current precision approach to Runway 3, as well as prevent any potential impacts due to changes in overflights. In fact, departure overflights over areas to the southwest will actually be higher than they are now.

The runway extension will require the acquisition of property for the runway protection zone. There are also several other tracts around the airport that are recommended for acquisition. These include the area around the VOR/DME, the south runway protection zone, areas that need to be protected for the parallel runway, and parcels associated with east side de-

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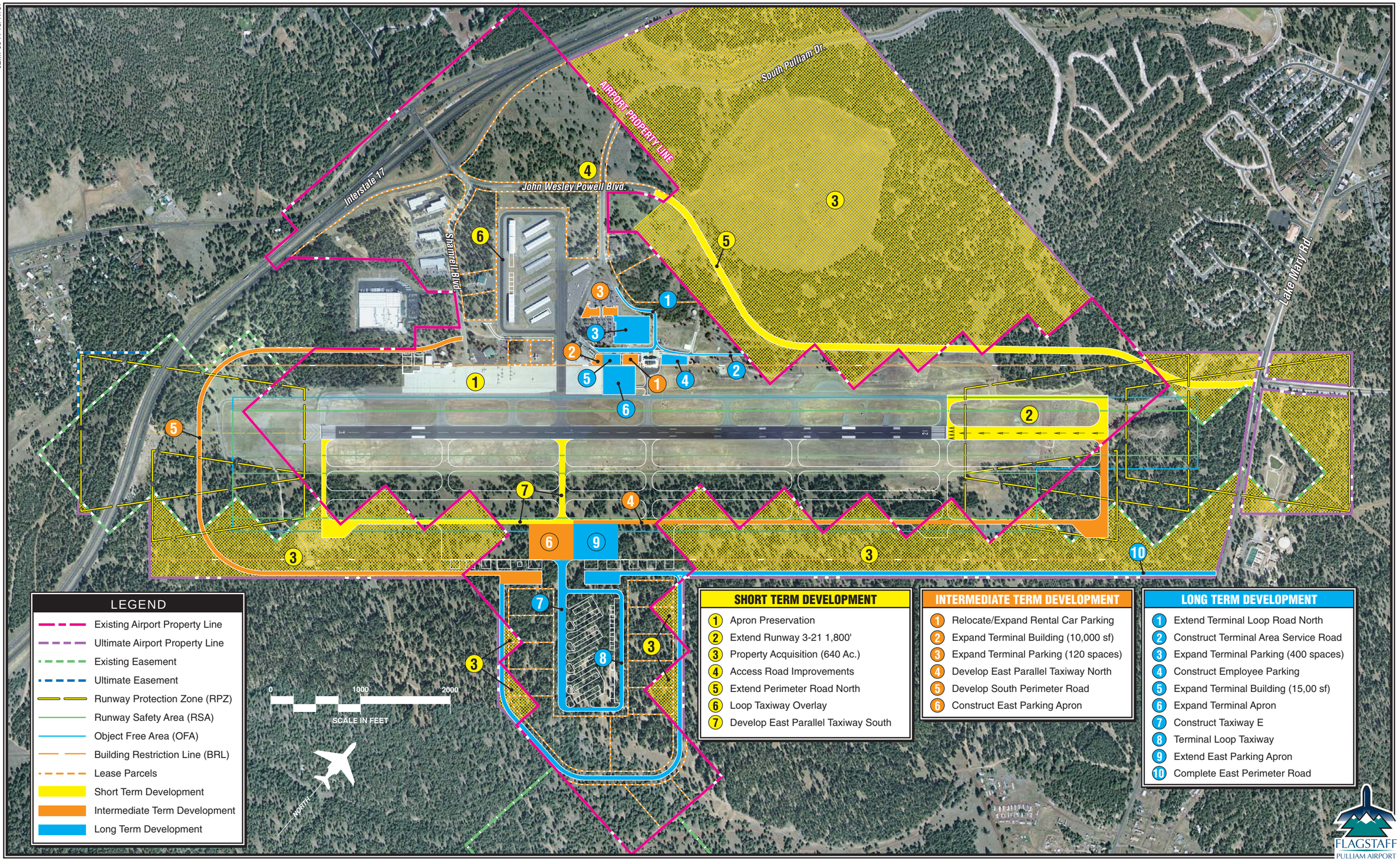

LEGEND

- Existing Airport Property Line
- Ultimate Airport Property Line
- Existing Easement
- Ultimate Easement
- Runway Protection Zone (RPZ)
- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Building Restriction Line (BRL)
- Lease Parcels
- Short Term Development
- Intermediate Term Development
- Long Term Development

SHORT TERM DEVELOPMENT

1. Apron Preservation
2. Extend Runway 3-21 1,800'
3. Property Acquisition (640 Ac.)
4. Access Road Improvements
5. Extend Perimeter Road North
6. Loop Taxiway Overlay
7. Develop East Parallel Taxiway South

INTERMEDIATE TERM DEVELOPMENT

1. Relocate/Expand Rental Car Parking
2. Expand Terminal Building (10,000 sf)
3. Expand Terminal Parking (120 spaces)
4. Develop East Parallel Taxiway North
5. Develop South Perimeter Road
6. Construct East Parking Apron

LONG TERM DEVELOPMENT

1. Extend Terminal Loop Road North
2. Construct Terminal Area Service Road
3. Expand Terminal Parking (400 spaces)
4. Construct Employee Parking
5. Expand Terminal Building (15,00 sf)
6. Expand Terminal Apron
7. Construct Taxiway E
8. Terminal Loop Taxiway
9. Extend East Parking Apron
10. Complete East Perimeter Road

FLAGSTAFF PULLIAM AIRPORT

Exhibit A
DEVELOPMENT STAGING

velopment. These are recommended to be placed under airport control in the short term.

The development of the perimeter road to the north is also planned. This road would connect to Lake Mary Road and serve as a portion of the perimeter road planned to provide access around the airport. This section of roadway might initially serve as a haul road for the runway extension.

The other key focus is on projects related to growth in demand. It is anticipated that service by regional jets will encourage more passenger use of the airport. As the short term planning horizon of 70,000 annual enplaned passengers is surpassed, the terminal building will become undersized. A two-phase terminal improvement project is planned. Phase I would include a 10,000-square-foot expansion to accommodate additional gates and second level boarding. When demand dictates, Phase II is expected to include an additional 15,000-square-foot building expansion. To accommodate the expansion, the rental car parking will need to be moved further north. To accommodate a widening of the expanded portion of the building, the terminal road in front of the building would be realigned slightly. Ultimately the terminal loop road would be extended further north to provide more surface parking lot.

Following fill-in of west side areas in the short term, long term general aviation development would begin to focus on the east side of the airport. A parallel taxiway system would be developed on the east side along with the extension of Taxiway E into an east side ramp and development area. This will be followed by the development of a taxiway loop, as well as the extension of utilities and the perimeter road around the east side. A perimeter road system has been planned to provide full access to the east side. While not anticipated to be needed within the next twenty years, the plan also provides for the ultimate development of a parallel runway east of the existing runway.

The full implementation of the master plan would involve a financial commitment of $84.4 million over the planning period, as shown in **Table B**. Approximately 88 percent of the total costs will be eligible for grants-in-aid administered by the Federal Aviation Administration (FAA) and the Arizona Department of Transportation (ADOT). The source of the FAA grants is the Aviation Trust Fund, which is a depository for aviation taxes such as those from airline tickets, aviation fuel, aircraft registrations, and other aviation-related fees. Most eligible projects can receive up to 95 percent funding from the FAA.

A similar program funded through the Aeronautics Division of ADOT provides supplemental matching funds. Thus, the combination of federal and state airport improvement programs could fund over 88 percent of the anticipated costs of the master plan development program.

TABLE B
Development Funding Summary (million $)
Flagstaff Pulliam Airport
Master Plan

Planning Horizon	Project Cost	FAA Eligible	ADOT Match	City Share
Short Term	$30.38	$25.16	$4.17	$1.05
Intermediate Term	$27.25	$23.19	$1.53	$2.53
Long Term	$26.78	$19.35	$1.27	$6.16
Grand Total	$84.41	$67.70	$6.97	$9.74

The City of Flagstaff will need to use other sources of airport-generated funding as well. Commercial service airports such as Flagstaff Pulliam Airport have been authorized by Congress to impose passenger facility charges (PFCs) as a means to collect revenues for airport improvements. A PFC of up to $4.50 is allowed. To date, the airport has been authorized for a $3.00 PFC and currently uses the revenue to retire the debt from the construction of the terminal building. Thus, the airport has additional PFC potential that can be considered.

The master plan is evidence that the City of Flagstaff is committed to providing high quality air transportation services to northern Arizona. The City recognizes the importance of Flagstaff Pulliam Airport to the community and the region, as well as the associated challenges inherent in providing for future aviation needs. By maintaining a sound, flexible master plan, the airport will continue to be a major economic asset to the area.

ECONOMIC BENEFITS OF FLAGSTAFF PULLIAM AIRPORT

In conjunction with the master plan, the economic impact of Flagstaff Pulliam Airport was also evaluated. The study measured economic benefits of the airport through four indicators:

Revenues or output measure the total flow of dollars from aviation-related activity and include total sales of business firms and budgets of administration agencies.

Earnings or payroll represent the dollar value of payments received by workers (as wages) and business proprietors (as income) who create the goods and services that are sold to produce revenues.

Employment is a measure of the number of jobs required to create the gross revenues and value added.

The economic benefits of Flagstaff Pulliam Airport for the year 2002 are summarized in **Table C**. The study concluded that the airport has a $100 million dollar annual benefit to the regional economy and supports 1,400 jobs in the community.

TABLE C
Economic Benefits
Flagstaff Pulliam Airport

	Revenues (million$)	Earnings (million$)	Employment
Direct Benefits			
On-Airport	$41,400,000	$11,800,000	336
Visitors	$16,000,000	$6,700,000	335
Indirect Benefits	$42,900,000	$20,200,000	721
Total Benefits	$100,300,000	$38,700,00	1,392

FLAGSTAFF
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Chapter One
INVENTORY

Inventory

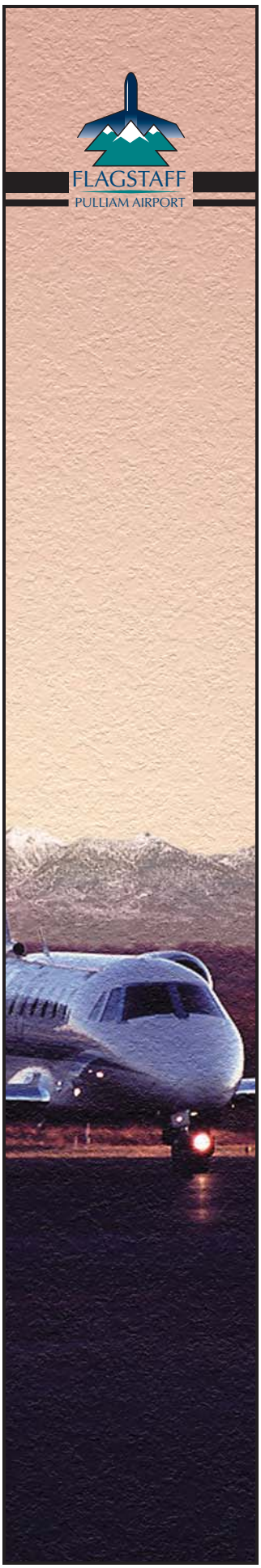
The initial step in the preparation of an updated master plan for Flagstaff Pulliam Airport is the assembly of information pertaining to existing conditions at the airport and the local area. This information will provide a foundation for subsequent analysis throughout the study. Therefore, it is essential that a complete inventory is conducted since the findings and assumptions made later in this study are dependent on information that is initially collected.

The inventory includes an examination of the existing airport facilities, air traffic activity, area airspace, and air traffic control. In addition, general information regarding the Flagstaff region is presented. This includes information regarding the airport's role in the regional and national aviation system, local climatology, and socioeconomic profile.

AIRPORT SETTING

The **National Plan of Integrated Airport Systems (NPIAS)** identifies 3,344 airports that are important to national transportation. The NPIAS identifies Flagstaff Pulliam Airport (FLG) as a primary commercial service airport. Flagstaff Pulliam Airport is also classified as a primary commercial service airport within the Arizona Airport System.

The airport is located on approximately 795 acres, on the southwest side of the City of Flagstaff, just to the east of Interstate 17. The airport's elevation of 7,011 feet above mean sea level (MSL) makes it the highest of any airport in the State of Arizona. The City of Flagstaff and the airport are located within Coconino County and the Coconino National Forest.



The airport has excellent interstate access as it is situated just east of Interstate 17 and a few miles from the intersection of I-17 with I-40. Access to the airport is available from John Wesley Powell Boulevard's interchange with the interstate. Secondary access is available from Lake Mary Road and South Pulliam Drive Boulevard. **Exhibit 1A** depicts the airport's locale.

CLIMATE

Weather plays an important role in the operational capabilities of an airport. Temperature is an important factor in determining runway length required for aircraft operations. The percentage of time that visibility is impaired due to cloud coverage is a major factor in determining the use of instrument approach aids. Wind speed and direction determine runway selection and operational flow.

Flagstaff's high elevation provides a climate atypical of most of Arizona. The climate in Flagstaff can be considered mild, with cold winters, mild pleasantly cool summers, and low humidity. The Flagstaff area is semiarid and it is not uncommon for several months to go by with little or no precipitation. Annual precipitation averages 19.80 inches with 84.40 inches of snowfall. The area experiences an average of 288 annual average days of sunshine.

The mean maximum daily temperature during July, the hottest month, is 81.9 degrees Fahrenheit (F). The mean maximum daily temperature during January, the coldest month, is 42 degrees F. The average annual temperature of the region is approximately 61 degrees F.

HISTORY

Flagstaff Pulliam Airport was constructed in 1949 on United States Forest Service land deeded to the City though the Federal Airport Act. The airport replaced Koch Field which had served Flagstaff since 1929, but was subject to adverse wind conditions during the winter months. The new airport was named in honor of Charles "Maggie" Pulliam, Flagstaff's city manager for 44 years. Originally constructed to a length of 5,300 feet, the runway was lengthened to 6,300 feet in 1955 and to its present length, 6,999 feet, in 1969.

A small stone administrative building served as the first terminal building when Frontier Airlines initiated service in June of 1950. Frontier served the airport continuously for nearly three decades until leaving in 1979 with the advent of airline deregulation. Over the years, the terminal building underwent several modifications and additions, reaching a total of 3,100 square feet by 1975. By the mid-1980s, the terminal was doubled in size to 6,200 square feet.

The airport traffic control tower (ATCT) was constructed in 1975. It remained operational until the FAA air traffic controllers' strike in September 1981. The controllers were subsequently fired, resulting in many towers being closed while new controllers were hired and trained. The Flagstaff ATCT remained closed until 1984.

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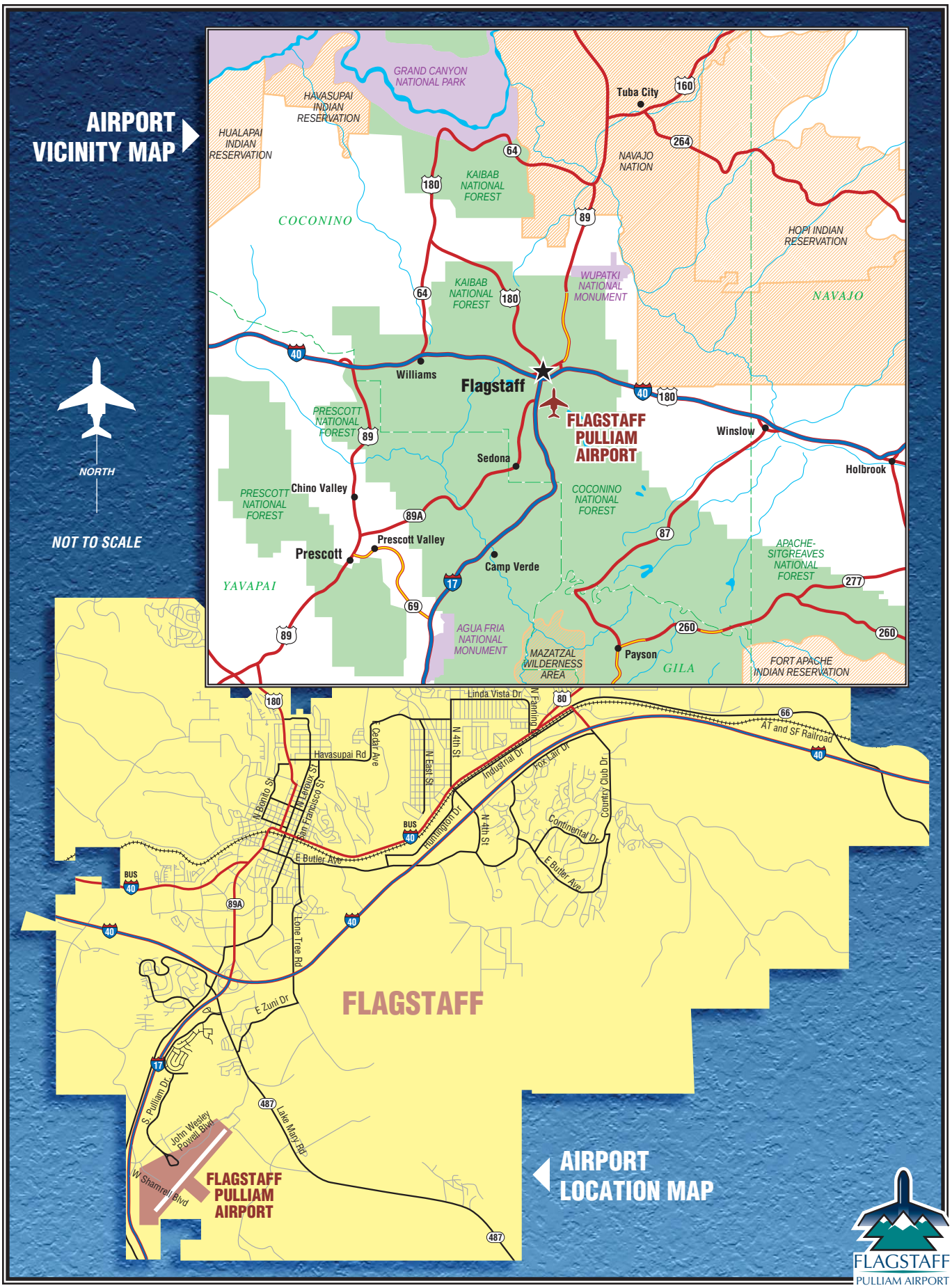

FLAGSTAFF PULLIAM AIRPORT

Exhibit 1A
LOCATION MAP

A 9,000 square foot stone hangar was constructed in the 1950s. A 12-unit T-hangar was added in the early 1960s. Four quonset-type hangars were added in 1970. The Peabody Coal Company hangar and the Arizona Department of Public Safety hangar were added in 1979. The 1980s saw the addition of several more hangars.

Improvements at the airport since the last Master Plan was completed in 1991 include a new 21,700 square foot passenger terminal building, loop road, and parking lot. To meet safety design standards, the parallel taxiway was relocated further away from the runway. To accommodate this relocation, much of the general aviation area had to be relocated further from the runway as well. This included the aircraft parking apron, T-hangars, private hangars, and a new fixed base operator (FBO) facility. Most of these older structures were replaced with new facilities in the new locations.

Table 1A outlines the various FAA development grants the airport received from 1990 through 2002.

AIRPORT ADMINISTRATION

Flagstaff Pulliam Airport is owned and operated by the City of Flagstaff, and is included within the Department of Public Works. A seven-member Airport Commission is responsible for reviewing and reporting to the Council on the development of the airport and on matters affecting the operation and efficiency of the airport, using the Airport Master Plan as a guide. The Airport Commission is appointed by the Mayor and City Council for staggered three-year terms.

AIR TRAFFIC ACTIVITY

Flagstaff Pulliam Airport serves both commercial service and general aviation activity. Military activity is minimal. Commercial service activity is typically quantified by the number of aircraft boardings or enplanements, and the number of takeoffs and landings or operations. General aviation activity is quantified by operations and the number of aircraft based at the airport. **Table 1B** outlines these indicators of aviation activity at Flagstaff Pulliam Airport over the last two decades.

There is one commuter airline providing scheduled passenger service at Flagstaff Pulliam Airport. America West Express, operated by Mesa Airlines, offers five daily flights to the America West hub in Phoenix on 37-seat DeHavilland Dash 8 aircraft.

The based aircraft at Flagstaff Pulliam Airport are listed in **Appendix B** by N-number, model, and type. The 116 based aircraft include 99 single-engine piston aircraft, seven multi-engine piston aircraft, seven turboprop aircraft, one business jet, and two helicopters.

TABLE 1A
Federal Airport Development Grants, 1990-2002
Flagstaff Pulliam Airport

Grant Agreement Year	Improvement	FAA-AIP Grant Amount
1990	Apron Rehabilitation	$398,448
1990	Snow Removal Equipment	22,864
1991	Apron Construction	1,030,137
1991	Snow Removal Equipment	166,559
1991	Access Road Improvements	386,240
1991	Airport Drainage Improvements	11,240
1992	Apron Rehabilitation	369,463
1992	Apron Rehabilitation	55,420
1993	Apron Expansion	917,968
1993	Building Improvements	379,199
1994	Taxiway Construction	400,000
1994	Apron Construction	282,000
1995	Taxiway Construction	700,000
1995	Apron Construction	359,163
1995	Snow Removal Equipment	132,646
1997	Airport Drainage Improvements	399,389
1997	Apron Expansion	392,596
1997	Taxiway Construction	379,811
1998	Obstruction Removal	197,192
1999	Obstruction Removal	1,867,428
1999	Obstruction Removal	136,336
2000	Runway Safety Area Improvements	650,000
2000	Runway Safety Area Improvements	100,000
2001	Runway Safety Area Improvements	3,802,808
2001	Runway Safety Area Improvements	5,213,792
2002	Environmental Study	200,332
2002	Snow Removal Equipment	180,460
2002	Master Plan/Part 150 Studies	591,890
2002	Handicap Passenger Lift	27,318

Over the past five years, military activity has averaged approximately 500 operations annually. In 2001, the tower count totaled 234. Military operations are primarily helicopter, with an occasional C-12 aircraft.

TABLE 1B
Historical Airport Activity
Flagstaff Pulliam Airport

				Itinerant Operations				Local Operations		
Year	Enplaned Passengers	Based Aircraft	Total Operations	Comm.	GA.	Military	Total	GA	Military	Total
1980	14,877	75	49,274	7,709	26,640	343	34,692	14,478	104	14,582
1981	14,784	79	48,557	7,226	27,697	310	35,233	13,242	82	13,324
1982	15,319	84	56,736	6,400	35,976	360	42,736	14,000	0	14,000
1983	13,000	85	53,000	8,000	32,000	0	40,000	13,000	0	13,000
1984	19,089	87	32,000	2,000	20,000	0	22,000	10,000	0	10,000
1985	19,140	97	37,390	7,370	22,911	287	30,568	6,772	50	6,822
1986	23,203	97	41,623	8,766	23,758	453	32,977	8,582	64	8,646
1987	41,463	98	47,778	9,570	26,792	620	36,982	10,642	154	10,796
1988	47,006	106	51,927	10,238	25,264	434	35,936	15,669	322	15,991
1989	51,891	107	54,955	9,269	27,148	397	36,814	17,892	249	18,141
1990	51,687	106	59,233	8,121	27,250	514	35,885	22,774	574	23,348
1991	48,304	110	61,326	7,579	29,187	559	37,325	23,754	247	24,001
1992	49,508	110	57,262	7,414	27,539	601	35,554	21,513	195	21,708
1993	42,262	110	53,060	7,964	26,827	415	35,206	17,611	243	17,854
1994	41,138	110	53,225	8,154	26,990	395	35,539	17,459	227	17,686
1995	39,213	110	51,914	7,583	27,412	487	35,482	16,192	240	16,432
1996	47,171	110	53,310	12,590	26,775	289	39,654	13,468	188	13,656
1997	46,704	110	44,243	11,297	22,195	194	33,686	10,450	107	10,557
1998	39,573	100	44,808	8,963	21,541	269	30,773	13,916	119	14,035
1999	36,656	112	51,196	7,258	25,743	272	33,273	17,811	112	17,923
2000	34,483	112	51,329	7,470	26,082	155	33,707	17,450	172	17,622
2001	31,370	112	52,371	8,123	25,731	405	34,259	17,829	283	18,112
2002	37,257	116	53,593	9,289	27,447	503	37,239	16,033	321	16,354
2003	36,400	116	51,353	9,494	25,541	430	35,465	15,363	525	15,888

AIRPORT FACILITIES

The facilities at an airport can be divided into two distinct categories: airside facilities and landside facilities. Airside facilities include those directly associated with aircraft operation. Landside facilities include those necessary to provide an interface between surface and air transportation, as well as support aircraft servicing, storage, maintenance, and operational safety.

AIRSIDE FACILITIES

Airside facilities include the runway and taxiway systems, airport lighting, and navigational aids. The airside facilities at Flagstaff Pulliam Airport are depicted on **Exhibit 1B. Table 1C** summarizes the airside facility data.

Runway and Taxiways

Flagstaff Pulliam Airport has a single runway available for use. Runway 3-21 is oriented northeast-southwest, and is 6,999 feet long and 150 feet wide. The southwest end is the high point on the runway at 7,011 MSL. The runway slopes downward to the northeast end which is at 6,990 feet MSL, for a runway gradient of 0.3 percent. There are 210-foot by 190-foot blast pads off each runway end.

The runway is constructed of asphalt with a porous friction course (PFC) surface. PFC is designed to promote drainage to reduce hydroplaning potential. The runway has a single wheel loading (SWL) strength of 30,000 pounds, a dual wheel loading (DWL) strength of 95,000 pounds, and a dual tandem wheel loading (DTW) strength of 140,000 pounds. **Table 1C** summarizes the basic runway data.

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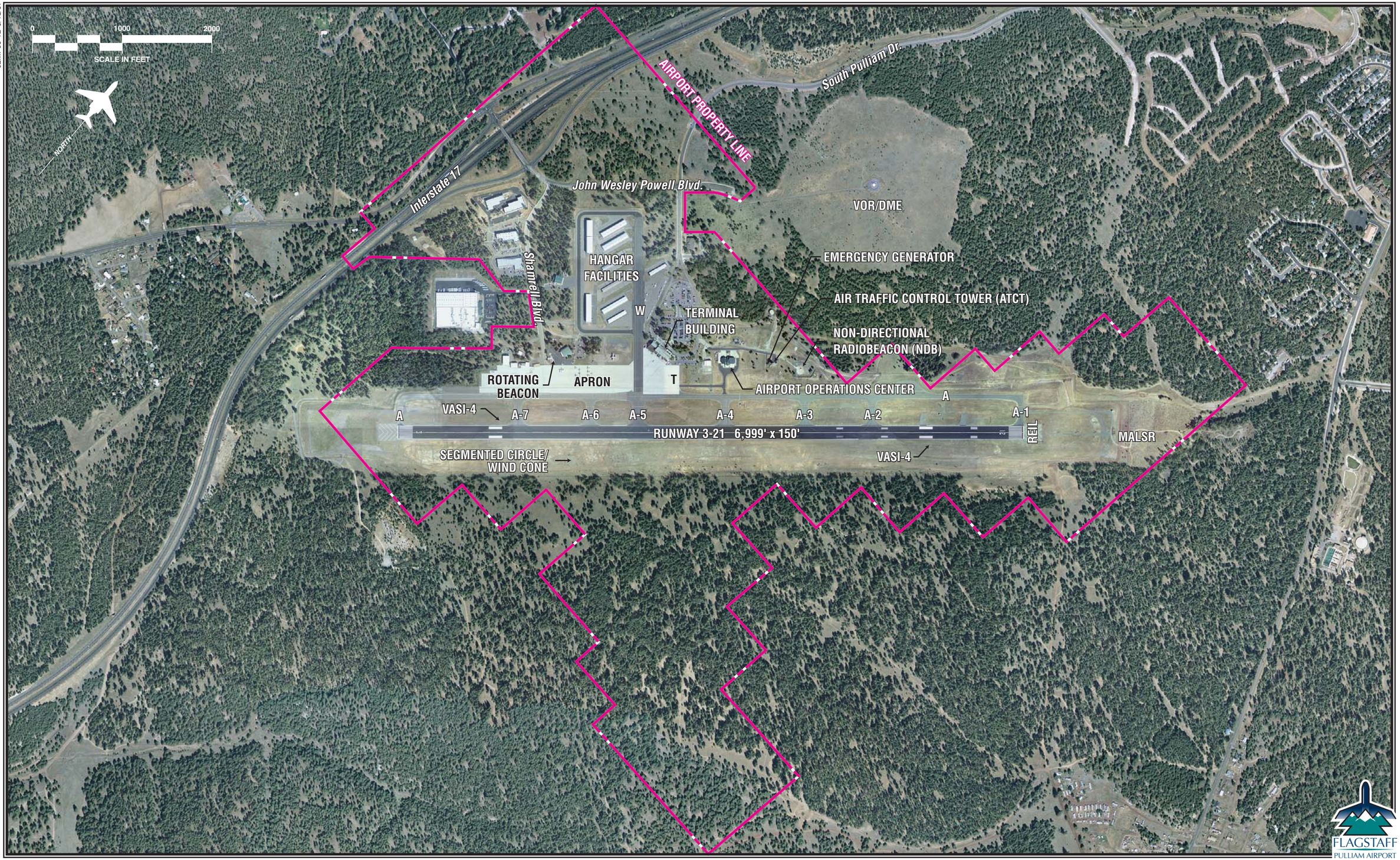

FLAGSTAFF PULLIAM AIRPORT

Exhibit 1B
EXISTING AIRFIELD FACILITIES

TABLE 1C
Runway Information
Flagstaff Pulliam Airport

	Runway	
	3	**21**
Runway Length (feet) Runway Width (feet)	6,999 150	
Runway Surface Material	asphalt/porous friction course	
Displaced Threshold	none	
Runway Load-Bearing Strength SWL DWL DTWL	 30,000 95,000 140,000	
Approach Aids VASI MALSR	 yes no	 yes yes
Markings	non-precision instrument	precision instrument
Lighting	HIRL	
Instrument Approach Procedures	VOR, GPS	ILS, NDB, VOR, GPS
Traffic Pattern	left	left

Source: Airport Facility Directory, North Central United States, May 12, 2005.

Notes:
SWL - Single wheel loading
DWL - Dual wheel loading
DTW - Dual tandem wheel loading
VASI - Visual Approach Slope Indicator
MIRL - Medium intensity runway lighting
HIRL - High intensity runway lighting
MALSR - Medium intensity approach lighting system with runway alignment indicator lights

The airfield taxiway system includes a full-length parallel taxiway, along with several exit taxiways and connecting taxiways. The taxiway numbering system is identified on **Exhibit 1B**. Taxiway A is the full-length parallel taxiway. The exit taxiway at the northeast end of the runway is included as part of Taxiway A. The parallel taxiway is 50 feet wide. The runway-taxiway centerline separation is 400 feet.

Besides Taxiway A, there are seven other entrance/exit taxiways providing access/egress along the runway. While Taxiway A provides access to the end of Runway 3, Taxiway A-1 provides access

to the end of Runway 21. Taxiways A-2, A-3, A-4, A-5, A-6, and A-7 provide for aircraft movement between the parallel taxiway and Runway 3-21.

Taxiway W extends west beyond the parallel taxiway, between the general aviation and terminal aprons, and into the hangar area. Connecting Taxiway W is 100-feet wide and is marked to allow for two-way movements by smaller aircraft.

Airfield Lighting and Marking

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or instrument weather. Pavement markings (including signage) aid in the movement of aircraft along airport surfaces. A variety of lighting and marking systems are installed at Flagstaff Pulliam Airport for this purpose. These lighting and marking systems, categorized by function, are summarized as follows.

Identification Lighting: The location of an airport at night is universally indicated by a rotating beacon which projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon at Flagstaff Pulliam Airport is located at the east end of Shamrell Boulevard, next to the general aviation apron and the fixed base operator.

Pavement Edge Lighting: Runway and taxiway edge lighting utilizes light fixtures placed near the pavement edge to define the lateral limits of the pavement. This lighting is essential for maintaining safe operations at night and/or during times of poor visibility, in order to maintain safe and efficient access from the runway and aircraft parking areas. High intensity runway lighting (HIRL) is provided on Runway 3-21. Medium intensity taxiway lighting (MITL) marks the edges of the parallel taxiway and taxiway exits.

Visual Approach Lighting: Visual glide slope indicators provide visual descent guidance to pilots during an approach to a runway. At Flagstaff Pulliam Airport, both runway approaches are equipped with four-box visual approach slope indicators (VASI-4L) installed on the left side of the runway.

Instrument Approach Lighting: Instrument approach lighting provides visual guidance to locate the end of the runway and align with the runway centerline. Instrument approach lighting is typically needed to obtain instrument minimums of 3/4 mile or lower. A medium intensity approach lighting system with runway alignment indicator lights (MASLR) is located off the approach end of Runway 21.

Airfield Signage: Airfield signage is an essential component of a surface movement guidance control system necessary for the safe and efficient operation of the airport. Lighted airfield signs are located at aircraft hold positions, runway exits, and taxiway intersections. Distance remaining signs are located back from the departure end of each runway, at 1,000-foot intervals, to give pilots an indication of the

remaining runway length available when landing or departing.

Pavement Marking: Besides runway centerline and edge markings, other markings vary from each runway end. Runway 21 is marked with precision runway markings in support of the precision approach to that runway. Runway 3 is marked with non-precision markings. The taxiways are also marked with centerline and edge markings.

Segmented Circle: The airfield is equipped with a segmented circle and lighted wind cone located on the east side of the field. The segmented circle provides traffic pattern information to pilots. The configuration of this marker tells a pilot of any nonstandard pattern conditions. In addition, the lighted wind cone in the center of the segmented circle alerts pilots to current surface wind conditions along the runway.

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which properly equipped aircraft and pilots translate into point-to-point guidance and position information. Ground-based electronic navigational aids that are located on or near Flagstaff Pulliam Airport are used for enroute and terminal area navigation, as well as landing aids.

- ENROUTE NAVAIDS

Locational aids operating near the airport are for the purpose of enroute navigation. Enroute navaids often serve navigation to more than just one area airport, as well as aircraft simply traversing the area. The types of enroute electronic navigational aids available for aircraft flying to or from Flagstaff Pulliam Airport include a very high frequency omnidirectional range with distance measuring equipment (VOR/DME), a nondirectional beacon (NDB), and the global positioning system (GPS).

The VOR provides azimuth readings to pilots of properly equipped aircraft by transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility to provide distance as well as directional information to the pilot.

The Flagstaff VOR/DME facility operates on a frequency of 113.85 KHz and Channel 85. It is located immediately adjacent to the Flagstaff Pulliam Airport and can be viewed on **Exhibit 1B.** The beacon transmits a continuous three-letter identifier code, "FLG," using International Morse Code. This navigational aid incorporates the VOR and distance-measuring equipment (DME) to function as a single channelized VHF/UHF system.

The Pulliam (PUU) NDB is also located on the airport as shown on **Exhibit 1B**. The NDB transmits a nondirectional signal that can be used to determine bearing to and from the beacon.

GPS is an additional navigational aid for pilots enroute to the airport. GPS was initially developed by the United States Department of Defense for military navigation around the world. Increasingly, over the last several years, GPS has been utilized more in civilian aircraft. GPS uses satellites placed in orbit around the globe to transmit electronic signals which properly equipped aircraft use to determine altitude, speed, and navigational information through triangulation of three separate satellite signals. GPS is similar to Loran-C as pilots can directly navigate to any airport in the country and are not required to navigate using a specific navigational facility.

- INSTRUMENT APPROACHES

Instrument approaches are defined with the use of electronic and visual navigational aids in order to assist pilots in landing when visibility is reduced below specified minimums. While these are especially helpful during poor weather conditions, they are often used by commercial pilots when visibility is good. Instrument approaches are classified as precision and non-precision. Both provide runway alignment and course guidance, while precision approaches also provide glide slope information for descent to the runway. The instrument approaches and their minimums are outlined on **Table 1D.**

Flagstaff Pulliam Airport has one published precision approach. Runway 21 is equipped with an ILS consisting of a localizer, glide slope antenna, and a medium intensity approach lighting system with MALSR. The Runway 21 ILS uses a standard 3.0 degree glide slope. The Category I ILS approach to Runway 21 can be flown when cloud ceilings are 300 feet above ground level (AGL) or greater and visibility is one-half mile or greater.

Flagstaff Pulliam Airport also has a number of non-precision approaches available. The following paragraphs describe non-precision approaches available for the runways.

Runway 3. The GPS approach to Runway 3 uses VOR signals and fixes to ensure adequate terrain and obstruction clearance during final approach to the runway. The Flagstaff VOR/DME is used to define the approach, although GPS can also be used to simulate the positions of required location fixes. This approach to Runway 3 can be flown when cloud ceilings are 400 feet AGL or greater with one mile visibility for Categories A, B, and C aircraft and visibility of 1-1/4 miles for Category D aircraft.

Runway 21. Runway 21 has an assortment of non-precision approaches available. A VOR/DME approach can be flown when cloud ceilings are 400 feet AGL or greater and visibility is one mile for Categories A, B, and C aircraft, and a visibility of 1-1/4 miles for Category D aircraft. A GPS straight-in approach for Runway 21 has 500-foot ceilings with visibility of one mile fo both Categories

A and B aircraft, and 1-1/4 mile visibility for Categories C and D aircraft. An NDB/DME approach for Runway 21 can be flown at 800-foot cloud ceilings. Visibility minimums are one mile for Category A aircraft, 1-1/4 miles for Category B aircraft, 2-1/4 miles for Category C aircraft, and 2-1/2 miles for Category D aircraft.

TABLE 1D
Instrument Approach Data
Flagstaff Pulliam Airport

	Weather Minimums by Aircraft Category					
	Category A/B		Category C		Category D	
	CH	VIS	CH	VIS	CH	VIS
ILS/DME RUNWAY 21						
Straight-In ILS	300	0.5	300	0.5	300	0.5
Localizer Only	500	0.5	500	0.75	500	1.0
Circling	700	1.0	700	1.75	700	2.0
VOR/DME RUNWAY 21						
Straight-In	400	1.0	400	1.0	400	1.25
Circling	700	1.0	700	1.75	700	2.0
NDB/DME RUNWAY 21						
Straight-In	800	1.25	800	2.25	800	2.5
Circling	800	1.25	800	2.25	800	2.5
GPS RUNWAY 21						
Straight-In	500	1.0	500	1.25	500	1.25
Circling	700	1.0	700	1.75	700	2.0
GPS RUNWAY 3						
Straight-In	400	1.0	400	1.0	400	1.25
Circling	600	1.0	600	1.5	700	2.0
VOR or GPS-A						
Circling	700	1.0	700	2.0	700	2.25

Aircraft Categories are established based on 1.3 times the stall speed in landing configuration as follows:
– Category A/B 0-120 knots
– Category C 121-140 knots
– Category D 141-165 knots

CH - Cloud Height (in feet above ground level)
VIS - Visibility (in miles)

There is also a VOR or GPS-A circling approach. This approach can be flown with cloud ceiling minimums of 700 feet and visibility of one mile for Categories A and B aircraft, two-mile visibility for Category C aircraft, and 2-1/4 mile visibility for Category D aircraft.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include the passenger terminal complex, aircraft storage/maintenance hangars, aircraft parking apron and support facilities such as fuel storage, automobile parking, and roadway access. Landside facilities at Flagstaff Pulliam Airport are identified on **Exhibit 1C**.

Passenger Terminal Complex

The Flagstaff Pulliam Airport passenger terminal complex is located at the end of South Pulliam Drive, northeast of Taxiway W. The terminal facilities involve the major functions of the passenger terminal system: access, processing, and flight. The complex is comprised of several different components. These components can be categorized as follows:

- Terminal Access Roadways
- Vehicle Parking
- Terminal Building
- Terminal Apron

- TERMINAL ACCESS ROADWAYS

The primary entrance to the passenger terminal area is off Interstate 17, then east and north on John Wesley Powell Boulevard to South Pulliam Drive. Both on-airport roads are two-lane. South Pulliam Drive divides into a one-way loop around the public parking lot to access the terminal curb. South Pulliam Drive extends west and north from John Wesley Powell Boulevard to provide access directly from the southern portions of Flagstaff.

- VEHICLE PARKING

Vehicle parking for the terminal includes public, employee, and rental car parking. The public lot is located within the terminal loop road. There is a total of 396 parking spaces. The airport does not charge for public parking within the lot. Most employees park in the public lot. There are five spaces next to the terminal building reserved for managers and airport vehicles.

The rental cars have a 48-space ready/return lot east of the terminal building. Eight (8) spaces along the terminal loop road and adjacent to the ready/return lot are also used for rental car parking. The rental car service and storage area is located to the northeast of the terminal loop road on West Liberator Lane. Each rental car company has a tent for servicing vehicles out of the elements. Storage is on unpaved ground in this area.

- TERMINAL BUILDING

The passenger terminal at Flagstaff Pulliam Airport was completed and put into service in 1993. As depicted on **Exhibit 1D,** the 21,700 square foot terminal building provides for airline ticketing, security screening, secure departure area, baggage claim, a restaurant, and rental cars. Airport

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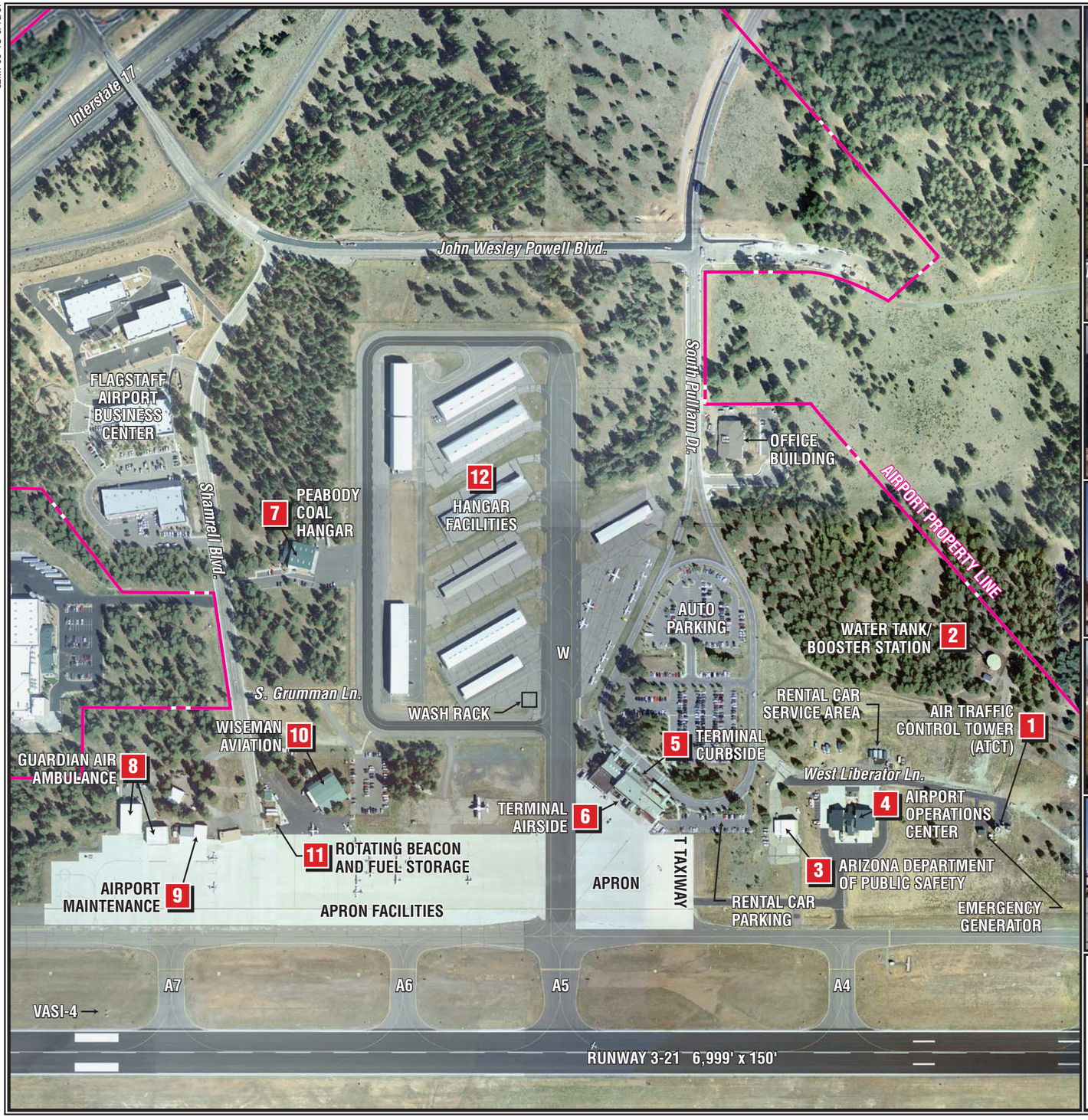

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SCALE IN FEET

NORTH

FLAGSTAFF PULLIAM AIRPORT

Exhibit 1C
EXISTING LANDSIDE FACILITIES

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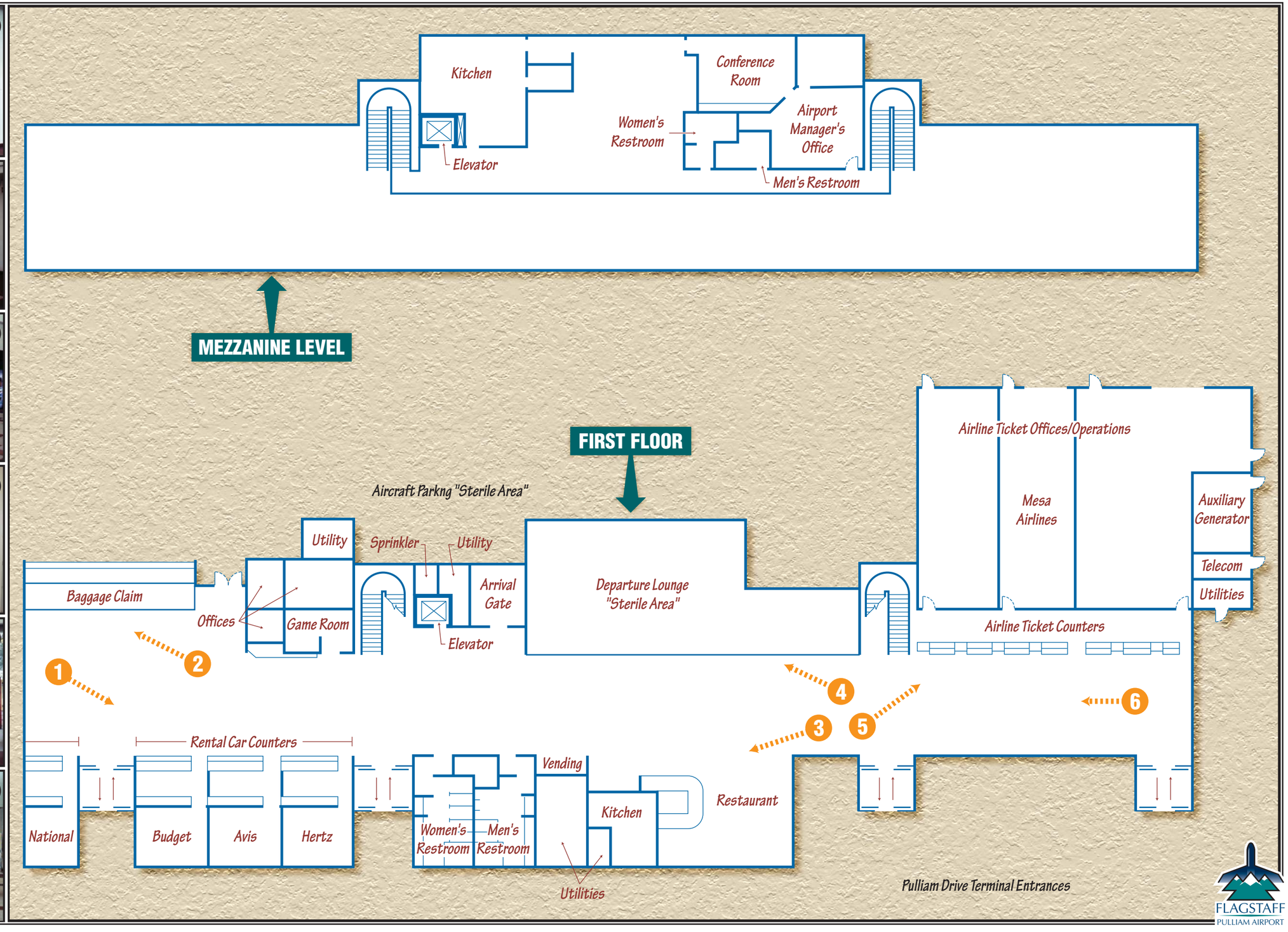

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 1D
TERMINAL BUILDING

administration offices, including a conference room, are located on the second floor.

The terminal runs linearly in a west-to-east alignment. Departing passengers enter the north side of the terminal building from the curbside. Ticketing and bag checking takes place along the southern wall at the west end of the terminal. There are three ticket counters and offices in this area. At the present time, Mesa Airlines occupies the middle counter and office space.

The airline departure gates are located on the south wall near the middle of the terminal. There is a security screening area at the entrance to the glassed-in departure lounge. A small restaurant is located on the north wall across the central corridor from the departure lounge. Vending machines and rest-rooms are also located along the north wall, west of the restaurant.

Baggage claim is located on the south wall at the east end of the terminal. There is a baggage conveyer, as well as a drop for skis and oversized baggage. On the north wall of the terminal building, across from baggage claim, are four rental car counters. Hertz, Avis, Budget, and National each have a counter in this area.

- TERMINAL APRON

The passenger terminal apron currently encompasses approximately 17,000 square yards of concrete pavement adjacent to the terminal building. There are three marked parking positions for use by commercial aircraft.

GENERAL AVIATION COMPLEX

In addition to commercial aviation facilities, general aviation (GA) facilities play a primary role in the overall activity at Flagstaff Pulliam Airport. It is general aviation that comprises the largest share of aircraft operations at the airport.

The general aviation area is located along the flight line, southwest of the passenger terminal complex. It is accessed by Shamrell Boulevard, which connects to the GA facilities from John Wesley Powell Boulevard. **Exhibit 1C** depicts the west general aviation terminal area.

In the 1990s, the general aviation facilities were revamped to allow for the relocation of the parallel taxiway and to meet other design standards. This also coincided with the construction of the new airline terminal building, which removed the airline functions to a separate area and opened up space for the GA facilities to be moved. Taxiway W essentially provides the separation of commercial service from general aviation functions.

The existing general aviation apron encompasses approximately 59,500 square yards of pavement from Taxiway W south along the parallel taxiway. The concrete pavement extends approximately 310 feet back from Taxiway A. Besides parking for transient and some based aircraft, the GA apron is also used

by the small cargo aircraft that operate into FLG.

The fixed base operator (FBO) is located near the middle of the apron flightline (**#11** on **Exhibit 1C**). Wiseman Aviation is a full service FBO. Access is available north from Shamrell Boulevard via South Grumman Lane. Wiseman Aviation provides fueling (100LL and Jet A), flight school/flight training, aircraft rentals, sightseeing tours/rides, aircraft maintenance, aircraft modification, aircraft parts, aviation accessories, aircraft parking, hangar storage, general aviation terminal lobby, and pilots' lounge, etc. The FBO hangar has approximately 7,500 square feet of open hangar bay and 2,500 square feet of other space. The hangar includes not only aircraft maintenance facilities, but also office, lounge, and lobby space for its general aviation clientele. There is a 50-space parking lot adjacent to the hangar.

Wiseman Aviation's fuel facilities (**#12**) are south of the hangar next to Shamrell Boulevard and the rotating beacon. There are two 12,000-gallon aboveground storage tanks for Jet A and 100LL (Avgas). The FBO also has a 4,000-gallon fuel truck.

Guardian Air Ambulance operates from two hangars (**#8**) located near the south end of the GA flight line. Guardian Air Ambulance operates Life Flight services with a Bell 407 helicopter and Beech King-Air aircraft.

The majority of based aircraft storage is located behind the flight line and is accessed from Taxiway W. This area includes a loop taxiway with several parcels available for T-hangar and corporate hangar development. There is also a tie-down apron for based aircraft in this area. Currently, the Peabody Coal Hangar is the only corporate hangar. There are also three 14-unit T-hangars, two 14-unit shade hangars, and one 10-unit shade hangar. There are approximately 36 tie-downs in this area as well. The T-hangars, shades, and tie-downs are owned by the City and leased to individual aircraft owners.

Other Landside Facilities

- DPS HANGAR

The Arizona Department of Public Safety (DPS) maintains a 3,500 square foot hangar north of the terminal complex. The facility (**#3** on **Exhibit 1C**) is accessed from a driveway connected to West Liberator Lane. The hangar includes 2,500 square feet of open hangar bay for aircraft storage and maintenance. The remaining space is utilized for offices. There is a 100-foot by 100-foot ramp in front of the hangar. A 20-foot wide taxiway connects the facility to the airfield. The backside of the hangar has paved parking for 12 vehicles. The DPS bases a Bell 407 helicopter at the facility and often hosts other DPS aircraft from Phoenix.

- AIRPORT TRAFFIC CONTROL TOWER (ATCT)

The airport traffic control tower (**#1** on **Exhibit 1C**) is located at the north end of the existing landside development. It

can be accessed via West Liberator Lane. The tower is run on a contract basis by the FAA and is operational from 6:00 a.m. to 9:00 p.m. from April through September. From October through March, the tower operates from 7:00 a.m. to 7:00 p.m.

- AIRPORT OPERATIONS CENTER

The airport operations center houses the airport's airport rescue and firefighting (ARFF) equipment as well as its snow removal equipment (SRE). The operations center is a new facility located northeast of the PPS as indicated by No. 4 on **Exhibit 1C**. The ARFF equipment includes a 1999 Emergency One E-500 quick response vehicle and a 1978 Mercedes Unimog. The ARFF is manned by airport employees who are trained and certified in ARFF procedures.

The high elevation of Flagstaff Pulliam Airport makes it one of the very few airports in Arizona to require snow removal capability. The SRE vehicles include two Oshkosh 4x4 dump trucks and wing plows, an Oshkosh 3,000 ton/hour snow blower, an IHC 10-wheel dump truck with snow plow, a CAT loader with bucket and 24-foot snow pusher, a Case skid steer loader with eight-foot snow pusher, and a Terra-Jet high speed runway sweeper.

Airpark

Flagstaff Pulliam Airport is also the location of the Flagstaff Business Airpark. The Airpark has developed around the hangar facilities, with several parcels featuring airfield access. Wiseman Aviation's hangar and the Peabody Coal hangar are located on parcels in the Airpark. Joy Cone is another business located in the Airpark. There are several parcels available, most ranging in size from three to seven acres. Two larger parcels of 31.9 and 12.2 acres are also available.

Utilities

The availability of facilities is important in the consideration of airport development opportunities. Flagstaff Pulliam Airport is currently served by the following utilities.

Water: Water service is provided to the airport by the City of Flagstaff from a single 12-inch line extended from Lake Mary Road. There is also a booster station on the airport with a 300,000-gallon storage tank (**#2** on **Exhibit 1C**) at the north end of the terminal area. The water line forms a loop system on the airport to serve the terminal and general aviation areas, as well as the Airpark.

Sanitary Sewer: The airport is connected to the City of Flagstaff's wastewater collection system. The on-airport collection flows to a 10-inch trunk main at the north end of the terminal area.

Power: Power is supplied by Arizona Public Service Company (APS). Emergency electrical power for the

airfield is provided by a 30 kVA diesel generator located near the ATCT.

Natural Gas: Natural gas is available from Citizens Utilities.

Telephone: Telephone service is provided by Qwest.

AIRSPACE AND AIR TRAFFIC CONTROL

The Federal Aviation Administration (FAA) Act of 1958 established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA Western-Pacific Region, with offices in Lawndale, California, controls the airspace over Flagstaff, Arizona.

The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including: air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

AIRSPACE STRUCTURE

Since the inception of aviation, nations have set up procedures within their territorial boundaries to regulate the use of airspace. Airspace is still broadly classified as either "controlled" or "uncontrolled" in the United States. The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States. **Exhibit 1E** shows the airspace classifications and terminology. Airspace designated as Classes A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control. Several types of controlled airspace exist in the Flagstaff Pulliam area and are listed below.

- Class A airspace governs operations above 18,000 feet mean sea level (MSL).
- Class D airspace encompasses traffic areas for airports with ATCTs, like Flagstaff Pulliam Airport.
- Class E airspace encompasses airports without ATCTs.
- Class G airspace covers uncontrolled airspace.

Classes B and C airspace are not present in the Flagstaff area. These airspace classifications are reserved for airports with the greatest traffic volume in terms of instrument flight rule (IFR) operations and enplaned passengers, such as Phoenix Sky Harbor International Airport. Airspace within

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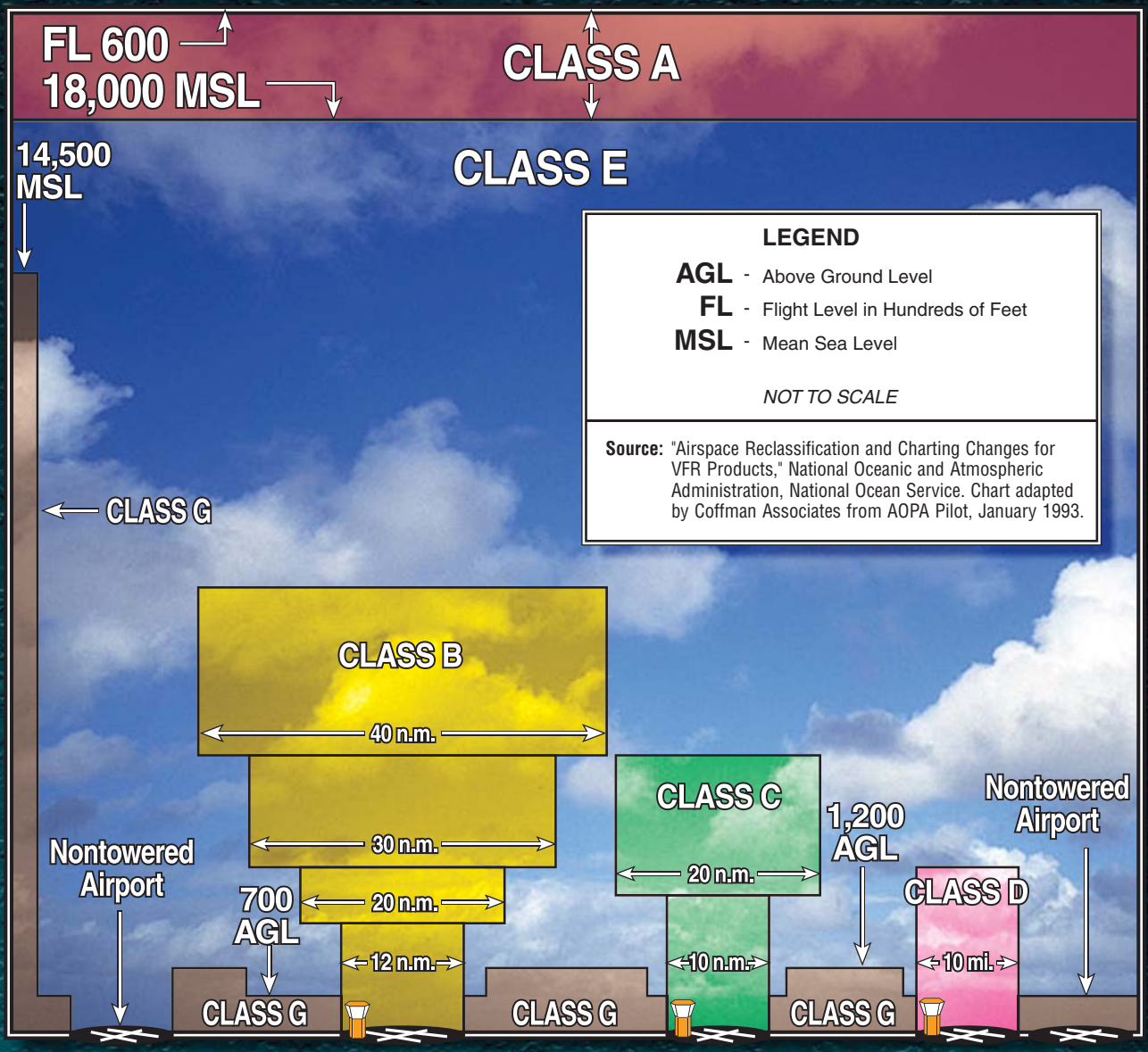

CLASSIFICATION	DEFINITION
CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600 .
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
CLASS E	Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
CLASS G	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 1E
AIRSPACE CLASSIFICATION

the study area is depicted on **Exhibit 1F**.

Class A Airspace

Class A airspace includes all airspace from 18,000 feet MSL to flight level (FL) 600 (approximately 60,000 feet MSL). This airspace is designated in F.A.R. Part 71.193 for positive control of aircraft. The Positive Control Area (PCA) allows flights governed only under IFR operations. The aircraft must have special radio and navigation equipment, and the pilot must obtain clearance from an air traffic control (ATC) facility to enter Class A airspace. In addition, the pilot must possess an instrument rating.

Class D Airspace

Class D airspace is controlled airspace surrounding airports with an ATCT. Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nautical miles (NM) from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. If an airport has an instrument approach or departure, Class D airspace extends along the approach or departure path.

Flagstaff Pulliam Airport has Class D airspace during the months of April 1 through September 30, during the hours of 6:00 a.m. to 9:00 p.m., and October 1 through March 31 from the hours of 7:00 a.m. to 7:00 p.m. These are the operational hours of the ATCT. At all other times, Class G airspace surrounds the airport.

Class E Airspace

Class E airspace consists of controlled airspace designed to contain IFR operations during portions of the terminal operation and while transitioning between the terminal and enroute environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace.

Flagstaff Pulliam Airport has airport-specific Class E airspace beyond their designated Class D airspace from the southwest to the northeast. This airspace begins at the floor and extends to 1,200 feet above the surface. In addition, Class E transition surfaces encompass both classes of airspace and reaches south to include Sedona Airport. These areas are controlled airspace having a floor of 700 feet above the surface.

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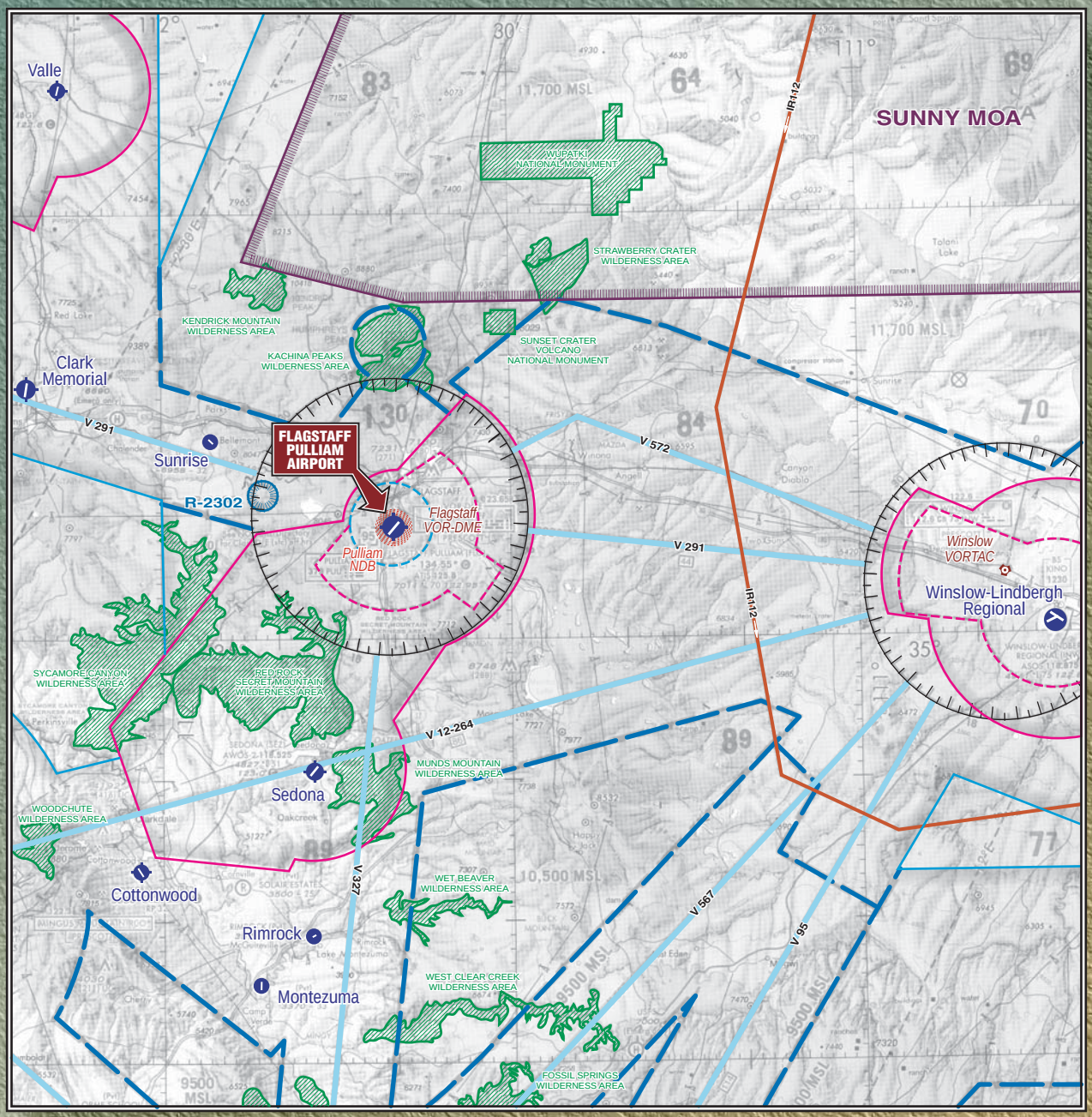

LEGEND

- Airport with other than hard-surfaced runways
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Non-Directional Radiobeacon (NDB)
- VOR-DME
- VORTAC
- Compass Rose
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700 ft. above surface
- Class E Airspace with floor 1,200 ft. or greater above surface
- Differentiates Floors of Class E Airspace greater than 700 ft. above surface
- Victor Airways
- MOA - Military Operations Area
- Prohibited, Restricted, Warning and Alert Areas
- Military Training Routes
- Wilderness Areas

Source: Phoenix Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration May 16, 2002

FLAGSTAFF PULLIAM AIRPORT

Exhibit 1F
AIRSPACE MAP

Class G Airspace

Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlying Class E airspace (700 to 1,200 feet above ground level [AGL]). Flagstaff Pulliam Airport utilizes Class G airspace when the ATCT is closed.

Additional FAA rules regulate flight altitudes over congested residential areas, national parks, and outdoor recreational areas, which are often located under Class G airspace. The overall amount of Class G airspace is continuing to decline due to the need for more coordinated air traffic activity.

Victor Airways

VORs define low-altitude (Victor) and high altitude airways (Jet Routes) through the area. Most aircraft enter the Flagstaff area via one of these federal airways. Aircraft assigned to altitudes above 18,000 feet MSL use the Jet Route system. Other aircraft use the low altitude airways. Radials off VORs define the centerline of these flight corridors.

There are three Victor Airways in the immediate vicinity of the airport that are defined using radials from the Flagstaff VORDME. These include V-291, V-572, and V-327.

Special Use Airspace

Special use airspace is defined as airspace where activities must be confined because of their nature, or where limitations are imposed on aircraft not taking part in those activities. There are a number of special use airspace designations within the study area of Flagstaff Pulliam Airport, including one Military Operations Area (MOA) and several wilderness areas and national monuments.

The southern border of the Sunny MOA is approximately 20 nautical miles north of the airport. This area is reserved for military use and is designed to separate nonparticipating aircraft from military training operations.

Aircraft overflying the wilderness areas are typically requested to maintain a minimum altitude of 2,000 feet. FAA Advisory Circular 91-36C defines the "surface" as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of the canyon or valley.

The wilderness areas in the Flagstaff area include:

- Red Rock Secret Mountain
- Sycamore Canyon
- Munos Mountain
- Kachina Peaks
- Kendrick Mountain
- Strawberry Crater
- Woodchute
- Wet Beaver
- West Clear
- Fossil Springs

National Monuments in the general area include:

- Wupatki
- Sunset Crater Volcano

AIR TRAFFIC CONTROL

Flights to and from Flagstaff Pulliam Airport are conducted using both IFR and VFR procedures. Instrument Flight Rules (IFR) are those that govern the procedures for conducting instrument flight. Visual Flight Rules (VFR) govern the procedures for conducting flight under visual conditions (good weather). Most air carrier, military, and general aviation jet operations are conducted under IFR, regardless of the weather conditions.

The FAA has established 21 Air Route Traffic Control Centers (ARTCC) throughout the Continental United States to control aircraft operating under IFR within controlled airspace and while enroute. An ARTCC assigns specific routes and altitudes along federal airways to maintain separation and orderly traffic flow. The Albuquerque ARTCC controls IFR airspace enroute to Flagstaff.

The ARTCC delegates certain airspace to local terminal facilities which assume responsibility for the orderly flow of air traffic arriving and departing major terminals. The Flagstaff airport traffic control tower (ATCT) is charged with the control of Class D airspace around FLG during the tower's operating hours. Under VFR conditions, the pilot is responsible for collision avoidance and will typically announce on the radio, when approximately 10 miles from the airport, their intention to enter the traffic pattern. The standard, left-hand traffic pattern is at 1,000 feet above the airport for conventional aircraft, 500 feet for helicopters, and 1,500 feet for high performance aircraft.

Formal noise abatement procedures have not been established at Flagstaff Pulliam Airport; however, a procedure has been established to reduce the effects of noise on surrounding noise-sensitive areas. This procedure includes the avoidance of overflight of Kachina Village which is three miles south of the Airport. This can be accomplished by using a left turn pattern when departing Runway 21.

AREA AIRPORTS

There are four public-use airports and five private airports within 40 nautical miles of Flagstaff Pulliam Airport. The following four airports are open to the public.

Sedona Airport is located 22 nautical miles south-southwest. It has one runway and a helipad. Runway 3-21, which is an asphalt runway in good condition, is 5,132 feet long and 75 feet wide. The concrete helipad is 50 feet by 50 feet. There are 101 aircraft based at the airport. General aviation services are available, including 100LL and Jet A fuel.

H.A. Clark Memorial Field Airport is located 27.4 nautical miles west-northwest near Williams, Arizona. Runway 18-36 is an asphalt runway in good condition that is 5,992 feet long and 100 feet wide. There are 15 aircraft based at the airport. General aviation services are available, including 100LL fuel.

Cottonwood Airport is located 33.9 nautical miles southwest. Runway 14-32 is an asphalt runway in good condition and is 4,250 feet long by 75 feet wide. There are 40 based aircraft. General aviation services are available, including 100LL and Jet A fuel.

Valle Airport is located 36.5 nautical miles northwest. Runway 1-19 is an asphalt runway in good condition and 4,262 feet long by 45 feet wide. The airport has five based aircraft. Limited general aviation services are available at the airport, including 100LL and Jet A fuel.

Exhibit 1F illustrates the location of these public airports as well as several private airports in the area.

SURFACE TRANSPORTATION NETWORK

Flagstaff has long been considered the transportation hub of northern Arizona. The site that is now Flagstaff was located along an old wagon trail to California. The city began to flourish after the railroad arrived in 1881. Since those beginnings, Flagstaff has developed as a major retail and service area because of the wide variety of transportation systems that converge here.

REGIONAL HIGHWAY SYSTEM

The Flagstaff area has strong highway links particularly to the east, west, and south. Historically, old Route 66 runs through Flagstaff. Route 66 was one of the earliest cross-country highways, running from Chicago to Santa Monica.

Today, the city is at the northern terminus of Interstate 17, which is also the intersection of I-17 with I-40. Interstate 40 is a major east-west freeway extending from Wilmington, North Carolina, to Bakersfield, California. Interstate 17 extends south from Interstate 40 in Flagstaff and connects in Phoenix with coast-to-coast I-10. The Flagstaff Pulliam Airport is at the first I-17 interchange south of I-40.

Two U.S. Highways provide access north from Flagstaff. U.S. Highway 89 provides a north-south link through Flagstaff, running north to Page, Arizona, then on to Utah. To the south, it extends to Wickenburg, Arizona. State Highway 89A runs south from Flagstaff, past the airport, and through Sedona before reuniting with U.S. 89 at Prescott. U.S. Highway 180 runs northwest from Flagstaff to Grand Canyon National Park. These highways serve as key arterial roadways within the city, as well.

In Flagstaff, Route 66 is still an arterial roadway, running east-west through the heart f the city. Lake Mary Road is

another arterial street that runs north of the airport into the city from the southeast. There presently is no direct access to the airport from Lake Mary Road.

PUBLIC TRANSPORTATION

Inter-city bus service is provided daily to Phoenix by Greyhound. Mountain Line is the local public transit company. Mountain Line operates a fleet of six vehicles on a fixed route system. Northern Arizona University has a separate transit system that operates on campus.

Flagstaff is also served by AMTRAK with two daily trains. An estimated 200 passengers a day board AMTRAK from the historic train station in downtown Flagstaff.

SURFACE FREIGHT

Flagstaff's location at the intersection of two interstate highways, makes it readily accessible to major continental motor freight carriers. As a gateway and hub for northern Arizona, regional trucking is also available.

The Burlington Northern/Santa Fe railroad serves Flagstaff with more than 130 trains daily on a major east-west cross-country rail corridor.

COMMUNITY PROFILE

A community profile provides a general look at the socioeconomic make-up of the community that utilizes an airport. It also provides an understanding of the dynamics for growth and the potential changes that may affect aviation demand. Aviation demand forecasts are often directly related to the population base, economic strength of the region, and the ability of the region to sustain a strong economic base over an extended period of time. Current demographic and economic information was collected from several local, state, and federal sources.

POPULATION

As is evident from **Table 1E**, the populations of the City of Flagstaff and Coconino County have both more than doubled since 1970. The city's growth has averaged 2.6 percent annually, while the county has averaged nearly 3.0 percent. This is not uncommon in Arizona, as the statewide population has nearly tripled over the same time frame.

EMPLOYMENT

Table 1F reflects Flagstaff labor force statistics since 1980. Over the years, the local labor force has grown from 17,841 to 33,885 in 1999. Unemployment was 8.4 percent in 1980 compared to 5.3 percent in 1999.

TABLE 1E
Population Statistics
Flagstaff-Coconino County

Year	Flagstaff	Coconino County	Arizona
1970	26,117	48,326	1,775,399
1980	34,743	75,008	2,716,546
1990	45,857	96,591	3,665,228
2000	57,200	116,320	5,132,632

Source: U.S. Census, except Flagstaff - 2000, which is from City of Flagstaff.

TABLE 1F
Labor Force Statistics
City of Flagstaff

	1980	1990	2000
Civilian Labor Force	17,841	23,490	32,788
Employed	16,348	22,009	31,320
Unemployed	1,493	1,481	1,468
Unemployment Rate	8.4%	6.3%	4.5%

Source: Arizona Department of Revenue

As can be seen on **Table 1G**, total employment in Coconino County has grown at an average annual rate of 3.2 percent since 1970. Between 1970 and 1980, jobs in the county grew by 15,150, or 75 percent. Between 1980 and 1990, the growth slowed slightly with an increase of 13,270 jobs or 39 percent. In the last decade, jobs have grown by 17,750 or 36 percent.

All sectors of non-farm jobs have grown over the past 30 years. Agricultural services jobs have grown at the fastest rate, but they still comprise just 540 total jobs and less than one percent of all jobs in the county. Services have grown at the next fastest rate of 5.5 percent annually, the same rate as Finance, Insurance, and Real Estate.

Services is the largest job sector in the county today, growing from 21.8 percent in 1970 to 32.9 percent in 2000. Services overtook the Government sector in the 1980s. The Government share of jobs has declined from 29.5 percent in 1970 to 22.7 in 2000. It is still the second highest job sector, although, Retail Trade has closed the gap over the years.

TABLE 1G
Coconino County Employment by Sector

	1970	1980	1990	2000	Annual Growth %
Farm	280	280	310	240	-0.5%
Agricultural Services	60	150	240	540	7.5%
Mining	100	60	170	150	1.4%
Construction	1,270	2,040	2,360	3,910	3.8%
Manufacturing	1,580	2,590	3,570	3,020	2.2%
Trans., Comm., Util.	960	2,180	1,990	2,030	2.5%
Wholesale Trade	400	480	800	1,320	4.1%
Retail Trade	4,350	7,140	10,880	14,390	4.1%
Fin., Ins., Real Estate	810	2,070	2,050	4,050	5.5%
Services	4,390	9,090	14,960	21,950	5.5%
Government	5,950	9,210	11,680	15,140	3.2%
Total	20,140	35,290	49,010	66,760	

Source: U.S. Department of Commerce, Regional Information Systems (REIS)

Table 1H lists the largest employers in the Greater Flagstaff Area. Northern Arizona University is the largest single employer with over 2,000 employees. The Flagstaff Medical Center is next on the list with 1,820. W.L. Gore Associates, a medical equipment manufacturer, is the next largest non-government employer at 1,000. Both W.L. Gore and Flagstaff Medical Center have aircraft based at Flagstaff Pulliam Airport.

TABLE 1H
Major Employers
Greater Flagstaff Area

Employer	Number of Employees
Northern Arizona University	2,364
Flagstaff Medical Center	1,820
Flagstaff Unified School District	1,670
Coconino County	1,184
W.L. Gore & Associates – Mfg. Medical Equipment	1,000
City of Flagstaff	650
United States Forest Service (includes seasonal employees)	550
Coconino Community College	485
SCA Tissue – Mfg. Recycled Paper Products	235
New England Business Services – Telemarketing Services	170
Ralston Purina Co. – Mfg. Pet Foods	160
United States Geological Survey – Map Making / Geology	151
Sturner and Klein – Telemarketing Services	150
Walgreens – Distribution Center	150
Arizona Public Services Co. – Electric	100
Pepsi Cola – Bottling / Beverage Dist.	99
Grand Canyon Railway – Transportation	60
Prent Thermoforming – Mfg. Injection Molding	59
Southwest Windpower – Mfg. Wind Turbines	50
Connect Tech International – Electronic Assembly	30

Source: Greater Flagstaff Economic Council, November 2002

ECONOMY

Table 1J compares the per capita personal income for Coconino County with that of the state and the country. Historically, the county has trailed the State of Arizona's per capita income over the years. The income of Flagstaff residents is slightly higher than that of the county as a whole. The annual median household income in Flagstaff in 2000 was $34,952 compared to $33,747 for the county.

TABLE 1J
Per Capita Income

	1970	1980	1990	2000
Coconino County	$3,096	$7,822	$14,043	$22,086
Arizona	$3,833	$9,597	$17,211	$24,941
United States	$4,091	$10,183	$19,584	$29,018

Source: U.S. Department of Commerce, Regional Information Systems (REIS)

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PULLIAM AIRPORT

Chapter Two
FORECASTS

Forecasts

An important factor in facility planning begins with a definition of demand that may reasonably be expected to occur during the useful life of its key components. In airport master planning, this involves projecting potential aviation activity over at least a twenty year time frame. For non-hub, primary commercial service airports such as Flagstaff Pulliam Airport (FLG), forecasts of passengers, based aircraft, and operations (takeoffs and landings) serve as the basis for facility planning.

FAA Advisory Circular 150/5070-6A outlines six standard steps involved in the forecast process, including:

1) Obtain existing FAA and other related forecasts for the area served by the airport.

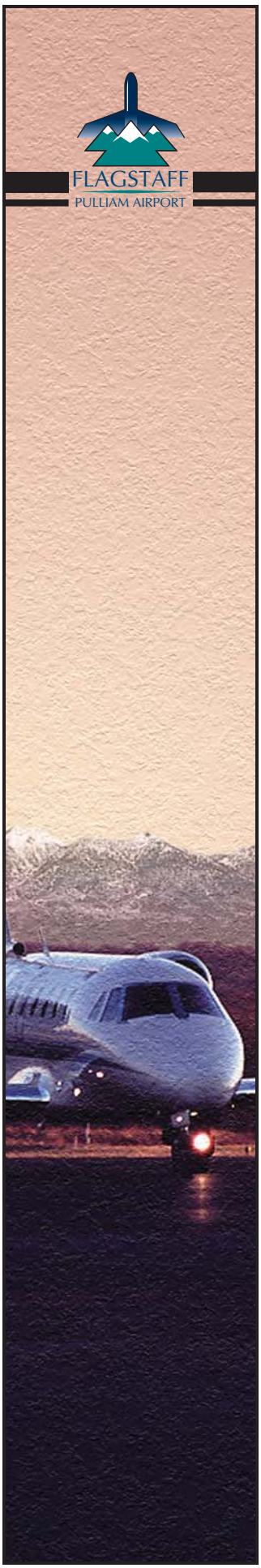
2) Determine if there have been significant local conditions or changes in the forecast factors.

3) Make and document any adjustments to the aviation activity forecasts.

4) Where applicable, consider the effects of changes in uncertain factors affecting demand for airport services.

5) Evaluate the potential for peak loads within the overall forecasts of aviation activity.

6) Monitor actual activity levels over time to determine if adjustments are necessary in the forecasts.



Aviation activity can be affected by many influences on the local, regional, and national level, making it virtually impossible to predict year-to-year fluctuations of activity over twenty years with any certainty into the future. Therefore, it is important to remember that forecasts are to serve only as guidelines and planning must remain flexible enough to respond to a range of unforseen developments.

The following forecast analysis examines recent developments, historical information, and current aviation trends to provide an updated set of aviation demand projections for Flagstaff Pulliam Airport. The intent is to permit the City of Flagstaff to make planning adjustments necessary to ensure that the facility meets projected demands in an efficient and cost-effective manner.

This is the first planning forecast to be prepared for FLG subsequent to the events of September 11, 2001. Immediately following the terrorist attacks, the national airspace system was closed and all civilian flights were grounded. Following the resumption of flights, commercial airline traffic declined, which led to schedule reductions and layoffs by many of the commercial airlines.

The federal government provided billions of dollars in financial assistance to the commercial airlines, along with loan guarantees. As of late 2002, similar assistance has not been provided for the general aviation industry. The cumulative impacts of September 11th may only be determined over time. Prior to updating the airport's forecasts, the following section discusses the trends in aviation at the national level.

NATIONAL AVIATION TRENDS

Each year, the Federal Aviation Administration (FAA) publishes its national aviation forecast. Included in this publication are forecasts for air carriers, regional/commuters, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and by the general public.

The current edition when this chapter was prepared was FAA **Aerospace Forecasts-Fiscal Years 2002-2013**, published in March 2002. The forecasts use the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets.

In 2002, the overall demand for aviation services was expected to decline significantly. Positive growth was not expected to be achieved until 2003, and even then the level of enplanements may not return to, or surpass, those of 2001 until 2004. While the majority of this decline was forecast to occur with the large air carriers, the regional airline industry was expected to achieve small levels of growth in 2002, possibly

returning to its long-term historical growth trend in 2003. Air cargo traffic was expected to grow at rates similar to those predicted for passenger traffic. After 2004, general aviation is expected to achieve low-to-moderate increases in the active fleet and hours flown, with most of the growth occurring in business/corporate flying. Combined aviation activity at FAA and contract airport traffic control facilities is expected to increase at significantly higher rates than those predicted for general aviation.

The forecasts prepared by the FAA assume that aviation demand will follow a similar path to recovery, as with previous terrorist or war-related incidents. In each instance, traffic and revenue growth resumed within a year. However, the events of September 11th had a much more significant effect on the aviation industry and, therefore, must be taken into consideration in the following forecasts.

MAJOR AIRLINES

Immediately after September 11th, the air carriers in the United States reduced their domestic capacity (available seat-miles) 20 percent. The FAA projects this capacity to gradually return to pre-September 11 capacity levels over a three year period. After that, capacity is projected to increase at an annual rate of 4.1 percent. Revenue passenger miles (RPM's) and enplanements were expected to decline in 2002, recover in 2003, then return to normal growth trends of 4.2 and 3.8 percent annually.

Domestic load factors declined in 2001 and 2002 to 68.2 percent, but are now expected to grow back to 72.5 percent over the next two years, then slowly increase increase to 73.2 percent by 2013. Passenger yield also took a hit after September 11th. Yields declined by 3.5 percent in 2001 with another decline of 3.4 percent expected in 2002. The FAA forecasts yields to rebound in 2003 (7.9 percent) then average 1.2 percent growth per year. This equates to a 1.2 percent annual decline in inflation adjusted yield. This is expected as the low-fare carriers continue to exert pressure to keep prices competitive.

This is leading to structural changes in the higher cost airlines to increase efficiency and productivity. The airlines have laid off thousands of employees and retired hundreds of aircraft over the past year. Airline negotiations with many of its unions have centered primarily around concessions by the labor groups. This includes only wage expectations, but also accelerated transfer of routes to regional airline affiliates. The anticipated trends for the regional/commuter airlines are discussed next.

REGIONAL/COMMUTER AIRLINES

The regional/commuter airline industry, defined as air carriers providing regularly scheduled passenger service and fleets composed primarily of aircraft having 60 seats or less, continues to be the strongest growth sector of the commercial air carrier industry. Dramatic growth in code-

sharing agreements with the major carriers, followed by a wave of air carrier acquisitions and purchases of equity interests, has resulted in the transfer of large numbers of short-haul jet routes to their regional partners, fueling the industry's growth.

Despite the events of September 11th, many regionals/commuters were able to maintain their previous flight schedules. Many have even increased their flight schedules in response to the transfer of additional routes from their larger code-sharing partners. Regional/ commuter capacity and traffic continued to grow in 2001, enplaning 79.4 million passengers in the fiscal year. This is an increase of 0.8 percent more than 2000. The regionals/commuters achieved a load factor of 58.6 percent in 2001, an increase of 0.3 percent over the previous year.

Industry growth is expected to outpace that of the larger commercial air carriers. The introduction of new state-of-the-art aircraft, especially high-speed turboprops and regional jets with trip ranges of well over 1,000 miles, is expected to open up new opportunities for growth in non-traditional markets. The regional airline industry will also continue to benefit from continued integration with the larger air carriers. The further need for larger commercial air carriers to reduce costs and fleet size will insure that these carriers continue to transfer smaller, marginally profitable routes, to the regional air carriers.

Likewise, the increased use of regional jets is expected to lead to another round of route rationalization by the larger commercial carriers, particularly on low-density routes in the 500-mile range. Regional jet aircraft can serve these markets with the speed and comfort of a large jet, while at the same time providing greater service frequency that is not economically feasible with the speed and comfort of a large jet. This is expected to contribute to strong growth during the early portion of the planning period, although this phenomenon is expected to diminish during the mid-to-latter portion of the planning period.

Passenger enplanements are expected to increase at an average annual rate of 5.5 percent during the FAA's 12-year forecast period, from 79.7 million in 2001 to 151.5 million in 2013. In 2013, regionals/commuters are expected to transport 16.6 percent of all passengers in scheduled domestic air service. This is an increase of 12.7 percent from 2001. This greater use of regional jets results in the average seating capacity of the regional fleet increasing from 39.9 seats in 2001 to 48.4 seats in 2013. **Exhibit 2A** depicts passenger enplanements and fleet mix forecasts for the U.S. regional/commuter market.

GENERAL AVIATION

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limits the liability on general aviation aircraft to 18 years from the date of manufacture. This legislation sparked an interest to renew

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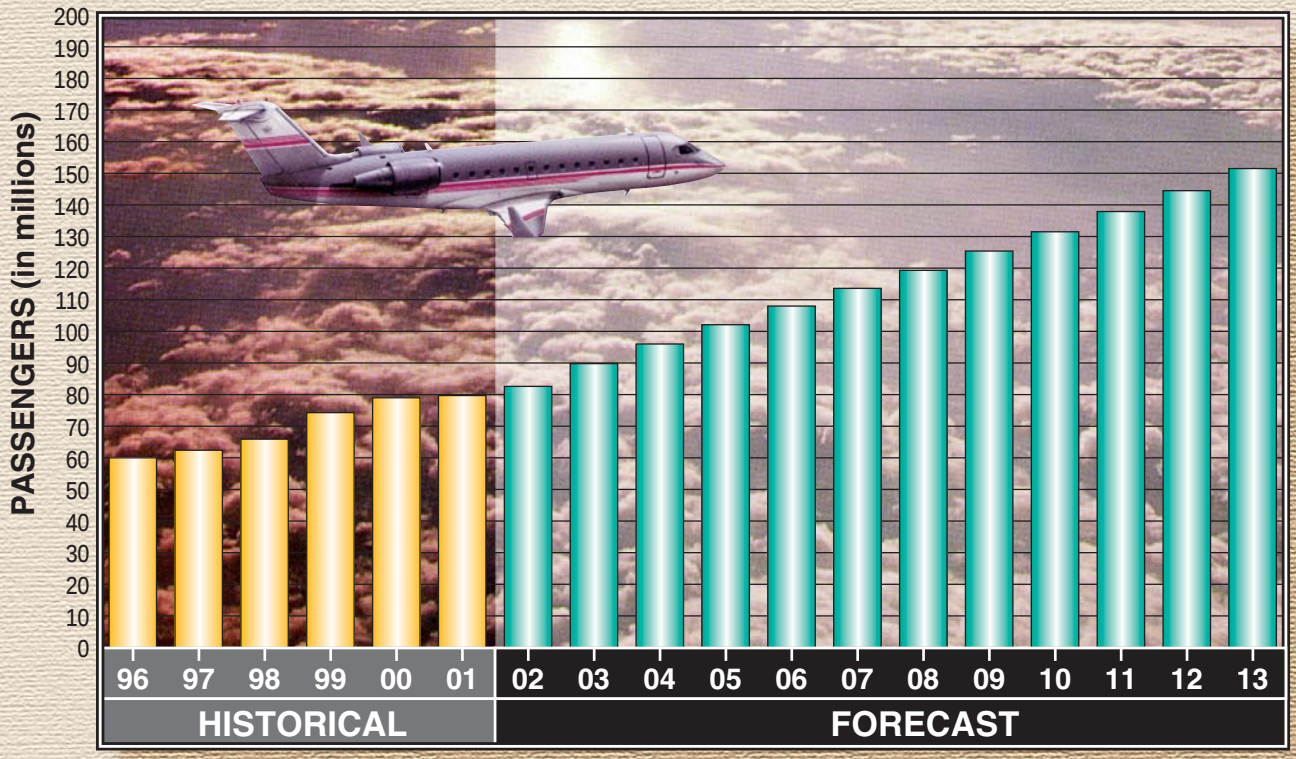
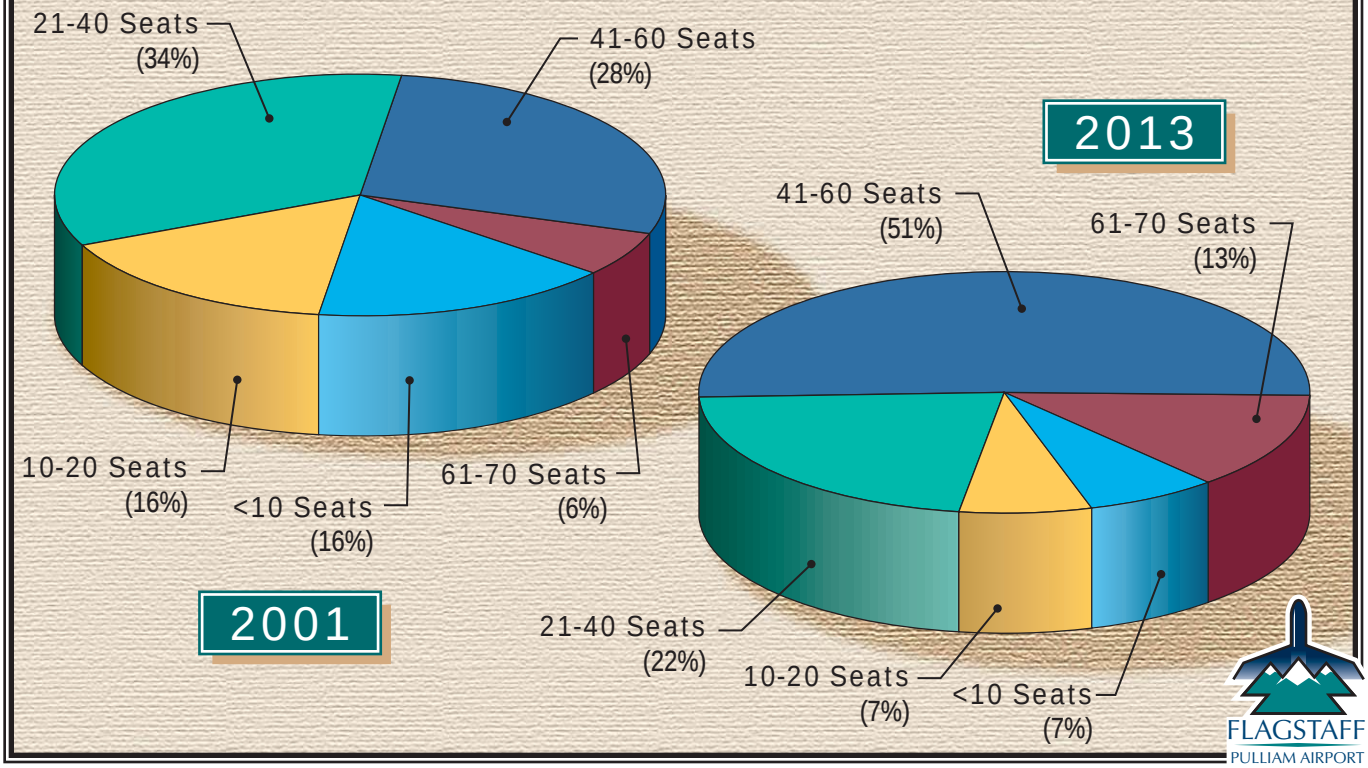
U.S. REGIONAL/COMMUTER SCHEDULED PASSENGER ENPLANEMENTS



Source: FAA Aerospace Forecasts, FY 2002-2013

PERCENT BY AIRCRAFT SEAT SIZE



FLAGSTAFF PULLIAM AIRPORT

Exhibit 2A
U.S. REGIONAL/COMMUTER FORECASTS

the manufacturing of general aviation aircraft, due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance was a major factor in the decision by many American aircraft manufacturers to slow or discontinue the production of general aviation aircraft.

However, this continued growth in the general aviation industry appears to have slowed considerably in 2001, negatively impacted by the events of September 11th. Thousands of general aviation aircraft were grounded for weeks, due to "no-fly zone" restrictions imposed on operations of aircraft in security-sensitive areas. Some U.S. airports in and around Washington, D.C. and New York City remained closed to visual flight rules (VFR) traffic well into 2002. This, in addition to the economic recession already taking place in 2001-02, has had a profoundly negative impact on the general aviation industry.

According to a report released by the General Aviation Manufacturers Association (GAMA), aircraft shipments in 2001 were down 13.4 percent for the third quarter and 6.2 percent year-to-date. The Aerospace Industries Association of America (AIAA) expects general aviation shipments to decline for the first time since 1994, down 8.8 percent, to 2,556 aircraft. The number of general aviation hours flown is projected to decline by 2.2 percent in 2002 and increase by only 0.4 percent the following year.

At the end of 2001, the total pilot population, including student, private, commercial, and airline transport, was estimated at 649,957. This is an increase of 3.9 percent, or 24,000 pilots, from 2000. Student pilots were the only group to experience a decrease in 2001, down 6.6 percent from 2000. The number of student pilots is projected to decline by 4.5 percent in 2002, and an additional 1.2 percent the following year. After 2004, the number of student pilots is expected to increase at an average annual rate of 1.0 percent, totaling 90,000 in 2013, which is less than the number recorded in 2000 (93,064).

However, the events of September 11th have not had the same negative impact on the business/corporate side of general aviation. The increased security measures placed on commercial flights has increased interest in fractional and corporate aircraft ownership, as well as on-demand charter flights. This is reflected in the forecast of active general aviation pilots (excluding air transport pilots), which are projected to increase by 54,000 (0.8 percent annually) over the forecast period.

According to the FAA, general aviation operations and general aviation aircraft handled at enroute traffic control centers increased for the ninth consecutive year. The forecast for general aviation aircraft assumes that business use of general aviation will expand much more rapidly than personal/sport use, due largely to the expected growth in fractional ownership.

In 2000, there was an estimated 217,533 active general aviation aircraft, representing a decrease of 0.9 percent from the previous year and the first decline in five years. **Exhibit 2B** depicts the FAA forecast for active general aviation aircraft in the United States. The FAA forecasts general aviation aircraft to increase at an average annual rate of 0.3 percent over the 13-year forecast period. Single-engine piston aircraft are expected to decline in the short-term, and then begin a period of growth after 2004. Multi-engine piston aircraft are expected to remain relatively flat throughout the forecast period. Turbine-powered aircraft are expected to grow at an average annual rate of 2.1 percent over the forecast period, while turbojet aircraft are expected to grow at an annual average growth rate of 3.4 percent. This strong growth rate for turbojet aircraft can be attributed to the growth in the fractional ownership industry, new product offerings (which include new entry level aircraft and long-range global jets), and a shift away from commercial travel by many travelers and corporations.

Manufacturer and industry programs and initiatives continue to revitalize the general aviation industry with a variety of programs. For example, Piper Aircraft Company has created Piper Financial Services (PFS) to offer competitive interest rates and/or leasing of Piper aircraft. Manufacturer and industry programs include the "No Plane, No Gain" program promoted jointly by the General Aviation Manufacturers Association (GAMA) and the National Business Aircraft Association (NBAA). This program was designed to promote the use of general aviation aircraft as an essential, cost-effective tool for businesses. Other programs are intended to promote growth in new pilot starts and to introduce people to general aviation. These include "Project Pilot" sponsored by the Aircraft Owners and Pilots Association (AOPA), "Flying Start" sponsored by the Experimental Aircraft Association (EAA), "Be a Pilot" jointly sponsored and supported by more than 100 industry organizations, and "Av Kids" sponsored by the NBAA. Over the years, programs such as these have played an important role in the success of general aviation and will continue to be vital to its growth in the future.

SERVICE AREA

The service area of an airport is defined by its proximity to other airports providing similar service. Flagstaff Pulliam Airport is one of three commercial airline airports in Coconino County. Coconino County has the largest land area in the state, virtually encompassing north central Arizona. It is also the second largest county in the United States, but one of the most sparsely populated.

There are only five incorporated communities in Coconino County, with much of the County's land area dedicated to Indian Reservations and national parks, forests, and recreation areas. The five cities support 54 percent of the County's population. Twenty (20) percent live on Indian Reservations, while 1.5 percent live on

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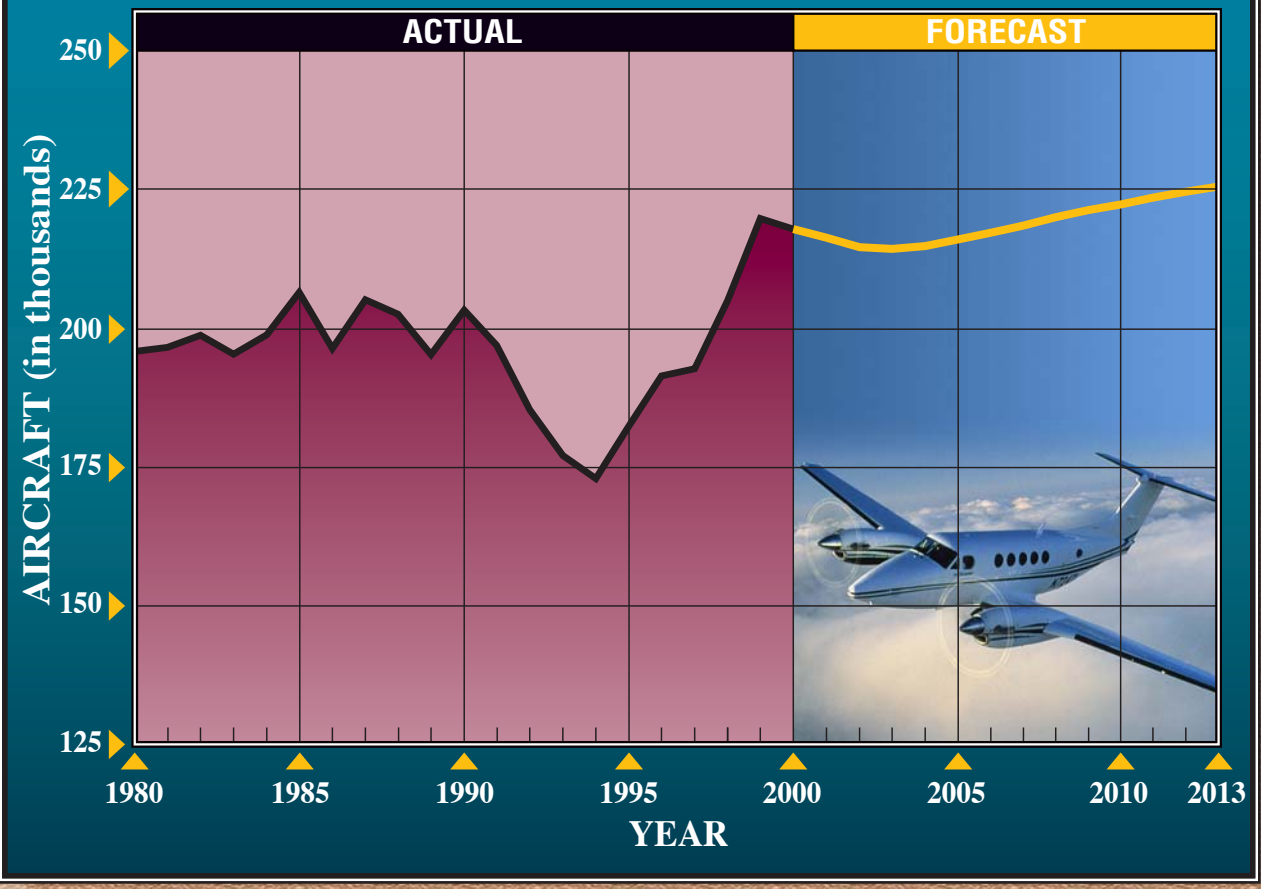
ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING				ROTORCRAFT		Experimental	Other	Total
	PISTON		TURBINE						
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine			
2000 (Actual)	149.4	21.1	5.8	7.0	2.7	4.5	20.4	6.7	217.6
2003	146.0	20.7	5.7	7.5	2.6	4.3	20.4	6.7	213.9
2008	148.7	20.7	5.8	9.6	2.8	4.5	20.8	6.8	219.7
2013	152.0	20.7	5.9	10.9	2.9	4.6	21.4	6.9	225.3

Sources: FAA General Aviation and Air Taxi Activity (and Avionics) Surveys.
FAA Aerospace Forecasts, Fiscal Years 2002-2013.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

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PULLIAM AIRPORT

Exhibit 2B
U.S. ACTIVE GENERAL AVIATION
AIRCRAFT FORECASTS

National Park Lands (primarily Grand Canyon Village). The remaining 24.5 percent live in unincorporated areas, 76 percent of which are within 10 miles of Flagstaff. Thus over 60 percent of the local County's population is within 10 miles of Flagstaff.

Page Municipal Airport's location in the northern reaches of the county, 134 miles from Flagstaff, limits its service primarily to the Page community, nearby Navajo Indian reservations, and the recreation and tourism generated from Lake Powell and the Glen Canyon Recreation Area. Grand Canyon Airport is 99 miles from Flagstaff. Its traffic is generated primarily by tourists to the Grand Canyon National Park. FLG also serves visitors to the Grand Canyon and its flight schedule is even listed under Grand Canyon in the **Official Airline Guide (OAG)**.

The closest commercial service airport to Flagstaff is actually outside Coconino County to the southwest in Prescott. This airport is still over 90 miles from Flagstaff. To the west, the closest airport with commercial service is in Show Low, over 140 miles away. Phoenix Sky Harbor Airport is the destination for all FLG scheduled service, but it also has the strongest pull on the Flagstaff market area. Located approximately 140 miles from Flagstaff, Sky Harbor draws many potential air travelers down Interstate 17.

The general aviation service area is smaller than the commercial service area, as there are other general aviation airports in closer proximity. Besides the airports discussed previously, GA airports are located to the west at Williams, to the east at Winslow, and to the south at Sedona.

SOCIOECONOMIC TRENDS

Local and regional forecasts developed for key socioeconomic variables provide an indicator of the potential for creating growth in aviation activities at an airport. Three variables typically useful in evaluating potential for traffic growth are population, employment, and per capita personal income (PCPI).

Most of this data is readily available on an annual historic basis at the county level. Annual population estimates were available for Flagstaff as well, but they have yet be updated to coincide with the 2000 census. **Table 2A** presents the historic population information for Flagstaff and Coconino County. The annual information since 1990 is based upon estimates, with the exception of the 2000 census data for Coconino County. The County estimates for 1991-1999 have been updated. This is important in that the estimates for 1999, prepared prior to the census were nearly eight percent higher than the census count for both the county and the city. County planning since the 2000 Census cite the census information, while City documents utilize the higher estimates.

The Arizona Department of Economic Security (DES) provides population forecasts for counties and communities in Arizona approximately every five-years. The most recent projections were

released in 1997. A check with the DES indicated that they had not updated the projections as of 2004. **Table 2A** presents the DES forecasts for Flagstaff and Coconino County.

TABLE 2A
Population
Flagstaff and Coconino County

Year	City Population	County Population	City % of County
1970	26,117	48,326	54.04%
1980	34,743	75,008	46.32%
1990	45,857	96,591	47.48%
1991	47,881	99,647	48.05%
1992	49,460	102,498	48.25%
1993	51,030	105,570	48.34%
1994	52,599	108,680	48.40%
1995	53,711	110,954	48.41%
1996	54,979	112,686	48.79%
1997	56,383	114,444	49.27%
1998	56,787	114,874	49.43%
1999	57,078	115,307	49.50%
2000	57,200	116,320	49.17%
2001	57,700	118,290	48.78%
2002	59,160	125,420	47.17%
2003	61,030	128,925	47.34%
FORECASTS			
2010	71,981	147,352	48.85%
2015	77,133	158,753	48.59%
2025	86,697	179,555	48.28%

Forecasts: Arizona Department of Economic Security, April 1997.
Historic Data: U.S. Bureau of Economic Analysis.

A more recent forecast of the county population by Woods and Poole takes into account the 2000 Census, and is presented on **Table 2B**. While this is not an officially accepted forecast it does provide a more recent perspective of population trends for the area. Woods and Poole also provides forecasts of employment and per capita personal income by county. The Coconino County projections of these indicators are included in the table as well.

AIRLINE ACTIVITY FORECASTS

Airline activity at Flagstaff Pulliam Airport has been primarily comprised of regional/commuter service since deregulation. Prior to deregulation, FLG was served by Frontier Airlines and Cochise Airlines. Frontier utilized Convair 580 turboprops and DC-9's while Cochise Airlines used small twin-engine aircraft.

TABLE 2B
Socioeconomic Statistics
Coconino County

Year	Population	Employment	PCPI (1996$)
1980	75,008	35,290	$14,168
1985	84,431	41,920	$15,609
1990	96,591	49,010	$16,400
1991	99,647	50,220	$16,406
1992	102,498	52,110	$16,924
1993	105,570	54,180	$16,758
1994	108,680	56,940	$17,301
1995	110,954	59,390	$17,563
1996	112,686	62,140	$18,051
1997	114,444	63,150	$18,599
1998	114,874	63,860	$19,620
1999	115,307	65,460	$20,311
2000	116,320	66,760	$20,541
2001	118,290	68,000	$20,808
2002	125,420	72,500	$22,173
FORECASTS			
2010	132,370	79,140	$23,115
2015	141,140	85,920	$24,491
2025	158,920	101,580	$27,492

Source: CEDDS 2002; Woods and Poole Economics, January 2002.

With deregulation in place, Frontier ended service in August 1979, while Cochise Airlines continued to serve FLG until declaring bankruptcy in 1982. During this period, SkyWest and Sun West Airlines started service to FLG. This service was generally with 19-seat turboprop or smaller aircraft.

In 1987, America West Airlines entered the market. The airline primarily used 37-seat DeHavilland Dash 8 turboprop aircraft, but occasionally brought in a Boeing 737. Sun West dropped out of the market, but both America West and SkyWest (operating as Delta Connection) continued to serve the airport for several years. In 1993, America West turned over its presence to Mesa Airlines under the code share name America West Express. With this change, service converted to Beech 1900s, so all service was by 19-seat aircraft. In the summer of 1994, SkyWest dropped its service to FLG. America West Express continues to serve Flagstaff Pulliam Airport, although service has transitioned back to the Dash 8 aircraft.

Table 2C depicts the annual enplaned passengers at Flagstaff Pulliam Airport since 1980. Prior to deregulation in 1979, the airport's highest annual

TABLE 2C
Enplanement Market Share
Flagstaff Pulliam Airport

Year	Annual Enplaned	U.S. Domestic Enplanements (millions)[1]	FLG % Market Share
1980	14,877	287.9	0.0052%
1981	14,784	274.7	0.0054%
1982	15,319	286.0	0.0054%
1983	13,000	308.1	0.0042%
1984	19,089	333.8	0.0057%
1985	19,140	369.9	0.0052%
1986	23,203	404.7	0.0057%
1987	41,463	441.2	0.0094%
1988	47,006	441.2	0.0107%
1989	51,891	443.6	0.0117%
1990	51,687	456.6	0.0113%
1991	48,304	445.9	0.0108%
1992	49,508	464.7	0.0107%
1993	42,262	470.4	0.0090%
1994	41,138	511.3	0.0080%
1995	39,213	531.1	0.0074%
1996	47,171	558.1	0.0085%
1997	46,704	579.1	0.0081%
1998	39,573	592.1	0.0067%
1999	36,656	613.3	0.0060%
2000	34,483	640.5	0.0054%
2001	31,370	627.5	0.0050%
2002	37,257	574.5	0.0065%
2003	36,400	587.9	0.0062%
DECLINING SHARE PROJECTION			
2010	48,924	815.4	0.0060%
2015	54,406	989.2	0.0055%
2025	65,894	1,464.3	0.0045%
CONSTANT SHARE PROJECTION			
2010	61,155	815.4	0.0075%
2015	74,190	989.2	0.0075%
2025	109,822	1,464.3	0.0075%
INCREASING MARKET SHARE			
2010	**81,540**	815.4	**0.0100%**
2015	123,650	989.2	0.0125%
2025	226,967	1,464.3	0.0155%

[1] FAA Aerospace Forecasts FY 2002-2013; FAA ADO-02-01, March 2002.
Years 2015 and 2025 extrapolated by Coffman Associates.

boardings were around 16,000. After deregulation, traffic remained in the low teens until 1984 as commuter service began to improve. A significant jump occurred in 1987 when America West started service. Traffic continued to grow to the end of the decade as service continued to improve under SkyWest and America West. Traffic began to decline during the early 1990s as the service transitioned to all 19-seat aircraft, but regained momentum in the mid-1990s when America West Express increased its service frequency to 16 daily flights. Since 1997, however, traffic declined each year through 2001.

Exhibit 2C depicts 12-month moving totals for enplanements at Flagstaff Pulliam Airport since December, 1997. The moving totals represent a year's worth of enplanements ending with the month shown. The moving totals declined steadily from the end of 1997, through August 1999. Traffic grew for just over a year, until September, 2000. This decline continued until August 2001. This occurred as America West Express transitioned back to the larger Dash 8, but reduced flight frequency to the current five daily flights.

Just when traffic appeared poised to rebound, the events of September 11th came. This sent the 12-month totals downward through the end of the year. Unlike the majority of locations, however, FLG rebounded the next year. Traffic in 2002 was 18.8 percent ahead of 2001.

ENPLANEMENT FORECASTS

The fluctuation in commercial passenger activity at Flagstaff over the years is not unusual for a small commercial market with Interstate highway access to a large hub airport within 150 miles. The level of usage does not reflect the passengers generated by the market. In fact, the level of usage can vary with the level of service provided. Major factors include fares, frequency of service, size and type of aircraft, destinations, and airline reliability.

As a result, typical correlation and trend line analyses do not apply in projecting future activity at Flagstaff Pulliam Airport. Rather, the potential or ability to capture a larger market share in the future is evaluated. **Table 2C** depicts FLG's share of the United States Domestic passenger market every year since 1980. Just after deregulation went into effect, FLG had a market share of 0.0052 percent in 1980. The market share dropped to a low of 0.0042 percent in 1983, then climbed to a high of 0.0117 percent in 1989. Since that high point, the market share has declined in every year since, with the exception of 1996. In 2001, the market share was at 0.0050 percent, or essentially the same as in 1980. In 2002, the market share rebounded to 0.0065 percent, the highest since 1998.

As was discussed in the previous section, the passenger traffic and

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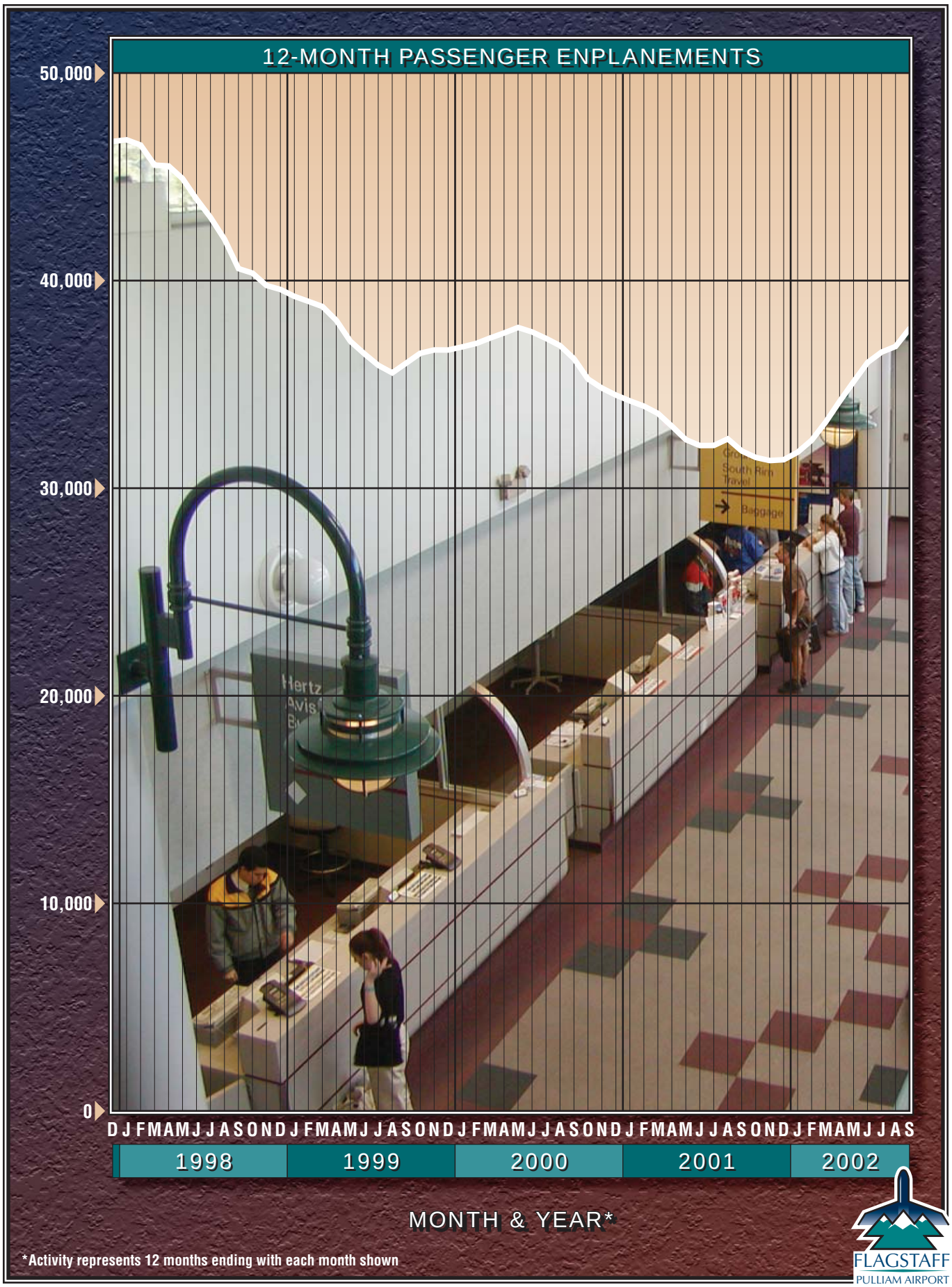

Exhibit 2C
12-MONTH MOVING
TOTALS ENPLANEMENTS

market share reached its peak in 1989 when America West and SkyWest were serving the airport. America West ran into financial difficulties in the early 1990's and transferred service in its smaller feeder markets in the southwest to Mesa Airlines to operate under contract as America West Express.

Mesa maintained the frequency of service, but used a 19-seat Beech 1900 instead of the Dash 8. In fact, in 1993, Mesa and SkyWest combined for 17 daily flights on 19-seat aircraft. After SkyWest left the market in 1994, Mesa began to increase its flight frequency, reaching 16 daily flights by 1996. The result was a bit of a rebound in enplanements. In 1998, Mesa reduced the number of flights in half but began to use Dash 8 aircraft. The response to less frequency was a decline in passengers even with the larger aircraft.

The rebound in 2002 shows other factors such as fares affect the local market as well. FLG traffic rose even when flight frequency did not change and the national passenger traffic was still declining.

Future air service at Flagstaff Pulliam Airport could be dependent upon the airport's ability to accommodate regional jets. Mesa Airlines is moving towards an all regional jet (RJ) fleet in its southwest service as America West Express.

Additional runway length will be necessary for FLG to accommodate the RJ's, the extent of which will be evaluated in the next chapter of the Master Plan. At least one other commuter airline has unofficially indicated an interest in serving FLG to other destinations if RJ's can be accommodated.

The entry of RJ's would be a service improvement that would have the potential to recapture a significant share of the local market that is currently driving down I-17 to Phoenix Sky Harbor Airport. An air service study prepared in February, 1998 for Flagstaff Pulliam Airport by The Boyd Group/ASRC, Inc. included a survey that indicated just 26 percent of the local air carrier traffic was utilizing Flagstaff Pulliam Airport. From this information and other data, the study indicated that 265,000 passengers (132,500 enplanements) annually leak to other airports, including as many as 250,000 to Sky Harbor.

Thus, the total enplanement potential for 1997 was approximately180,000, or 0.0311 percent of the U.S. domestic enplanement market. A capture of 20 to 30 percent of the local market is very typical of commuter turboprop markets within 150 miles of a larger hub airport. In fact, a share of 10 to 20 percent is not uncommon in smaller commuter markets.

While the capture can improve with improved service and fares, it would still be very difficult to attain a complete recapture of the local market. Based upon experience in similar cases, The Boyd Group indicated it is likely that 50 percent of the leakage could never be captured simply because the discount fares and service at the large

hub in Phoenix could never be completely matched in a market such as Flagstaff. This would mean that FLG could attract up to 62.5 percent of its own market demand with service improvements.

Coffman Associates experience confirms this statement. A recapture in the range of 60 to 70 percent is a maximum level for smaller markets within reasonable driving distance of a large hub airport.

For master planning purposes, three different market share scenarios were considered. The first is a low range projection that assumes that the airport does not undertake any improvements to accommodate regional jets. Under this scenario, the airport could actually experience a further decline in market share as the local air service is left with the few commuter airlines that will continue to operate turboprop aircraft. The resulting projection is presented in **Table 2C** as well as **Exhibit 2D**.

The next scenario assumes the FLG market share would continue to fluctuate with ups and downs in air service, but maintain the average of the last two decades. This is called the constant share projection on **Table 2C** and **Exhibit 2D**.

The increasing market share scenario, also presented on the table and exhibit, considers a market recapture projected to gradually grow to 50 percent of the total Flagstaff service area demand over the long term. From the base year of 1997, this would be equivalent to 90,000 annual enplanements, or 0.0155 percent of the U.S. domestic enplanements. For this scenario to be realized, several conditions would need to occur. The first is an upgrade in service to regional jets. Also key is the introduction of additional airlines into the market, additional frequency, more non-stop and/or direct destinations, and fare competition. Under this scenario, the airport could grow to over 200,000 passenger enplanements over the long term.

The market share scenarios are compared to the previous Master Plan forecasts and the FAA's **Terminal Area Forecasts** (TAF) 2001-2015 for FLG on **Table 2D**, and **Exhibit 2D**. The **1991 Master Plan** forecasts were based upon the passenger growth experienced in the 1980s, as traffic more than tripled from 15,000 to over 50,000 annual enplanements. The TAF updates its forecasts every year, and are typically adjusted to the most recent base year. As depicted on the table and the exhibit, the TAF projections are already underestimating traffic for 2002. In fact, the 2015 projection is lower than the actual traffic will be for 2002.

Given the service potentials discussed earlier, the growth of commercial service passenger traffic at Flagstaff Pulliam Airport is not likely to follow a steady growth pattern over the course of twenty years. Changes in service over the time frame are more likely to be met with sharp increases or declines. If service continues to upgrade, the increasing market share scenario has a strong chance to happen. For the purposes of the Master Plan and the

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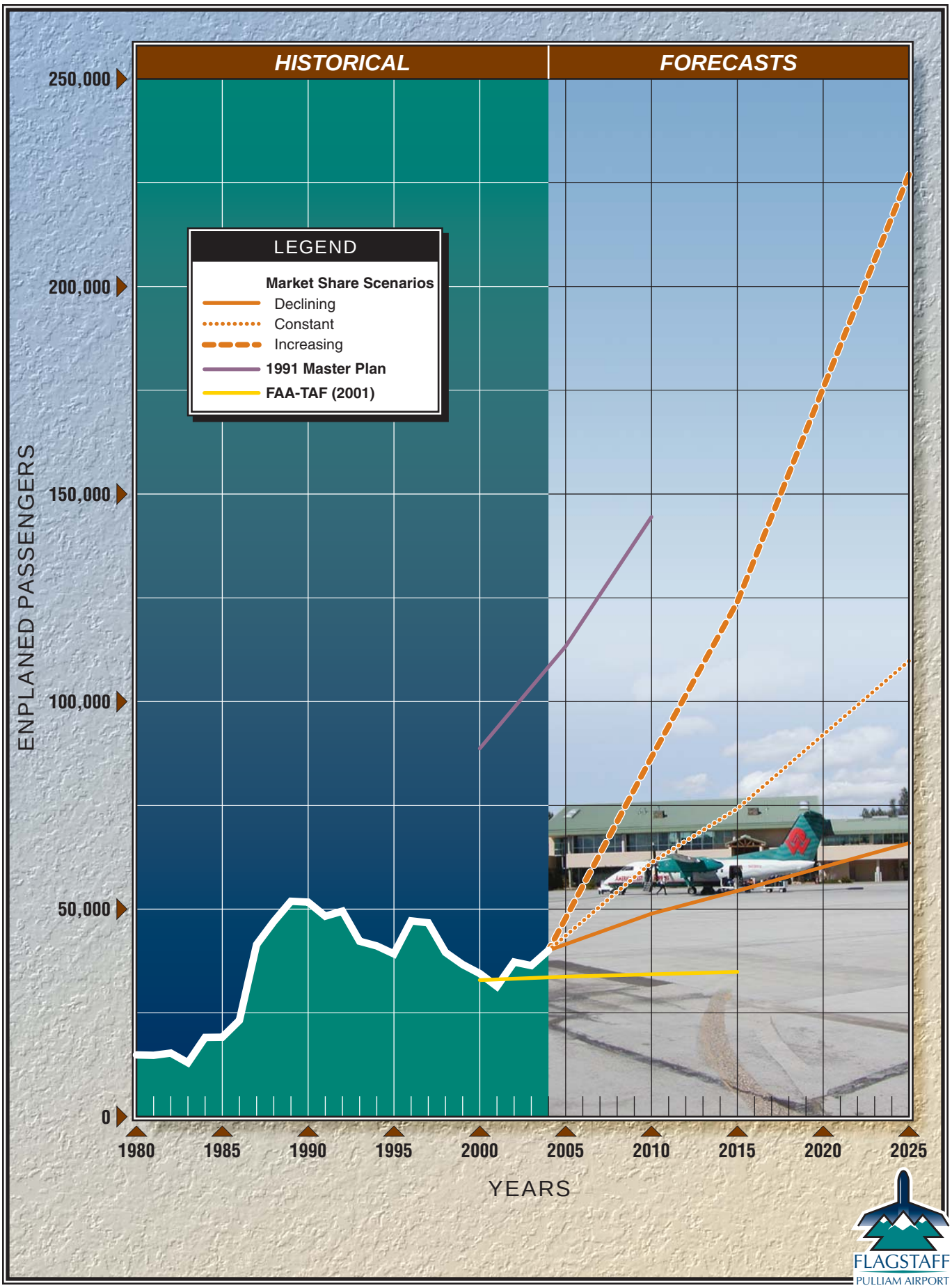

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 2D
ENPLANEMENT FORECASTS

F.A.R. Part 150 Noise Compatibility Study being conducted concurrently, it is recommended that the increasing market share projections be considered over the long term.

TABLE 2D
Enplanement Projections
Flagstaff Pulliam Airport

	2000	2005	2010	2015	2025
1991 Master Plan	88,700	113,300	144,500	N/A	N/A
FAA-TAF (2001)	32,898	33,733	34,303	34,874	N/A
Market Share Scenarios					
Declining	34,500	44,200	48,900	54,400	65,900
Constant	34,500	51,000	61,200	74,200	109,800
Increasing	34,500	57,900	82,000	124,000	227,000

AIRLINE OPERATIONS AND FLEET MIX

The commercial service fleet mix defines a number of key parameters in airport planning, including critical aircraft (for pavement designs and ramp geometry), terminal complex layout, and maximum stage length capabilities (affecting runway length evaluations). A projection of fleet mix has been developed for Flagstaff Pulliam Airport by reviewing equipment used by the airline serving the airport, a well as the equipment of airlines with potential to serve Flagstaff in the future.

Changes in equipment, airframes, and engines have always had a significant impact on airlines and airport planning. There are many on-going programs by the manufacturers to improve performance characteristics. These programs are focusing on improvements in fuel efficiency, noise suppression, and the reduction of air emissions. As indicated earlier, many commuter airlines such as Mesa Airlines are in the process of adding regional jets and phasing out their turboprop aircraft.

The current service by Mesa Airlines under the code-share name America West Express utilizes the 37-seat Dash 8 aircraft for its four daily flights. Mesa Airlines' website listed a total fleet of 126 aircraft effective November 2, 2002, including 64 business jets comprised of 32 Embraer 145 (ERJ-145) aircraft, and 32 Canadair Regional Jet 200 (CRJ-200) aircraft. Both of these regional jets types have 50-seat capacities. The remaining aircraft are turboprops including 17 DeHavilland Dash 8's (37-seats) and 45 Beech 1900's (19-seats).

The regional jets are used in several markets served by Mesa across the country, including Phoenix. The Dash 8 aircraft operate out of the Phoenix hub under the America West Express name. The Beech 1900 aircraft are used primarily in the midwest under the Air Midwest subsidiary. A re-visit of

the Mesa fleet in 2005 revealed that the airline has expanded its airline fleet by 43 percent to 180 aircraft. All of this growth has been in regional jets as turboprop aircraft in the fleet have declined. The fleet now includes 36 ERJ-145s, 56 CRJ-200s, 32 90-seat CRJ-900s, and 15 70-seat CRJ-700s. The Dash 8s in the fleet have declined by one to 16, and the Beech 1900s have declined by 20 to 25.

It should also be noted that only six of the 16 Dash 8s are available for use as America West Express. The remainder are committed to Mesa's United Express operation in Denver.

SkyWest is an airline that has served Flagstaff in the past, and is an example of an airline that could provide service again in the future. According to its website, SkyWest is also adding more CRJ's while reducing its turboprop fleet.

The airline has 125 CRJ-200s and 32 CRJ-700s with firm orders for 20 more CRJs over the next four years. At that same time, it has reduced the Embraer 120 turboprop fleet to 62 aircraft.

Table 2E presents the fleet mix by seating capacity in 2002 and 2003, as well as a projection for the future. The table shows that the fleet mix into Flagstaff has been entirely comprised of the 37-seat Dash 8's in 2002.

TABLE 2E
Airline Fleet Mix and Operations Forecast
Flagstaff Pulliam Airport

	ACTUAL		FORECAST		
Fleet Mix Seating Capacity	**2002**	**2003**	**2010**	**2015**	**2025**
COMMUTER AIRLINES					
60+	0.0%	0.0%	0.0%	10.0%	15.0%
45-59	0.0%	0.0%	100.0%	80.0%	75.0%
35-44	100.0%	100.0%	0.0%	10.0%	10.0%
20-34	0.0%	0.0%	0.0%	0.0%	0.0%
10-19	0.0%	0.0%	0.0%	0.0%	0.0%
Totals	100.0%	100.0%	100.0%	100.0%	100.0%
Seats/Departure	37.0	37.0	50.0	50.7	51.7
Boarding Load Factor	60.6%	63.1%	59.0%	**60.0**	**62.0**
Enplanements/Departure	22.4	23.3	**29.5**	**30.4**	**32.1**
Annual Enplanements	37,257	36,400	82,000	124,000	227,000
Annual Departures	1,662	1,559	2,780	4,076	7,082
Annual Operations	3,324	3,118	5,560	8,152	14,164

The forecast indicates the probable conversion by Mesa to 50-seat RJs by 2010, provided the runway is capable of accommodating the aircraft by then. If

it is, at least one additional airline can be expected to follow suit. Over the planning period, the airport could experience some service by RJ's with seating capacities from 30 to 70 seats, however, the 50-seat aircraft is expected to still make up the majority of the aircraft serving Flagstaff in the future.

The fleet mix projections have been used to calculate the average seats per departure, which (after applying a load factor) were used to project annual departures. The boarding load factor for Flagstaff Pulliam Airport, may fluctuate with periodical changes in air service, but it is expected to remain around 60 percent through at least the short term as the aircraft upgrade occurs and if there are new entries into service. After that, the load factor can be expected to rise slightly. Annual operations were then calculated based on boarding load factors. **Table 2D** summarizes the fleet mix and operations forecast for FLG.

GENERAL AVIATION FORECASTS

General aviation is defined as that portion of civil aviation which encompasses all portions of aviation except commercial operations. To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of this activity must be forecast. These indicators of general aviation demand include: based aircraft, aircraft fleet mix, and annual operations.

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft, the growth of other general aviation activities and demands can be projected.

As depicted on **Exhibit 2E**, the based aircraft totals at Flagstaff Pulliam Airport hardly changed for the past 12 years. This may be due, in part, to the fact that the number of aircraft storage units has changed very little over that same time frame. A current listing based aircraft by N-number, model, and type is provided in **Appendix B**; this research brings the total based aircraft to 116.

A check of based aircraft at the two closest public-use general aviation airports, Sedona Airport and Clark Memorial in Williams shows they have not seen any appreciable growth in basing either. The number of registered aircraft in Coconino County, however, has risen by 20 percent (249 to 300) since 1991. According to the FAA registrar, there are over 30 aircraft registered to Flagstaff addresses that are not included on the basing list in **Appendix B**.

While aircraft registered to a local address do not necessarily have to be based in that immediate area, this is a larger than ordinary number, suggesting there may be some demand based elsewhere due to a lack of hangar space. In 2003, the City of Flagstaff had 42 T-hangars units and 38 shade

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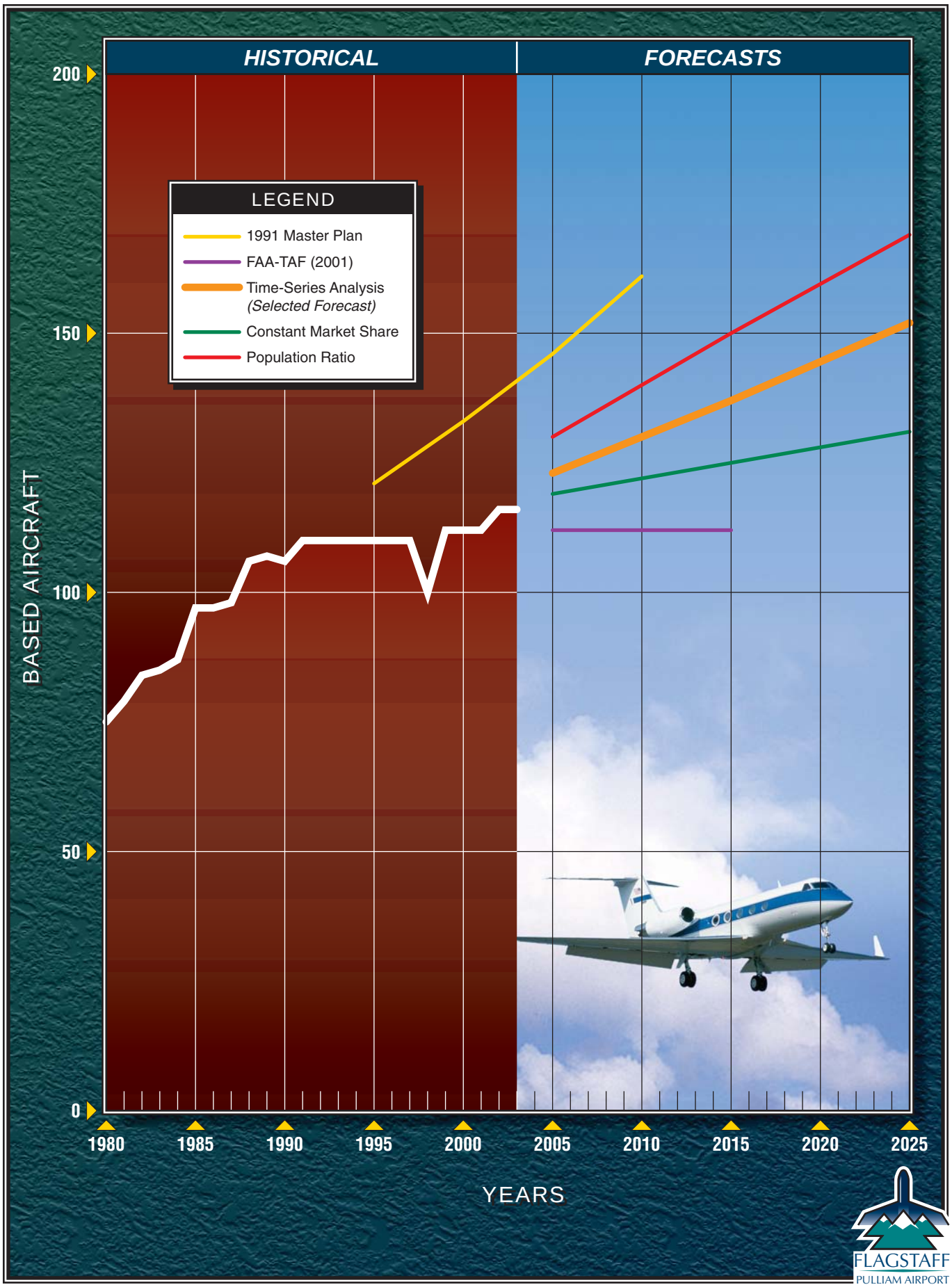


Exhibit 2E
BASED AIRCRAFT

hangars units that are all full. The City also leases out individual tie-downs to 18 aircraft. The remainder of the based aircraft on the airport are in private hangars.

A historical listing of based aircraft at FLG back to 1980 is provided on **Table 2F.** In contrast to many locations around the country, based aircraft at FLG grew throughout the 1980s. The based aircraft forecast in the **1991 Master Plan** was based upon the trend in the 1980s, and is depicted on **Exhibit 2E**. Since growth went flat in the 1990s the Master Plan forecast has proven to be high with 133 projected for the year 2000 compared to the actual 112.

The last **Terminal Area Forecast (TAF)** prepared by the FAA projected that based aircraft would remain at 112 through at least 2015. This is also depicted on **Exhibit 2E**. A waiting list for hangars suggests that there would be more based aircraft at FLG if space were made available. So, several different methods were used to estimate the potential for growth if hangar space were provided on an as-needed basis.

First, an updated trend line or "time-series" analysis was conducted for the period of 1980-2002. The historical data provided a correlation coefficient or r-value of 0.75. An r-value of at least 0.90 is necessary be considered a significant statistical fit. Still, the time-series analysis does reflect the average growth trend over the 22-year period. The results of this analysis are shown on **Table 2F** and **Exhibit 2E.** The time-series extrapolation predicts that based aircraft will grow from 116 to 154 by the year 2025.

The lack of growth over the last decade while other independent variables such as population, employment, and per capita income have grown suggests that further regression analyses would not turn up any significant correlations. So, market share and the aircraft-to-population ratio were examined in lieu of the standard statistical fits.

As would be expected, the FLG market share of the United States active general aviation aircraft has declined over the decade. A constant market share was projected based upon the airport maintaining at least its current share. This results in a growth to 129 based aircraft over the planning period. This is depicted on **Table 2F** and **Exhibit 2E** for comparison. An increasing market share that recaptures the highest market share experienced over the past nine years was considered as well. This results in a projection very similar to that of the time-series projection.

Finally, a constant ratio of aircraft per 1,000 population in Flagstaff was developed for comparison. The changing ratios and market shares for each projection are presented in the table as well. Each of the previous projections resulted in a declining ratio of aircraft to population, so the constant ratio resulted in the highest forecast.

TABLE 2F
Based Aircraft
Flagstaff Pulliam Airport

Year	FLG Based	U.S. Active Aircraft	FLG Market Share	City Population	Aircraft per 1,000 Population
1980	75	NA	NA	34,743	2.16
1981	79	NA	NA	NA	NA
1982	84	NA	NA	NA	NA
1983	85	NA	NA	NA	NA
1984	87	NA	NA	NA	NA
1985	97	NA	NA	NA	NA
1986	97	NA	NA	NA	NA
1987	98	NA	NA	NA	NA
1988	106	NA	NA	NA	NA
1989	107	NA	NA	NA	NA
1990	106	NA	NA	45,857	2.31
1991	110	NA	NA	47,881	2.30
1992	110	NA	NA	49,460	2.22
1993	110	177,719	0.0619%	51,030	2.16
1994	110	172,936	0.0636%	52,599	2.09
1995	110	188,089	0.0585%	53,711	2.05
1996	110	191,129	0.0576%	54,979	2.00
1997	110	192,414	0.0572%	56,383	1.95
1998	100	204,710	0.0488%	56,787	1.76
1999	112	219,464	0.0510%	57,078	1.96
2000	112	217,533	0.0515%	57,200	1.96
2001	112	211,447	0.0530%	57,700	1.94
2002	116	211,244	0.0549%	59,160	1.96
2003	116	210,606	0.0551%	61,030	1.90
Time-Series Projection					
2010	131	222,410	0.0589%	71,981	1.82
2015	139	227,160	0.0612%	77,133	1.80
2025	154	238,300	0.0646%	86,697	1.78

TABLE 2F (Continued)
Based Aircraft
Flagstaff Pulliam Airport

Year	FLG Based	U.S. Active Aircraft	FLG Market Share	City Population	Aircraft per 1,000 Population
Constant Market Share Projection					
2010	122	222,410	0.0550%	71,981	1.70
2015	125	227,160	0.0550%	77,133	1.62
2025	131	238,300	0.0550%	86,697	1.51
Increasing Market Share Projection					
2010	129	222,410	0.0580%	71,981	1.79
2015	136	227,160	0.0600%	77,133	1.77
2025	153	238,300	0.0640%	86,697	1.76
Constant Ratio: Aircraft per 1,000 Population					
2010	140	222,410	0.0631%	71,981	1.95
2015	150	227,160	0.0662%	77,133	1.95
2025	169	238,300	0.0709%	86,697	1.95

Since general aviation aircraft in the United States are not expected to grow as fast as the Flagstaff population, a decline in the aircraft to population ratio should be anticipated over the long term. The addition of hangars, however, could create a short term spike in based aircraft that would, in turn, raise the ratio and market shares. For the purposes of this Master Plan, a forecast similar to the time-series and increasing market projections is recommended. This forecast is presented on **Table 2G**.

BASED AIRCRAFT FLEET MIX

The current based aircraft fleet mix at Flagstaff Pulliam Airport is presented on **Table 2G**. This was compared to the existing and forecast U.S. general aviation fleet mix trends as presented in **FAA Aerospace Forecasts Fiscal Years 2002-2013**. The current based aircraft fleet mix at FLG has a higher than average percentage of rotorcraft and multi-engine piston aircraft, lower than average turboprops, and one business jet.

According to the FAA forecasts, active single-engine aircraft will dip in the short term, as older aircraft are retired, then have a slow growth trend. Experimental aircraft, which tend to consist primarily of single-engine models, are expected to experience a 0.3 percent per year growth. So the overall percentage of single engine and experimental aircraft will remain fairly constant in the future.

The number of multi-engine piston aircraft will remain relatively constant according to the FAA forecasts. Turboprop aircraft are expected experience only marginal gains,

approximately 15 per year nationwide.. The largest percentage growth is anticipated in the business jet market, where an average annual increase of 3.4 percent is expected. This relates to a net gain of approximately 300 business jets a year. Rotorcraft are anticipated to show a growth rate slightly better than the single engine and experimental aircraft.

TABLE 2G
Based Aircraft Fleet Mix

Year	Single-Engine	Multi-Engine	Turbo-prop	Jet	Rotor	Total
ACTUAL						
2003	99	7	7	1	2	116
FORECAST						
2010	110	8	8	2	3	131
2015	115	8	9	4	3	139
2025	125	8	10	7	4	154

The fleet mix for FLG is forecast to evolve into a similar make-up as that on the national level. The single-engine percentage will decline slowly, and the number of multi-engine piston aircraft is forecast to remain static after an immediate increase, resulting in a percentage decline. The percentages of turbine-powered aircraft at the airport can be expected to increase. With a net increase of three turboprops and six business jets over the planning period.

GENERAL AVIATION OPERATIONS

General aviation operations are classified by the airport traffic control tower (ATCT) as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use, since business aircraft are operated on a high frequency.

Itinerant Operations

Table 2H depicts the history of general aviation itinerant operations at FLG since 1990. Itinerant operations have varied from a high of 29,187 in 1991 to a low of 21,541 in 1997. The FLG market share as a percentage of GA itinerant operations at towered airports across the country has fluctuated around and average of 0.12 percent. With a low of 0.97 percent and a high of

0.131 percent. The ratio of operations per based aircraft has remained relatively stable as well, with and average of 239. The ratio has varied between 202 and a high of 265.

In 2002, GA itinerant operations were up 6.7 percent over 2001 and 5.2 percent over 2000. This may be indicative of more use of general aviation for travel to and from Flagstaff in the wake of September 11, 2001. The table depicts a market share based upon the FAA's forecast for towered GA itinerant operations for 2002. The operations were the third highest total in the past 13 years and also the third highest market share. The operations per based aircraft ratio of 237 is near the average for the period.

TABLE 2H
General Aviation Itinerant Operations Forecast
Flagstaff Pulliam Airport

		U.S. ATCT GA			
Year	**FLG GA Itinerant**	**Itinerant (millions)**	**FLG Market Share (%)**	**FLG Based AC**	**Itinerant Ops Per AC**
1990	27,250	23.1	0.118%	106	257
1991	29,187	22.2	0.131%	110	265
1992	27,539	22.1	0.125%	110	250
1993	26,827	21.1	0.127%	110	244
1994	26,990	21.1	0.128%	110	245
1995	27,412	20.9	0.131%	110	249
1996	26,775	20.8	0.129%	110	243
1997	22,195	21.7	0.102%	110	202
1998	21,541	22.1	0.097%	100	215
1999	25,743	23.0	0.112%	112	230
2000	26,082	22.9	0.114%	112	233
2001	25,731	21.4	0.120%	112	230
2002	27,447	21.5	0.130%	116	237
2003	25,665	20.2	0.127%	116	221
FORECAST					
2010	32,240	24.8	0.130%	131	248
2015	34,580	26.6	0.130%	139	252
2025	39,780	30.6	0.130%	154	262

In **FAA Aerospace Forecasts Fiscal Years 2002-2013**, the FAA projects itinerant general aviation operations will be recovering the operation level lost in 2001 in the immediate term, then grow at approximately 1.4 percent annually. **Table 2H** presents this forecast and includes a projection for Flagstaff Pulliam Airport based upon maintaining a constant of the itinerant market. The share depicted is at the higher end of the range experienced since 1990, but slightly lower than that shown for 2002.

Because of the close relationship of itinerant operations to based aircraft that has been displayed at FLG, the projected increase in based aircraft can also be expected to be followed with an increase in itinerant operations. The future ratio shown in the table was used as a check of the reasonableness of the itinerant operations forecast. As can be seen from the table, the ratio grows slightly over the planning period, but stays within the range experienced over the past decade.

The itinerant operations forecast is depicted on **Exhibit 2F** and compared to the forecasts of the **1991 Master Plan** and the **2001 FAA-TAF**. The **TAF** forecasts show no growth, and will be exceeded in 2002 by nearly 10 percent. The **1991 Master Plan** anticipated over 57,000 itinerant operations by 2000. The new forecast developed expects growth in operations, but at a rate well below that anticipated in the previous master plan.

Local Operations

A similar methodology was utilized to forecast local operations. **Table 2J** depicts the history of local operations at Flagstaff Pulliam Airport, and examines its historic market share of GA local operations at towered airports in the United States. After 23,754 operations in 1991, the local total declined to 10,450 in 1997. Since that time local operations have climbed back into the 17,000 to 18,000 range and have remained there for three years. Local operations declined in 2002 and 2003 to 15,363.

The share of the U.S. market has averaged 0.109 percent since 1990, ranging between 0.069 percent and 0.143 percent. Local operations per based aircraft have averaged 160, with a range between a low of 95 and a high of 216.

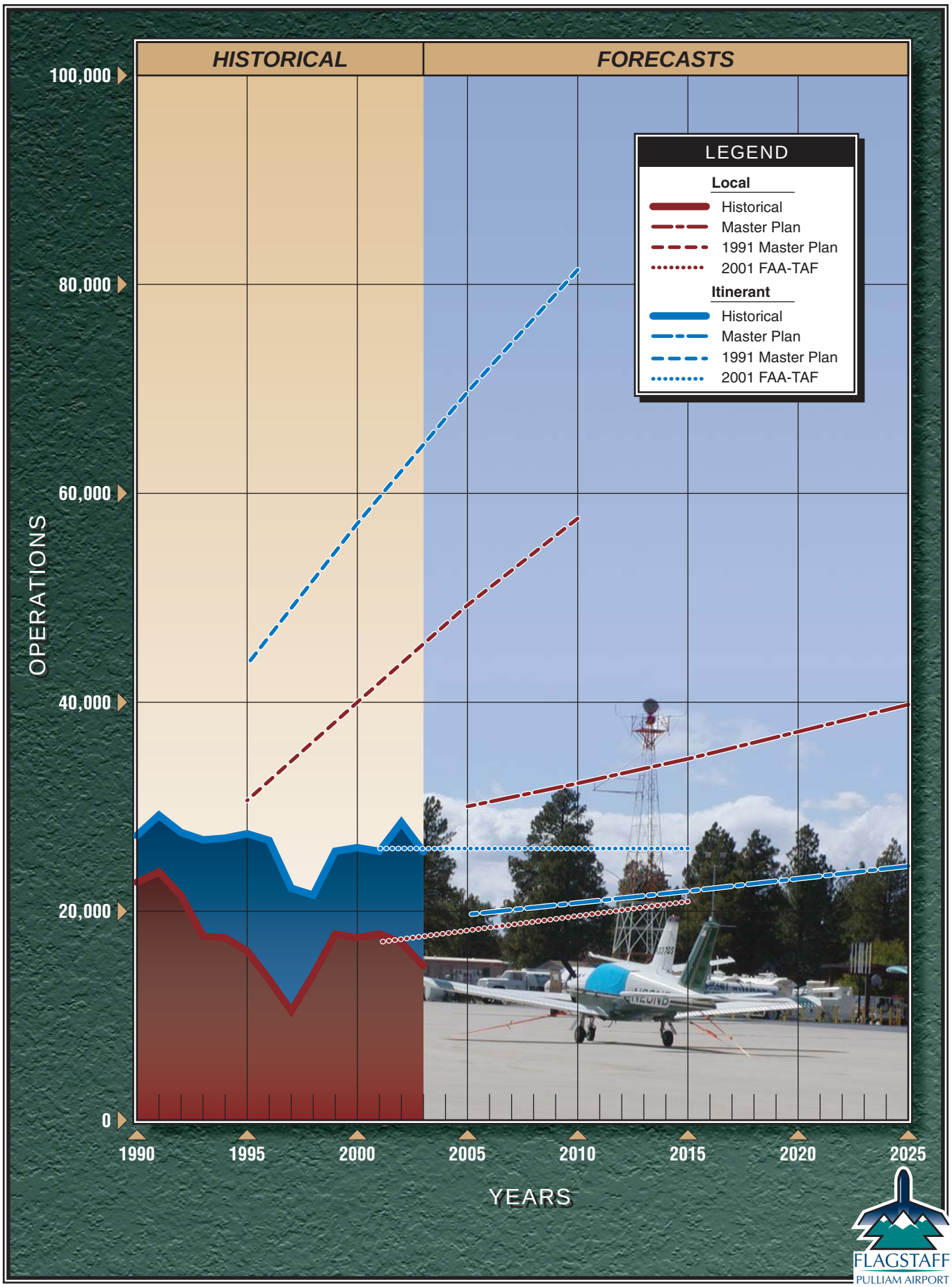
The FAA **Aerospace Forecasts** projects a one percent per year increase in local operations nationwide. As with itinerant operations, this would indicate an increase in operations per active aircraft since general aviation are projected to grow at a slower rate.

Training activity is not expected to increase significantly at Flagstaff Airport, thus the local operations forecast assumes a growth associated with the based aircraft ratio. As can be seen from the table, the local share of the national market will also remain constant in this scenario.

Exhibit 2F provides a summary of the general aviation local operations forecasts for FLG along with the **1991 Master Plan** and the **FAA Terminal Area Forecasts** for 2001. The previous master plan forecast has proven to be optimistic while the more recent **TAF** anticipates some growth, although lower than that projected here.

AIR CARGO FORECASTS

Air cargo is basically comprised of air freight and air mail. Both are handled by the passenger airlines as well as by all-cargo airlines. The enplaned and deplaned freight recorded at FLG since 1998 is reported on **Table 2K**.



FLAGSTAFF
PULLIAM AIRPORT

Exhibit 2F
GENERAL AVIATION OPERATIONS

TABLE 2J
General Aviation Local Operations Forecast
Flagstaff Pulliam Airport

		U.S. ATCT GA			
Year	**FLG GA Itinerant**	**Itinerant (millions)**	**FLG Market Share (%)**	**FLG Based AC**	**Local Ops Per AC**
1990	22,774	17.1	0.133%	106	215
1991	23,754	16.6	0.143%	110	216
1992	21,513	16.3	0.132%	110	196
1993	17,611	15.5	0.114%	110	160
1994	17,459	15.2	0.115%	110	159
1995	16,192	15.1	0.107%	110	147
1996	13,468	14.5	0.093%	110	122
1997	10,450	15.2	0.069%	110	95
1998	13,916	16.0	0.087%	100	139
1999	17,811	17.0	0.105%	112	159
2000	17,450	17.0	0.103%	112	156
2001	17,829	16.2	0.110%	112	159
2002	16,033	15.3	0.105%	116	138
2003	15,363	14.9	0.103%	116	132
FORECAST					
2010	20,800	19.0	0.109%	130	160
2015	21,920	20.0	0.110%	137	160
2025	24,340	22.1	0.110%	152	160

Besides America West Express, the airport is also served by four small all-cargo airlines. This includes FedEx, Airborne, UPS, and US Delivery. All use small commuter aircraft such as the Cessna Caravan or the Piper Navajo. All operate from the general aviation ramp. Flagstaff's proximity to Phoenix, combined with the recreational and tourism economy, does limit the level of air cargo shipped from FLG. A continued broadening of the local economic based could also increase demand.

After a decline in 2001, air cargo has been recovering to previous levels. Volumes around 1,000 annual tons can be expected with the type and size of commuter aircraft that have been serving FLG. With the potential for service by regional jets, there will be opportunities for increases in air cargo. The cargo potential was projected to increase at a rate similar to the seating capacity and frequency of airline flights in the future. This is reflected in **Table 2K**, where air cargo is projected to grow to 4,300 tons over the planning period.

TABLE 2K
Air Cargo Forecasts
Flagstaff Pulliam Airport

Year	Enplaned Tons	Deplaned Tons	Total Tons
1998	516	580	1,096
1999	457	615	1,072
2000	460	609	1,069
2001	424	441	865
2002	436	524	860
2003	434	500	934
FORECAST			
2010	733	988	1,721
2015	1,065	1,437	2,502
2025	1,844	2,487	4,332

OTHER AIR TAXI

The air taxi category includes aircraft involved in on-demand passenger or small parcel transport. The control tower counts air taxi in the same category as commuter airline operations. Since the airport keeps track of airline operations from the airline landing reports, the commuter operations can be subtracted from the tower count to determine the air taxi operations**.**

In 2000, the tower counted 7,470 air taxi and commuter operations. The commuter airlines reported a total of 2,340 landings for a total of 4,680 annual operations. Thus there were 2,790 other air taxi operations. In 2002, there were 9,289 operations in the tower count, and 3,324 were by the commuters, leaving 5,965 other air taxi operations.

September 11 may have been a factor in more than doubling air taxi operations at FLG in two years. Air taxi operations continued to grow to 6,376 in 2003. While not being experienced at every airport across the country, some are experiencing an increase in air taxi use by businesses for air travel that avoids the security issues at airport terminals.

This growth is not expected to be continue to be so pronounced, but growth in general aviation business travel is expected to continue. For this Master Plan Update, other air taxi operations are projected to grow at a rate similar to that of general aviation itinerant operations. The air taxi forecasts are presented on **Table 2L**.

TABLE 2L
Air Taxi And Military Operations
Flagstaff Pulliam Airport

	Air Taxi	Military
ACTUAL		
2000	2,790	327
2001	4,525	688
2002	5,965	824
2003	6,376	955
FORECAST		
2010	6,600	800
2015	7,100	800
2025	8,200	800

MILITARY

Military activity accounts for the smallest portion of the operational traffic at FLG. Since 1990, annual military operations have fluctuated between a high of 1,088 in 1990 and a low of 301 in 1997. Between 1990 and 2002, military operations have averaged 522 annually. While the percentage fluctuates from year-to-year, itinerant operations average two-thirds of all military operations at the airport.

The **1991 Master Plan** projected military operations to average 400 annually. For the purposes of this Master Plan update, military operations were projected to average 800 per year over the planning period. **Table 2L** includes the military forecast.

SUMMARY

This chapter has outlined the various activity levels that might be anticipated over the planning period. Airline passenger activity has good potential for growth, provided the airport is prepared to accommodate the expected transition by the primary commuter airlines to a full fleet of regional jets. This, coupled with additional flights to more destinations and relatively competitive air fares, could allow FLG to re-capture some of its market that is currently driving to Phoenix Sky Harbor Airport.

Based aircraft at FLG have not grown appreciably in the past decade. This can be attributed, at least in part, to no net change in the number of hangar spaces available. There is a demand for hangars that is not being met. Should additional hangars be developed, growth in based aircraft can be expected. General aviation operations will also follow suit, although some growth in itinerant operations can be expected regardless.

Air cargo activity will be dependent somewhat on the types of aircraft that the airlines utilize in the future. Other air taxi operations have grown at FLG in the aftermath of September 11, 2001. They can be expected to continue to grow with increased business use of general aviation. Military activity is expected to continue to be a small part of the mix at Flagstaff Pulliam Airport.

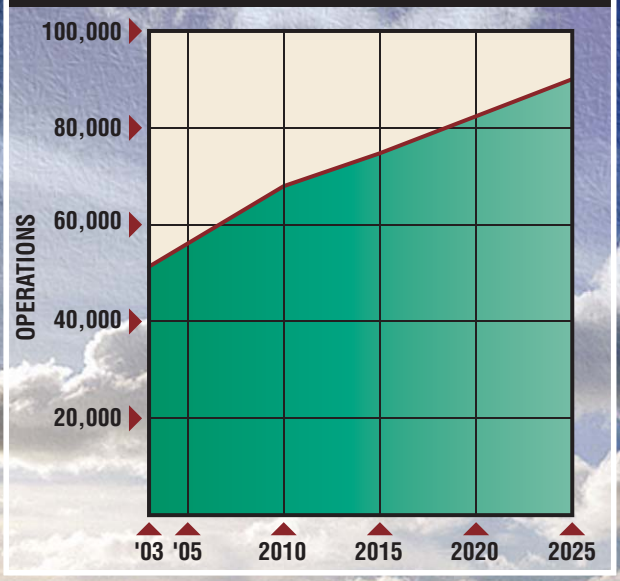
Exhibit 2G is a summary of the aviation forecasts prepared in this chapter. Actual activity is included for 2001 as well as estimated activity for 2002 based upon extrapolations from nine months of data. This column will be updated to actual figures prior to completion of this master plan.

02MP09-2G-7/6/05

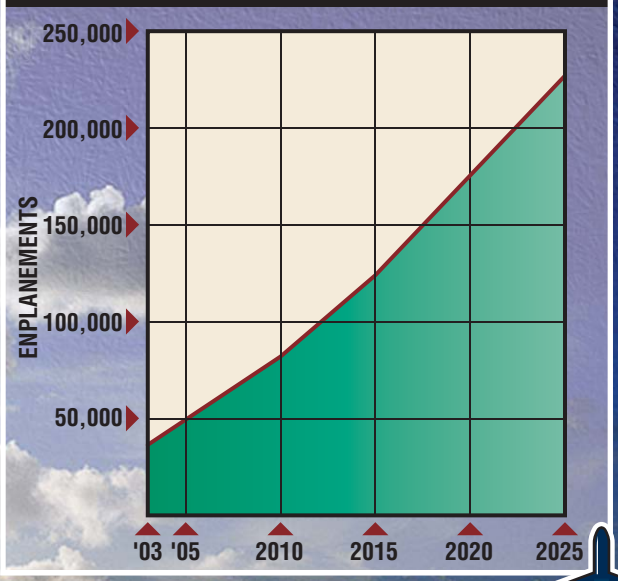
SUMMARY OF AVIATION ACTIVITY FORECASTS

CATEGORY	Actual 2002	Actual 2003	Forecasts 2010	Forecasts 2015	Forecasts 2025
Annual Operations					
General Aviation					
Itinerant	27,447	25,541	32,200	34,600	39,800
Local	16,033	15,363	20,800	21,900	24,300
Total General Aviation	**43,480**	**40,904**	**53,000**	**56,500**	**64,100**
Airline	3,324	3,118	5,600	8,200	14,200
Other Air Taxi	4,965	6,376	6,600	7,100	8,200
Military	824	955	800	800	800
Total Operations	**53,593**	**51,353**	**66,000**	**72,600**	**87,300**
Annual Enplanements					
Enplaned Passengers	**37,257**	**36,400**	**82,000**	**124,000**	**227,000**
Based Aircraft					
Single Engine	99	99	110	115	125
Multi-Engine	7	7	8	8	8
Turboprop	7	7	8	9	10
Jet	1	1	2	4	7
Rotorcraft	2	2	3	3	4
Total Based Aircraft	**116**	**116**	**131**	**139**	**154**
Annual Air Cargo					
Total Cargo (Tons)	**960**	**934**	**1,700**	**2,500**	**4,300**

Operations Forecast



Enplanements Forecast



FLAGSTAFF PULLIAM AIRPORT

Exhibit 2G
FORECAST SUMMARY

The next step in the planning process is to assess the capacity of the existing facilities to determine what upgrades may be necessary to meet future demands. The forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve milestones or activity benchmarks in evaluating facility requirements. Peak activity characteristics will also be determined for the various activity levels for use in determining facility needs.

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PULLIAM AIRPORT

Chapter Three
FACILITY REQUIREMENTS

Facility Requirements

In this chapter, existing components of the airport are evaluated so that the capacities of the overall system are identified. Once identified, the existing capacity is compared to the forecast activity levels prepared in Chapter Two to determine where deficiencies currently exist or may be expected to materialize in the future. Once deficiencies in a component are identified, a more specific determination of the approximate sizing and timing of the new facilities can be made.

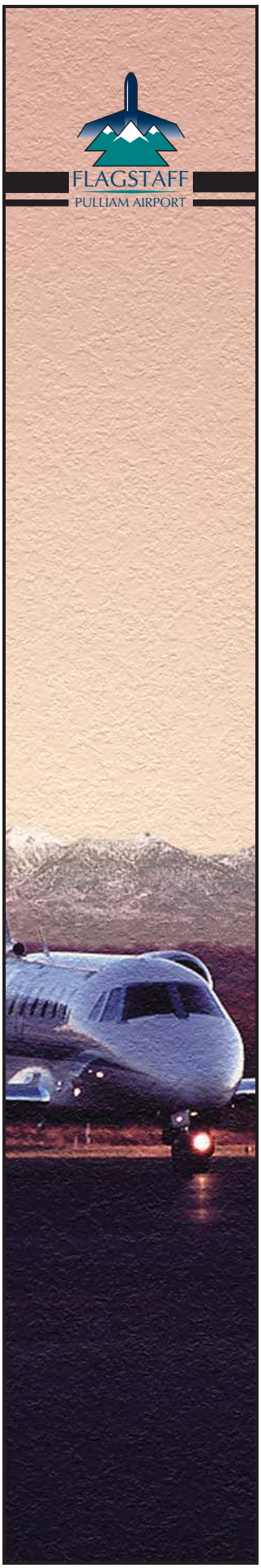
As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. The components include:

- Runways
- Taxiways
- Navigational Approach Aids
- Airfield Lighting, Marking, and Signage

Landside facilities are needed for the interface between air and ground transportation modes. This includes components for commercial service and general aviation needs such as:

- Passenger Airline Terminal
- General Aviation Terminal
- Aircraft Hangars
- Aircraft Parking Aprons
- Auto Parking and Access
- Airport Support Facilities

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what new facilities may be needed and when they may be needed to accommodate forecast demands. Having established these facility requirements,



alternatives for providing these facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

PLANNING HORIZONS

Cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. Thus, in order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones has been established that takes into consideration the reasonable range of aviation demand projections.

It is important to consider that, over time, the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts, or changes in the aviation demand. It is important to plan for these milestones so that airport officials can respond to unexpected changes in a timely fashion. As a result, these milestones provide flexibility, while potentially extending this plan's useful life if aviation trends slow over the period.

The most important reason for utilizing milestones is to allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as the schedule can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

ATCT COUNT ADJUSTMENT

The planning horizon operational activity levels in **Table 3A** represent the actual operations counted by the airport traffic control tower (ATCT). They will remain the milestones for monitoring growth and activity because tower count is readily available.

The Flagstaff ATCT is not a 24-hour tower, so the count is not all-inclusive of operations at the airport. Certain elements of the planning analyses, however, require that all the airport activity be considered. For these evaluations, it is necessary to estimate and adjust for operations that occur when the tower is closed.

The Flagstaff ATCT hours are from 7:00 a.m. to 7:00 p.m. from October through March. From April through September, the hours are extended from 6:00 a.m. to 9:00 p.m. The commercial service operations were derived from the landing reports of the airline and do not need to be adjusted. The other operations were adjusted based upon information obtained from flight plans and airport management estimates.

TABLE 3A
Aviation Demand Planning Horizons
Flagstaff Pulliam Airport

	2002	Short Term	Intermediate Term	Long Term
ANNUAL OPERATIONS				
Airline	3,324	4,800	8,200	14,200
Air Taxi	5,965	6,400	7,100	8,200
Military	824	800	800	800
General Aviation				
Itinerant	27,447	31,300	34,600	39,800
Local	16,033	20,400	21,900	24,300
TOTAL OPERATIONS	53,593	63,700	72,600	87,300
ANNUAL ENPLANEMENTS				
Enplaned Passengers	37,257	70,000	124,000	227,000
BASED AIRCRAFT	116	131	139	154

The flight plan review indicated that the air ambulance aircraft are often deployed in the evening and overnight hours. As a result, the air taxi adjustment is the highest of the various categories (21 percent). Military activity was adjusted 10 percent while general aviation itinerant operations were adjusted by 12 percent, and GA local operations by eight percent. **Table 3B** outlines the adjusted operations.

PEAKING CHARACTERISTICS

Airport capacity and facility needs analyses typically relate to the levels 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 when peak passenger volumes of aircraft operations occur.
- **Design Day** - The average day in the peak month. This indicator is easily derived by dividing the peak month operations by the number of days in a month.
- **Busy Day** - The busy day of a typical week in the peak month. This descriptor is used primarily to determine general aviation transient ramp space requirements.
- **Design Hour** - The peak hour within the design day.

TABLE 3B
Adjusted Aircraft Operations
Flagstaff Pulliam Airport

	2002	Short Term	Intermediate Term	Long Term
Airline	3,324	4,800	8,200	14,200
Air Taxi	7,127	7,700	8,600	9,900
Military	880	900	900	900
General Aviation				
Itinerant	30,659	35,100	38,800	44,600
Local	17,488	22,000	23,600	26,200
Total Operations	59,478	70,500	80,100	95,800

Aircraft operations adjusted to account for those that occur overnight when ATCT is not operating.

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.

Airline Peak Periods

Passenger peaking activity at FLG was reviewed dating back to 1997. The peak passenger demands at FLG fall between May and October. Since 1997, the peak month totals have fluctuated around 11 percent of the annual enplaned passengers.

Hourly passenger activity is examined as a percentage of the daily activity. At smaller airports, this can be greatly affected by the number of flights and the aircraft seats available during the design hour. At FLG, there are presently four daily flights, spread throughout the day. Each is conducted utilizing the 37-seat Dash 8.

With a single arrival during the design hour, the current design hour passenger was considered to be the seating capacity of the aircraft. As traffic increases it can be anticipated that additional airlines will enter the market and/or more nonstop destinations will be added. This will increase the operations during the design hour. As design hour flights are added, the design hour passengers will not necessarily equal the seating capacity of the aircraft. This is reflected in the airline peaking characteristics summarized in **Table 3C.** At the long term planning horizon of 227,000 enplaned passengers, the airport could expect four arrivals and four departures during the design hour along with up to 190 passenger enplanements.

TABLE 3C
Peaking Characteristics
Flagstaff Pulliam Airport

	2002	Short Term	Intermediate Term	Long Term
ENPLANEMENTS				
Annual	37,257	70,000	124,000	227,000
Peak Month	4,005	7,700	13,600	25,000
Design Day	134	260	450	830
Design Hour	37	85	130	190
OPERATIONS				
Airline				
Annual	3,324	4,800	8,200	14,200
Peak Month	288	420	720	1,240
Design Day	10	14	24	42
Design Hour	2	4	6	8
General Aviation Itinerant				
Annual	27,447	31,300	34,600	39,800
Peak Month	2,919	3,380	3,740	4,300
Design Day	98	113	125	143
Busy Day	124	142	158	180
Design Hour	14	16	18	20
Total Airport				
Annual	53,593	63,700	72,600	87,300
Peak Month	5,488	6,630	7,550	9,080
Design Day	183	221	252	303
Design Hour	29	34	38	44

General Aviation Peak Periods

Over the past ten years, the peak month for general aviation itinerant operations has occurred during the summer months of June through September. June was the peak month five times over that period. Over that same ten-year period, the peak month averaged 10.8 percent of the annual itinerant general aviation operations.

Daily operational counts from the ATCT were utilized to determine a busy day peaking factor for itinerant general aviation activity. During the peak month over the last five years, the peak day of each week averaged 18 percent of the week. This equates to a busy day, 26 percent higher than the average design day.

The design hour for itinerant operations was calculated as 14 percent of the design day operations, but can be expected to decline slightly as activity increases over the long term. **Table 3C** summarizes the general aviation peak activity projections for each planning horizon.

Total Operations Peak Periods

The peaking characteristics of the overall operations are utilized in examining the operational capacity of the airfield. The peak month for total operations has averaged 10.4 percent over the last 10 years. Over that time, the peak month was August five times, June four times, and July once.

Design hour operations were calculated as 16 percent of the design day. This can be expected to decline as activity increases. **Table 3C** also summarizes the peak activity projections for the total operations planning horizons.

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** of a runway measures the maximum number of aircraft that can take place in an hour. The **annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given time frame. FAA Advisory Circular 150/5060-5 **Airport Capacity and Delay** provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to Flagstaff Pulliam Airport FLG:

- **Runway Configuration** - A single runway configuration with a full length parallel taxiway, and an instrument approach from the north.

- **Runway Use** - Runway 21 is designated as the calm wind runway and is used approximately 75 percent of the time.

- **Exit Taxiways** - Based upon mix, only taxiways between 3,000 feet and 5,500 feet count in the exit rating. There are at least three exits available within this range for each runway. Therefore, the exit rating is the maximum of three for both Runway 3 and 21.

- **Weather Conditions** - The airport operates under visual flight rules (VFR) 92.5 percent of the time. Instrument flight rules (IFR) occur when cloud ceilings are between 500 and 1,000 feet and visibility is between one and three statute miles. This occurs 6.5 percent of the time. Poor visibility conditions apply for minimums below 500 feet and one mile. This occurs one percent of the time.

02MP09-3A-2/4/03

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits

WEATHER CONDITIONS

VFR

IFR

PVC

AIRCRAFT MIX

A&B

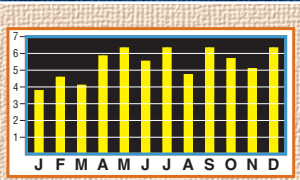
C

D

OPERATIONS

Arrivals and Departures

Total Annual Operations



Touch-and-Go Operations

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 3A
AIRFIELD CAPACITY FACTORS

- **Aircraft Mix** - Description of the classifications and the percentage mix for each planning horizon is presented on **Table 3D**.

- **Percent Arrivals** - Generally follows the typical 50-50 percent split.

- **Touch-and-Go Activity** - Percentages of touch-and-go activity are presented in **Table 3D**.

- **Operational Levels** - Operational planning horizons were outlined in the previous section of this chapter. The peak month averages 10.4 percent of the year. The peak hour currently averages 16 percent of the operations in a day, and will decline to 14 percent as operations increase over the long term.

TABLE 3D
Aircraft Operational Mix - Capacity Analysis
Flagstaff Pulliam Airport

Aircraft Classification	Current	Short Term	Intermediate Term	Long Term
VFR				
Classes A & B	82%	80%	76%	70%
Class C	18%	20%	24%	30%
Class D	0%	0%	0%	0%
IFR				
Classes A & B	32%	29%	25%	21%
Class C	68%	71%	75%	79%
Class D	0%	0%	0%	0%
Touch-and-Go's	24%	26%	24%	22%

Definitions:
Class A: Small single-engine aircraft with gross weight of 12,500 pounds or less.
Class B: Small twin-engine aircraft with gross weight of 12,500 pounds or less.
Class C: Large aircraft with gross weights over 12,500 pounds up to 300,000 pounds.
Class D: Large aircraft with gross weights over 300,000 pounds.

HOURLY RUNWAY CAPACITY

Based upon the input factors, current and future hourly capacities for the various operational scenarios at Flagstaff Pulliam Airport were determined. The hourly operational capacity today during VFR is 94 operations per hour. During IFR, the hourly capacity of the runway drops to

55 operations per hour. This is due to increased spacings required between aircraft during IFR conditions.

As the mix of aircraft operating at an airport changes to include a higher percentage of large aircraft (weighing over 12,500 pounds), the hourly capacity of the system declines. As indicated on **Table 3D**, the percentages of Class C aircraft will increase with the planning horizon activity milestones. This results in a decline in the hourly capacity.

The weighted hourly capacity reflects the average capacity of the airfield taking into account VFR, IFR, and PVC conditions. The current and future weighted hourly capacities are depicted in **Table 3E**. At Flagstaff Pulliam Airport, the current weighted hourly capacity is 86 operations. This is expected to decline to 75 operations in the long term. This is still well above the design hour of 44 operations expected in the long term.

TABLE 3E
Airfield Demand/Capacity Summary
Flagstaff Pulliam Airport

	PLANNING HORIZON			
	Base Year (2002)	**Short Term**	**Intermediate Term**	**Long Term**
Operational Demand				
Annual (Adjusted)	59,478	70,500	80,100	95,800
Design Hour	29	34	38	44
Capacity				
Annual Service Volume	177,000	177,000	169,000	163,000
Weighted Hourly Capacity	86.4	85.5	80.0	74.6
Delay				
Per Operation (Min.)	0.20	0.25	0.30	0.50
Total Annual (Hrs.)	199	294	401	798

ANNUAL SERVICE VOLUME

The weighted hourly capacity is utilized to determine the annual service volume in the following equation:

$$ASV = C \times D \times H$$

C = weighted hourly capacity;

D = ratio of annual demand to the average daily demand during the peak month; and

H = ratio of average daily demand to the design hour demand during the peak month.

The ratio of annual demand to average daily demand (D) was determined to be

288 for FLG. This is expected to remain relatively constant over the long range planning period. The ratio of average daily demand to average peak hour demand (H) was determined to be 6.98. This ratio was also projected to increase to 7.62 by the long term planning horizon. The current ASV was determined to be 177,000 operations. As mentioned earlier, the percentage of Class C aircraft utilizing the airport is expected to increase as activity increases. This will result in a decline in the annual service volume to 163,000 as operations increase over the long term. With adjusted operations in 2002 totaling 59,478, the airport is currently at 34 percent of its annual service volume. Long range adjusted annual operations are forecast to reach nearly 95,800 operations which would be 59 percent of the airport's ASV. **Table 3E** summarizes the airport's ASV over the long range planning horizon.

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside of the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by air traffic control.

Table 3E summarizes the aircraft delay analysis conducted for Flagstaff Pulliam Airport. Current annual delay is a minimal 199 hours. As an airport's operations increase toward the annual service volume, delay increases exponentially. Analysis of delay factors for the long range planning horizon indicate that annual delay can be expected to reach 798 hours. This is still not considered a significant level of delay.

CAPACITY ANALYSIS CONCLUSIONS

Exhibit 3B compares annual service volume to existing and forecast operational levels at Flagstaff Pulliam Airport. The current operations level represents 33 percent of the airfield's annual service volume. By the end of the planning period total annual operations are expected to represent 59 percent of annual service volume.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (*NPIAS*), indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 percent of the annual service volume. This would just be reached at the long term planning horizon. While the airfield should have adequate operational capacity through the long term planning horizon, consideration should be given in the plan to reserve space for a parallel runway, should activity extend beyond the planning milestones.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and

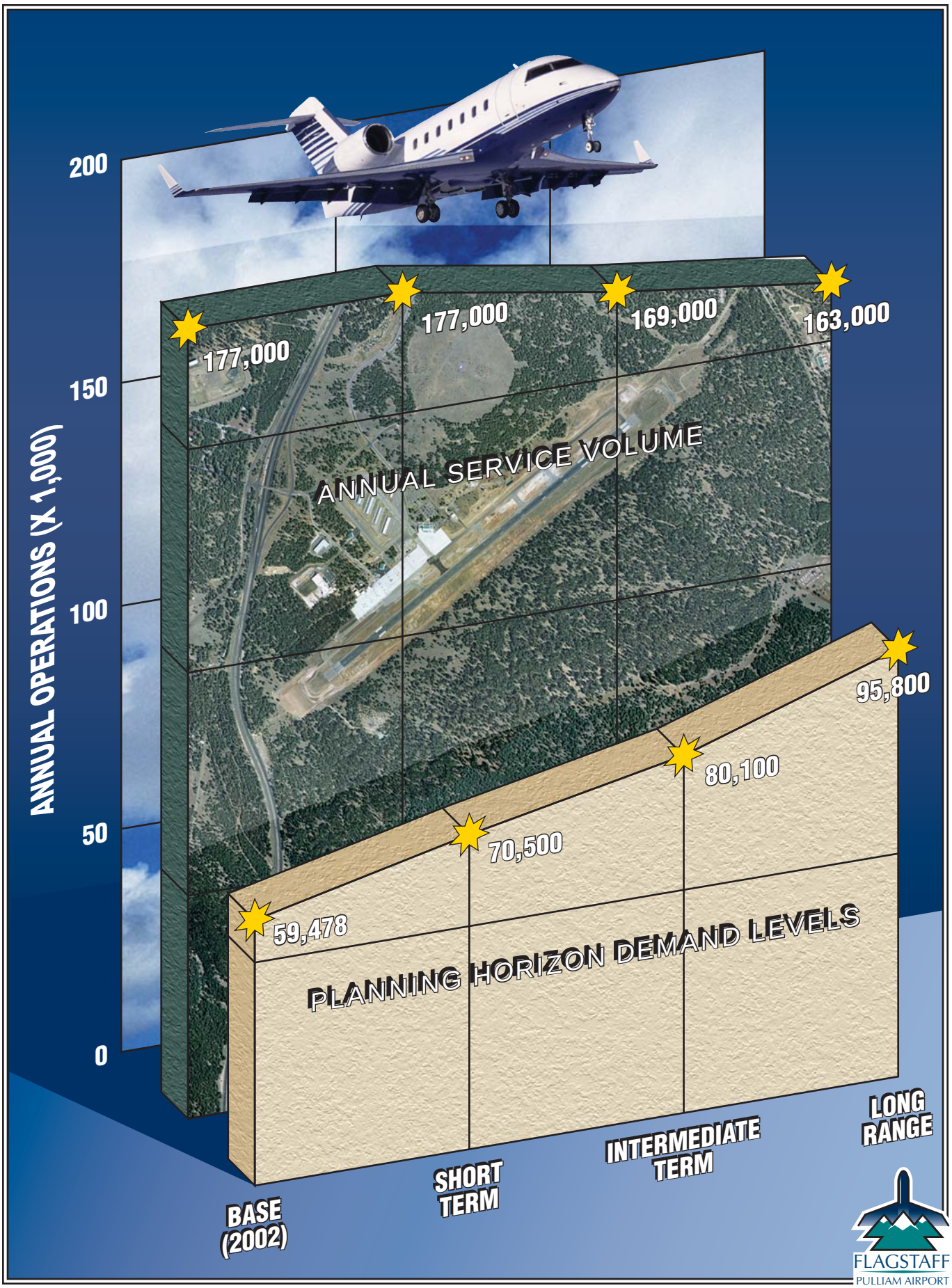


Exhibit 3B
AIRFIELD DEMAND VS. CAPACITY

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

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This airport reference code (ARC), has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADGs used in airport planning are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

Exhibit 3C summarizes representative aircraft by ARC.

In order to determine several airfield design requirements, the critical

02MP09-3C-7/5/05

A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Piper Archer
- Piper Seneca

B-I less than 12,500 lbs.

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

B-II less than 12,500 lbs.

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

B-I, II over 12,500 lbs.

- Super King Air 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation** II, **III**, IV, V
- Saab 340
- Embraer 120

A-III, B-III

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

C-I, D-I

- Beech 400
- **Lear** 25, 31, **35**, 45, 55, 60
- Israeli Westwind
- HS 125-400, 700

C-II, D-II

- Cessna Citation X
- **Gulfstream** II, III, **IV**
- Canadair 600
- Canadair Regional Jet
- Lockheed JetStar
- Super King Air 350

C-III, D-III

- Boeing Business Jet
- B 727-200
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

C-IV, D-IV

- **B-757**
- B-767
- DC-8-70
- DC-10
- MD-11
- L1011

D-V

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

Note: Aircraft pictured is identified in bold type.

FLAGSTAFF PULLIAM AIRPORT

Exhibit 3C
AIRPORT REFERENCE CODES

aircraft and critical ARC should first be determined, then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Flagstaff Pulliam Airport. **Table 3F** provides a projected breakdown of planning horizon operations by airport reference code.

TABLE 3F
Airport Reference Code (ARC) Mix
Flagstaff Pulliam Airport

		ANNUAL OPERATIONS		
Reference Code	**2002**	**Short Term**	**Intermediate Term**	**Long Term**
A, B-I	48,253	55,950	59,800	66,000
A, B-II	5,762	6,800	7,900	9,700
A, B-III	3,414	150	300	600
C-I	1,450	1,600	1,850	2,200
C-II	330	5,550	9,400	15,800
C-III	37	100	375	700
D-I	104	150	150	200
D-II	106	150	250	500
D-III	22	50	75	100
Total	59,478	70,500	80,100	95,800

Note: Operations based upon adjusted ATCT count.

From the table, it is evident that C-I currently has well over 500 annual operations with 1,450. ARC C-II has just 330 operations, but if those in higher ARC's (D-II, C-II, and D-III) are included they total 495 operations. This is just short of 500 operations, however, the runway design standards for C-I, C-II, D-I, and D-II are essentially the same.

Consideration must also be given, to aircraft at a slower approach speed, but larger wingspans. The larger wingspan will determine the taxiway design standards. The Dash 8 flown by Mesa Airlines is only Approach Category A but Design Group III. **As a result, the current design ARC for Flagstaff Pulliam Airport is a combination of C-II and A-III.**

In the future, more aircraft in each ARC can be expected. From the table, ARC D-II and C-III would reach the 500 annual operation threshold by the long term planning horizon. C-III would become the most demanding on airfield design standards. **Therefore, it is recommended that Flagstaff Pulliam Airport be planned to ultimately accommodate ARC C-III.**

AIRFIELD REQUIREMENTS

The analyses of the operational capacity and the critical design aircraft are used to determine airfield needs. This includes, runway configuration, dimensional standards, pavement strength, as well as navigational aids, lighting, and marking.

RUNWAY CONFIGURATION

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. The airfield capacity analysis indicated that additional runway capacity should not be needed within the long range planning horizon. Beyond that activity level, however, capacity enhancements may need to be considered. As a result, the Master Plan may consider reserving space for capacity improvements should activity exceed the planning horizon milestones of this Master Plan. This should be a factor considered during the formulation and evaluation of alternatives.

FAA Advisory Circular 150/5300-13, Change 1, **Airport Design** recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARC A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; and 16 knots (18 mph) for ARC A-III, B-III, and C-I through D-II, and 20 knots for ARC C-III through D-IV.

The most recent 10 years of wind data specific to the Flagstaff Pulliam Airport at the time of this analysis was 1993-2002. This data is graphically depicted on the wind rose in **Exhibit 3D**. The orientation of Runway 3-21 provides 98.8 percent coverage for 10.5 knot crosswinds. Thus, the single runway orientation has adequate wind coverage for all sizes and speeds of aircraft. For this reason, a second runway strictly for crosswind purposes should not be necessary.

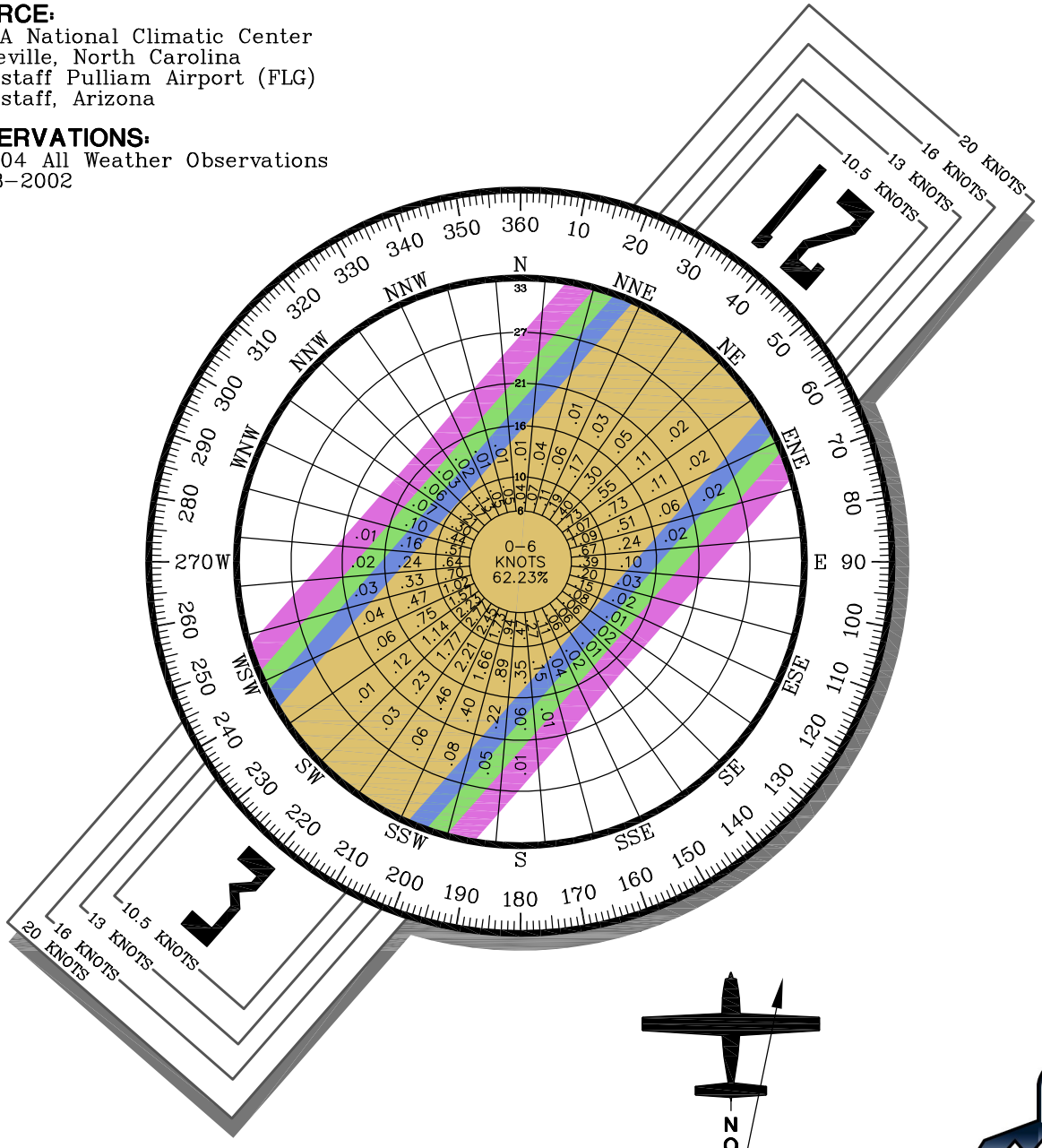
RUNWAY DIMENSIONAL REQUIREMENTS

Runway dimensional standards include the length and width of the runway as well as the dimensions associated with runway safety areas and other clearances. These requirements are based upon the design aircraft, or group of aircraft. The runway length must consider the performance characteristics of individual aircraft types, while the other dimensional standards are generally based upon the most critical airport reference code expected to use the runway. The dimensional standards are outlined for the planning period for the primary runway as well as for a potential parallel runway to meet future capacity demand.

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3–21	*98.82%*	*99.60%*	*99.94%*	*99.99%*

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Flagstaff Pulliam Airport (FLG)
Flagstaff, Arizona

OBSERVATIONS:
78,804 All Weather Observations
1993–2002



Magnetic Variance
11.61° East (April 2005)
Annual Rate of Change
2.41' West (April 2005)

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 3D
ALL WEATHER WIND ROSE

Runway Length

The aircraft performance capability is a key factor in determining the runway length needed for takeoff and landing. The performance capability and, subsequently, the runway length requirement of a given aircraft type can be affected by the elevation of the airport, the air temperature, the gradient of the runway, and the operating weight of the aircraft.

The airport elevation at Flagstaff Pulliam Airport (FLG) is 7,014 feet above mean sea level (MSL). The temperature commonly used for design is the mean maximum daily temperature during the hottest month. According to the National Weather Service, that occurs in July in Flagstaff and is 81.9 degrees Fahrenheit (F). The elevation varies by 17 feet from its high (7,014 feet) to its low (6,994 feet) for a runway gradient of 0.23 percent.

In the past, the critical aircraft at most commuter service airports such as Flagstaff have been business jets. This has been, at least in part, because most commuter aircraft were turboprops that generally require less runway length than jets. The advent of regional jets, however, has changed that in some locations. While relatively efficient on 7,000 feet or less runway length at lower elevations, most regional jets have been found to require significantly more length at higher elevation airports such as FLG. Another consideration at high elevation is the performance of piston-powered aircraft. Piston aircraft that are not turbo-charged often require significantly more runway length at higher elevation airports.

The aircraft load is dependent upon the payload of passengers and/or cargo plus the amount of fuel on board. For departures, the amount of fuel varies depending upon the length of nonstop flight, or trip length. This can vary for commuter and general aviation aircraft. As a result, the runway requirements for each are evaluated to determine the critical length for Flagstaff Pulliam Airport.

- AIRLINE REQUIREMENTS

At the present time, scheduled commercial service flights use turboprop aircraft. These include the 37-seat Dash 8 and the 19-seat Beech 1900. All scheduled service flights are to Phoenix Sky Harbor which is 119 nautical miles (nm) from FLG.

FLG's sole carrier, Mesa Airlines, has been reducing its turboprop fleet while growing its regional jet fleet. SkyWest Airlines, which has provided service to FLG in the past, has been replacing turboprops with regional jets. It is highly probable that Flagstaff's ability to maintain and improve upon its current level of air service will be dependent upon the airport's ability to accommodate regional jets.

Mesa Airlines provides service to the America West hub in Phoenix. SkyWest provides service to the Delta Airlines hub in Salt Lake City (391 nm). Other potential future destinations and

the flight distance from Flagstaff include Las Vegas (206 nm), Denver (490 nm), Los Angeles (392 nm), and San Francisco/Oakland (619 nm).

The Mesa and SkyWest fleets primarily utilize the Canadair Regional Jet (CRJ) 200. Mesa operates the CRJ 200ER, while SkyWest owns the 200LR. The aircraft has a 50-passenger seating capacity. Both operate the CRJ 700 aircraft as well. This aircraft typically serves larger markets than Flagstaff, however, it could serve FLG in the long term, after the market develops.

The runway length analysis for the CRJ determined that the 7,014-foot elevation of Flagstaff will restrict the takeoff weight to 44,800 pounds at the design temperature of 82 degrees F. This is 6,000 to 8,000 pounds less than the certified maximum takeoff length of the ER and LR models. This would require 8,700 feet of runway length at the design temperature. The operating empty weight of the aircraft is 30,500 pounds, leaving a maximum useful load of 14,300 pounds. When operating at its 50-seat capacity with an average payload of 200 pounds per passenger (10,000 pounds), the aircraft would be limited to 4,300 pounds of fuel. After allowing for auxiliary power units (APU), taxi, and reserve fuel requirements, it was determined that the maximum range with a full load from FLG would be approximately 520 miles.

This would allow the aircraft to fly nonstop to the most likely near term destinations of Phoenix and Salt Lake City, in addition to other future potential destinations such as Las Vegas, Denver, and the Los Angeles Basin. Some off-loading would be necessary to reach San Francisco in design day conditions.

To be able to maintain and improve service in the future, Flagstaff Pulliam Airport will need to be able to accommodate 50-passenger regional jet flights to hubs. Phoenix Sky Harbor Inter-national Airport is the current destination. This 119-mile flight would require a runway length of 7,800 feet. To allow for additional air service possibilities in the near term, regional jet flights to Salt Lake City (391 nm) should be planned. This trip length would require a length of 8,400 feet on the design day. The design day flight to Denver (490 nm) would need the maximum 8,700-foot runway length.

Landing length requirements were also evaluated. The maximum landing weight during design day conditions was determined to be 45,900 pounds. This would require a landing length of 6,600 feet during wet runway conditions. This is less than the current runway length. Subsequently, if necessary for airspace purposes, the landing area could be maintained within the current runway thresholds.

- GENERAL AVIATION REQUIREMENTS

Table 3G outlines the runway length requirements for various classifications of general aviation aircraft at Flagstaff Pulliam Airport. These were derived utilizing the FAA Airport Design

Computer Program for **Runway Lengths Recommended for Airport Design**. These runway lengths are based upon groupings or "families" of aircraft. As discussed earlier, the runway design required should be based upon the most critical family with at least 500 annual operations.

TABLE 3G
General Aviation Runway Length Requirements
Flagstaff Pulliam Airport

AIRPORT AND RUNWAY DATA	
Airport elevation	7,014 feet
Mean daily maximum temperature of the hottest month	81.90 F
Maximum difference in runway centerline elevation	21 feet
Length of haul for airplanes of more than 60,000 pounds	975 miles
Wet runway	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with approach speeds of less than 30 knots	510 feet
Small airplanes with approach speeds of less than 50 knots	1,360 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	6,000 feet
95 percent of these small airplanes	8,400 feet
100 percent of these small airplanes	8,400 feet
Small airplanes with 10 or more passenger seats	8,400 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	7,600 feet
75 percent of these large airplanes at 90 percent useful load	**8,800 feet**
100 percent of these large airplanes at 60 percent useful load	11,200 feet
100 percent of these large airplanes at 90 percent useful load	11,200 feet
Airplanes of more than 60,000 pounds	Approximately 8,800 feet

REFERENCE: Chapter 2 of AC 150/5325-4A, **Runway Length Requirements for Airport Design**, no Changes included.

Small aircraft are defined as aircraft weighing 12,500 pounds or less. Small airplanes make up the vast majority of general aviation activity at FLG and at most airports. In particular, piston-powered aircraft make up the majority of the small airplane operations. The performance of many piston aircraft is significantly affected at high elevation airports. As a result, the runway length requirement for these aircraft is 8,400 feet.

Larger airplanes of 60,000 pounds or less are typically comprised of business jets. The classifications listed on the table include 75 and 100 percent of the fleet. FAA Advisory Circular 150/5325-

4A, **Runway Length Requirements for Airport Design**, lists the following common aircraft in the 75 percent fleet classification:

- LearJet (20, 30, and 40 series)
- Rockwell Sabreliner (40, 60, 75, and 80 series)
- Cessna Citation (II, III)
- Dassault Falcon (10, 20, 50 series)
- HS-125 (400, 600, and 700 series)
- Israeli Westwind 1124

Flight plan data was utilized to better define the fleet mix of business jet aircraft utilizing Flagstaff. From this data, business jet operations were estimated at 2,100 (1,050 departures) in 2002.

Approximately 75 percent of the operations were conducted by aircraft in the 75 percent of the fleet category. Aircraft in the 100 percent category conducted 19 percent of the operations. Business jets weighing over 60,000 pounds conducted the remaining six percent.

A major corporate jet user of the airport is W.L. Gore Company, the largest private employer in Flagstaff. The company's corporate aircraft, an Israeli Westwind 1124, makes regular flights between New Castle County Airport in Delaware and Flagstaff. The flight distance between the two airports is 1,990 nautical miles. Over the course of a year, less than one-third of the trips can be flown non-stop from Flagstaff to New Castle. The other two-thirds of the flights must stop to refuel in either Colorado or Kansas. The percentage of trips the aircraft had to stop and refuel indicates that a longer runway for takeoff would be beneficial. Cooler temperatures and higher than normal tailwinds were likely contributors to the limited nonstop trips.

This aircraft fits into the 75 percent large airplane classification in the table. A runway length of 7,600 feet would accommodate these aircraft at 60 percent of their useful load. The useful load is the maximum certificated takeoff weight minus the operating empty weight. Sixty (60) percent loading will not generally permit aircraft in this category to fly nonstop to the east coast.

A useful load of 90 percent will generally accommodate cross-country flights by these aircraft, provided they have sufficient range. The Westwind has a maximum range of 2,440 miles with a full load of fuel. A runway length of 8,800 feet will accommodate the 75 percent classification at 90 percent useful load.

Business jets that exceed the 60,000 pound category make up six percent of the business jet traffic. These include the Gulfstream II, III, IV, and V, as well as the Global Express. The Boeing Business Jet (BBJ) also exceeds 60,000 pounds. The table indicates that this size of general aviation aircraft could operate on at least a 975-mile trip length from 8,800 feet of runway at FLG.

- CONCLUSIONS

The analysis above indicates that the current runway length at Flagstaff Pulliam Airport is not sufficient for existing general aviation needs. Aircraft serving one of the largest local employers on a regular basis face operational limitations. The airport serves over 2,100 business jet operations annually, yet the existing 7,000-foot runway does not meet the requirements for even the 75 percent family of business jets operating at 60 percent useful load. Small aircraft weighing less than 12,500 pounds can also be restricted from operations due to the available runway length.

In addition, the existing runway length is not adequate for the airport to accommodate daily scheduled flights by regional jets. With the commuter airline service becoming dominated by regional jets, a longer runway must be seriously considered.

Based upon the evaluations above, a runway length of 8,800 feet will best meet the needs of FLG's commercial service and general aviation users both in the near term as well as over the long term planning period.

Pavement Strength

An important feature of airfield pavement is the ability to withstand repeated use by aircraft of significant weight. Runway 3-21 is strength-rated at 30,000 pounds single wheel loading (SWL), 95,000 pounds dual wheel loading (DWL) and 140,000 pounds dual tandem loading (DTL).

The Dash 8 currently utilized by Mesa Airlines has a maximum ramp weight or 365,000 pounds on dual wheel gear. Most of the business jets currently utilizing the airport weigh less than 60,000 pounds on dual wheel gear. The Gulfstream V is the largest business jet to frequent the airport. Its maximum weight is 91,400 pounds on dual wheel gear. A similar aircraft, the Bombardier Global Express weighs a maximum of 95,000 pounds. Thus, the airport is capable of accommodating these current aircraft.

The Canadair Regional Jet (CRJ) 200 aircraft that Mesa Airlines uses weigh up to 53,000 pounds on dual wheel gear. The comparable Embraer Regional Jet (ERJ-145) has a similar weight. The 95,000 pound pavement strength will be adequate for most regional jets up to at least 78 passengers.

Occasional charters using commercial jets such as the Boeing 737-300 (124,500 pounds) would exceed the pavement strength. In addition, the Boeing Business Jet (BBJ) is a large corporate aircraft that can weigh over 170,000 pounds. Occasional use by these aircraft will not require the pavement to be strengthened. This type of aircraft, however, could eventually be utilized by an overnight package carrier. In that case, the pavement would need to be strengthened to at least 125,000 pounds DWL.

Dimensional Design Standards

Runway dimensional design standards define the widths and clearances required to optimize safe operations in the landing and takeoff area. These dimensional standards vary depending upon the ARC for each runway. **Table 3H** outlines key dimensional standards for the airport reference codes most applicable to Flagstaff Pulliam Airport now and in the future.

TABLE 3H
Airfield Design Standards
Flagstaff Pulliam Airport

Airport Reference Code	Current Runway 3-21	A-III (ft.)	C-II (ft.)	C-III (ft.)
Runway Width	150	100	100	100
Runway Safety Area				
Width	500	400	500	500
Length Beyond End	1,000	800	1,000	1,000
Runway Object Free Area				
Width	800	800	800	800
Length Beyond End	1,000	800	1,000	1,000
Runway Blast Pad				
Width	150	140	120	200
Length	200	200	150	200
Runway Centerline to:				
Holding Position	290	200	250	250
Parallel Taxiway	400	350	400	400
Parallel Runway	N/A	700	700	700
Taxiway Width	50	50	35	50
Taxiway Centerline to:				
Fixed or Movable Object	93	93	65.5	93
Parallel Taxilane	N/A	152	105	152
Taxilane Centerline to:				
Fixed or Movable Object	N/A	81	57.5	81
Parallel Taxilane	N/A	140	97	140
Runway Protection Zones - One mile or greater visibility				
Inner width	500	500	500	500
Length	1,700	1,700	1,700	1,700
Outer width	1,010	1,010	1,010	1,010
Category I				
Inner Width	1,000	1,000	1,000	1,000
Length	2,500	2,500	2,500	2,500
Outer Width	1,750	1,750	1,750	1,750

The primary runway at FLG should currently be designed to at least C-II and A-III standards, the airport's current critical ARC. Planning and development considerations should take into account the potential for C-III aircraft in the future. Room should be reserved for a future parallel runway that can meet at least B-II standards.

Runway 3-21 currently meets the dimensional standards for C-III aircraft depicted on **Table 3H**. The only area that may be considered deficient under the current design standard is the runway protection zone off the north end of the runway. There is a corner of the RPZ that is not under airport control either in fee simple or easement.

TAXIWAY REQUIREMENTS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

As detailed in Chapter One, Runway 3-21 is served by a full length parallel taxiway, and seven exit/entrance taxiways on the west side of the runway. With all the landside facilities currently being located on the west side of the airport, this taxiway system is adequate. Should future landside facilities be planned for the east side, a parallel taxiway may need to be planned for the west side.

Dimensional standards for the taxiways are depicted on **Table 3H**. The existing taxiways associated with the runway currently meet C-III standards.

Bottlenecks can often occur near the takeoff end of a runway when a preceding aircraft is not ready to take off and blocks the access taxiway for the next aircraft in line. Holding aprons provide flexibility in ground circulation by permitting departing aircraft to maneuver around an aircraft that is not ready to depart. Holding aprons are recommended when runway operations exceed 30 per hour. A holding apron is currently available along the south portion of the parallel taxiway. It is set 1,100 feet south of the north end so that aircraft hold behind the glide slope. A holding apron could be considered for the south end of the runway as well. However, it is a lower priority as only 25 percent of the departures use that runway end.

NAVIGATIONAL APPROACH AIDS

Navigational aids provide two primary services to airport operations, precision guidance to specific runway and/or non-precision guidance to a runway or the airport itself. The basic difference between a precision and non-precision navigational aid is that the former provides electronic descent, alignment (course), and position guidance, while the non-precision navigational aid provides only alignment and position location information. The necessity for such equipment is usually determined by design standards predicated on safety considerations and operational

needs. The type, purpose and volume of aviation activity expected at the airport are factors in the determination of the airport's eligibility for navigational aids.

The advancement of technology has been one of the most important factors in the growth of the aviation industry in the twentieth century. Many of the civil aviation improvements have been derived and enhanced from initial development for military purposes. The use of orbiting satellites to confirm an aircraft's location is one of the latest military developments to be made available to the civil aviation community.

Global positioning systems (GPS) use two or more satellites to derive an aircraft's location by a triangulation method. The accuracy of these systems has been remarkable, with initial degrees of error of only a few meters. As the technology improves, it is anticipated that GPS may be able to provide accurate enough position information to allow Category II and III precision instrument approaches, independent of any existing ground-based navigational facilities. In addition to the navigational benefits, it has been estimated that GPS equipment will be much less costly than existing precision instrument landing systems.

Currently, the best minimums to FLG are provided by the ILS/DME approach to Runway 21. This approach provides weather minimums down to 300-foot AGL cloud ceilings and ½-mile visibility. The best minimums to Runway 3 are provided by a GPS approach with a 500-foot ceiling and one-mile visibility. There is also a GPS approach to Runway 21 with similar minimums. As the technology improves, the airport should plan for a CAT I GPS.

As is evident from the IFR wind rose on **Exhibit 3D**, Runway 21 is used the most during IFR conditions. There are sufficient times when winds dictate the use of Runway 3 to justify a straight-in approach. When minimums are below 500 feet and one mile, however, winds tend to be from the southwest. In fact, winds from the northeast during CAT I conditions are almost nonexistent. Therefore, it is difficult to justify a CAT I approach to Runway 3 now or in the future.

Visual glide slope indicators provide visual descent guidance information during approach. There are two forms of these aids that have been regularly installed by the FAA at airports. They include precision approach path indicators (PAPI) and visual approach path indicators (VASI). At FLG, Runway 3-21 is currently equipped with VASI-4 for both approaches. These should meet existing and future needs.

Two types of automated weather observing systems are currently deployed at airports around the country. ASOS (automated surface observing system) and AWOS (automated weather observing system) both measure and process surface weather observations 24 hours a day, with reporting varying from one minute to hourly. The systems provide near real-time

measurements of atmospheric conditions.

ASOS is typically commissioned by the National Weather Service or the Department of Defense. AWOS is often commissioned by the Federal Aviation Administration for airports that meet criteria of either 8,250 annual itinerant operations or 75,500 annual local operations. Flagstaff Pulliam Airport currently has an ASOS operating on site.

FLG is presently served by an airport traffic control tower (ATCT) operated on a contract basis. Hours of operation may increase in the future as operations increase and as scheduled regional jet activity is initiated.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Runway identification lighting provides the pilot with a rapid and positive identification of the runway end. The most basic system involves runway end identifier lights (REILs). REILs should be considered for all lighted runways not planned for a more sophisticated approach light system (ALS). Runway 21 is presently equipped with a medium intensity approach light system with runway alignment indicator lights (MALSR). This system was needed to achieve the Category I minimums currently available on Runway 21. Runway 3 does not presently have any sort of runway identification lighting, but should be planned for REILs.

The high intensity runway edge lighting (HIRL) currently available along Runway 3-21 is appropriate for a runway with a CAT I approach. The taxiway system is lighted with medium intensity taxiway lighting (MITL) which will be adequate for the planning period. MITL should be planned for all future taxiways as well.

Lighted airfield signage on the primary runway currently meets FAR Part 139 standards. This will need to be extended to any new airfield pavements as well.

Precision runway marking should be maintained on Runway 34, as well as the non-precision markings on Runway 16. Basic taxiway marking will continue to be adequate and should be applied to all new taxiways as well.

The airport also has a lighted wind cone and segmented circle which provide pilots with information about wind conditions and the airport traffic pattern. In addition, an airport beacon assists in identifying the airport from the air at night. Each of these facilities should be maintained in the future.

AIRLINE TERMINAL

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

The review of the capacity and requirements for various terminal complex functional areas was performed with the guidance of Federal Aviation Administration Advisory Circular 150/5360-13, **Planning and Design Guidelines for Airport Terminal Facilities**. Facility requirements were updated to reflect the planning horizon year's milestones for enplanements. This included the current level (40,000) as well as milestone levels of 70,000, 124,000, and 227,000 annual enplaned passengers.

Airline terminal capacity and requirements were developed for the following functional areas:

- Airline Ticketing and Operations
- Security Screening
- Gates and Holdrooms
- Baggage Claim
- Terminal Services
- Administration/Support

Following the discussion of these areas, at the end of the chapter is a summary of the terminal building space requirements and a comparison to inventory values. In general, it was found that the current 21,700 square foot terminal will be adequate through the short term planning horizon, or at least 70,000 enplanements.

TICKETING AND AIRLINE OPERATIONS

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

The ticket lobby should be arranged so that the enplaning passenger has immediate access and clear visibility to the individual airline ticket counters upon entering the building. Circulation patterns should allow the option of bypassing the counters with minimum interference. Provisions for seating should be minimal to avoid congestion and encourage passengers to proceed to the gate area. Airline ticket counter frontage, counter area, counter queuing area, ticketing lobby and airline office and operations area requirements for each potential enplanement level have been calculated.

The analysis of the airline ticketing space indicates the area has capacity for as many as 120,000 annual enplanements, which would extend nearly to the short term planning horizon. As shown on **Table 3J**, it appears that the airline ticketing and operations area will be more than adequate to meet demand levels in the short term. Thus, the ticketing area should be adequate for at least the initial conversion to the 50-passenger aircraft. Beyond the 120,000 enplanement level, the airport will begin to experience congestion in this section of the terminal. By the long term horizon, the ticketing space will need to be increased by at least 50 percent to accommodate the traffic levels.

TABLE 3J
Terminal Building Requirements (square feet unless noted)
Flagstaff Pulliam Airport

		Enplanement Milestones			
	Building Space	**Existing**	**70,000**	**124,000**	**227,000**
AIRLINE TICKETING AND OPERATIONS					
Counter Frontage (l.f.)	62	18	30	48	***72***
Counter Area	320	180	300	***480***	***720***
Counter Queue	935	360	600	***960***	***1,440***
Lobby Area	375	180	300	***480***	***720***
Airline Operations	3,200	1,440	2,400	***3,840***	***5,760***
SECURITY					
Checked Baggage Search	–	***148***	***340***	***520***	***760***
Screening Station (#)	1	1	1	1	1
Screening Area	350	***600***	***600***	***600***	***600***
TSA Office	320	***400***	***400***	***400***	***400***
DEPARTURE GATES/HOLDROOMS					
Gates (#)	3	1	2	3	***4***
Holdroom Area	***1,500***	814	***1,870***	***2,860***	***4,180***
BAGGAGE CLAIM					
Claim Display (l.f.)	32	30	***68***	***104***	***152***
Display Area	200	178	***408***	***624***	***912***
Lobby Area	1,630	722	1,658	***2,535***	***3,705***
Bag Input	0	***281***	***646***	***988***	***1,444***
RENTAL CAR					
Counter Frontage (l.f.)	62	12	24	36	48
Counter/Office	1,500	240	480	720	960
Queue Area	375	72	144	***216***	***288***
TERMINAL SERVICES					
Food and Beverage	2,400	914	1,989	***2,958***	***4,199***
Shops	150	***274***	***597***	***887***	***1,260***
Other Concessions	200	183	***398***	***592***	***840***
Restrooms	850	500	597	***887***	***1,260***
Public Lobby	1,200	415	938	***1,424***	***2,063***
TOTAL PROCESSING SPACE	**15,595**	**7,718**	***14,266***	***21,379***	***30,671***
Circulation/Mech./Util.	5,215	3,287	***5,992***	***8,979***	***12,882***
Airport Administration	890	500	713	***1,069***	***1,534***
TOTAL TERMINAL PROGRAM	21,700	11,505	***20,971***	***31,426***	***45,086***

SECURITY SCREENING

Current security screening is positioned in the entrance to the departure holdroom in the terminal building. The capacity of a single station is approximately 300 per hour making the existing security area adequate through the long term planning milestone. These requirements are presented on **Table 3J**.

Checked baggage screening is currently conducted in a vacant portion of the ticket counter area. As traffic grows and additional airlines enter the market, this system will need to be modified. This will actually add to the space requirements in the ticketing lobby. At some point, a shared baggage room and baggage sorting system may be required.

DEPARTURE GATES AND HOLDROOMS

An airport terminal gate designates an aircraft parking position adjacent to a terminal building for the loading and unloading of passengers and baggage. The size and type of aircraft served, the parking arrangement and assignment procedures affect the number of gates, size and layout of the terminal gates.

In turn, the number of gates required to service the combined peak hour activity and the aircraft seating capacities determines holdroom capacity requirements. Holdrooms should be sized to provide adequate space and area for the largest group of aircraft that can use each gate. The requirement for gate podiums and check-in space are based on providing one full bay for each function at each individual gate.

The apron at the terminal has three marked parking positions spaced 125 feet apart. With the 85-foot wingspan of the Dash 8, this allows for 40 feet of clearance if parked side-by-side. The CRJ-200 has a 70-foot wingspan, allowing for even more clearance. In fact, the spacing is adequate to accommodate aircraft as large as a Boeing 737. All three positions are ground loaded, push-back or power-back positions.

With service from a single carrier, only one gate is needed, however, a second gate can serve as a back-up or be utilized by charters. As the traffic increases, the number of airlines and destinations will also increase. This will drive the need for additional gates as depicted in **Table 3J**. As many as four gate positions may be needed for the long term planning horizon. So the current gates should be adequate through at least the intermediate term.

The current holdroom is adequate for the current traffic levels. It will also be adequate to serve a single 50-seat regional jet. With space inside the holdroom utilized for security screening, holdroom space will begin to get tight if two regional jets' flights need to be accommodated at the same time. The entrance of another airline or introduction of a second destination would likely trigger the need for more holdroom space. The current holdroom capacity can be expected to be reached at approximately 60,000 annual enplanements, or prior to the short term

milestone. As shown on **Table 3J,** holdroom space requirements will be nearly three times the existing space by the long term planning horizon of 227,000 enplanements.

BAGGAGE CLAIM

The passenger arrival process consists primarily of those facilities and functions that reunite the arriving passengers with their checked baggage. The baggage claim facility needs for each planning horizon are included in **Table 3J**. The existing claim devices at FLG consist of a linear conveyor and an oversized bag drop. They are marginally adequate for current traffic, and will be taxed by a loaded 50-seat aircraft. The bag claim lobby is adequately-sized to approximately 70,000 annual deplaning passengers, the short term planning horizon. The frontage of the bag claim device, however, will need to be doubled in the short term. To meet the long term milestone, the bag claim would need to more than double again from the short term.

RENTAL CAR COUNTER

Similar to airline ticketing, rental car counter facilities include office, counter area, and queue areas. It appears that the current rental car counters could accommodate the long term planning horizon of 227,000 annual enplanements. The rental car requirements are presented on **Table 3J**.

TERMINAL SERVICES

The space allotted for concessions is presently underutilized. As traffic increases, more demand for food services, gift shops, and other concessions can be expected. As shown on **Table 3J**, there is adequate space for food and beverage to at least 100,000 enplanements. While the total space may be sufficient beyond the short term, much of the space is on the second floor. Other concessions appear to be undersized according to the figures, but there is presently little demand by retailers. The long term planning horizon of 227,000 annual enplanements would bring a need to double the concession space.

Public lobby areas are typically located for departing passengers to say farewell and to meet and greet arrivals. In today's environment, visitors must remain out of the secure departure areas, so a public lobby is important. The corridor around the holdroom was allocated as a public lobby for this analysis. The available area should be adequate for approximately 100,000 enplaned passengers. By the intermediate term, additional lobby area will become necessary. The long term planning horizon will place a demand for approximately 70 percent more space.

Existing restroom space will be adequate through the intermediate term, but will need to increase by almost 50 percent over the long term. **Table 3J** summarizes the space requirements for terminal services.

BUILDING SUPPORT AND ADMINISTRATION

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

The existing office space is located on the second level of the main terminal building. The future space for the airport administrative and operations offices will need to grow as activity develops. (See **Table 3J**).

TERMINAL REQUIREMENTS SUMMARY

The overall terminal space requirements for each planning horizon are summarized at the bottom of **Table 3J**. It is apparent that the existing terminal building can be adequate through the short term planning horizon with some modifications to allow for more baggage claim, and possibly additional space for security screening. There is sufficient space to allow the terminal to accommodate the initial change to 50-seat aircraft before considering any major modifications or expansions. If traffic does grow as anticipated, the terminal would need approximately 50 percent more space by the intermediate term planning horizon of 124,000 annual enplanements. More than double the current space would be required to accommodate the long term horizon of 227,000.

GENERAL AVIATION (GA) FACILITIES

General aviation facilities are those necessary for handling general aviation aircraft, passengers, and cargo 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

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 shade hangars or T-hangars, and executive or conventional hangars. Conventional hangars can include individual hangars or multi-aircraft hangars. These different types of hangars offer varying levels of privacy, security, and protection from the elements.

Demand for hangars varies with the number of aircraft based at the airport. Another important factor is the type of based aircraft. Smaller single engine aircraft usually prefer shade or T-hangars, while larger business jets will prefer conventional/ executive hangars. Rental costs will also be a factor in the choice.

Unlike other Arizona airports, FLG based aircraft do not have the desert heat as a factor in their storage choice. The higher elevations, however, make snow and ice a factor. The majority of aircraft owners still tend to prefer covered storage. For planning purposes, 85 percent of piston-powered aircraft were estimated to prefer shade or T-hangar storage. Five percent of the piston-powered aircraft were estimated to prefer conventional hangar storage. Ten percent would remain on apron tiedowns, although that percentage was projected to decline in future years to just five percent. All based turbine-powered aircraft and helicopters were planned to be hangared in conventional or executive hangars. The resulting facility requirements are shown on **Table 3K**.

TABLE 3K
Hangar Storage Requirements
Flagstaff Pulliam Airport

	Available	Existing	Short	Intermediate	Long
Based Aircraft					
Piston		105	117	122	132
Turbine		9	11	14	18
Rotor		2	3	3	4
Total Based Aircraft		116	131	139	154
Hangar Positions					
Shade/T-Hangars	80	89	102	107	119
Executive/Conventional	11	16	20	23	29
Total Hangar Positions	91	106	122	130	148
Hangar Area Requirements					
T-Hangars (s.f.)	76,200	84,800	96,700	102,000	112,900
Exec./Conv. (s.f.)	18,200	30,800	37,500	45,300	56,900
Service Hangar Area (s.f.)	7,500	20,300	22,900	24,300	27,000
Total Hangar Area (s.f.)	101,900	135,900	157,100	171,600	196,800

The next step in the process of determining hangar requirements involves estimating the area necessary to accommodate the required hangar space. The T-hangars and shades at FLG average 950 square feet per hangar space. Planning figures for conventional hangars suggest an area of 1,200 square feet for piston and rotary aircraft and 2,500 square feet for turbine aircraft. These figures were applied to the aircraft to be hangared. Requirements for maintenance and shop hangar area were estimated at 175 square feet per based aircraft.

Table 3K compares the existing hangar availability to the future hangar requirements. It is evident from the table that there is an immediate need for additional enclosed hangar storage space. This includes both T-hangars

and service hangar space. For planning purposes, all the space available in the FBO hangars was assumed to be utilized for service, even though it is cross-utilized for based and transient storage. The future requirements assume that the FBO service hangar area will be cross-utilized for transient storage, but not based storage.

GA PARKING APRON

Parking apron should be provided for at least the number of locally-based aircraft that are not stored in hangars, as well as transient aircraft. As discussed in the previous section, approximately five to 10 percent of the based single engine aircraft owners will still prefer ramp storage over the long range. Therefore, the parking apron should be sized to accommodate this demand through the planning period. FAA planning criterion of 350 square yards per tie-down was used to estimate the ramp area that would be needed for based aircraft. The number of local tie-downs and ramp space for the planning period is presented in **Table 3L.**

FAA Advisory Circular 150/5300-13 suggests a methodology by which transient apron requirements can be determined as 35 percent of busy-day operations. At Flagstaff Pulliam Airport, summer tourism with extended stays can be a factor, so the number of transient spaces required was estimated at a higher ratio of 50 percent. Planning criterion of 600 square yards per aircraft was applied to the number of transient spaces to determine future transient apron requirements. The transient apron space ratio is higher than that of the local apron, because it serves a larger variety of aircraft and is typically designed for taxi-through parking spaces.

The results of this analysis are presented in **Table 3L**. There are approximately 66,000 square yards of GA parking apron located around the airport. As shown in the table, the existing apron area should be adequate for the planning period if it is designated to GA use. Another consideration in the future, however, will be the location of the apron in relation to other facilities.

TABLE 3L
GA Apron Requirements
Flagstaff Pulliam Airport

	Available	Existing	Short	Intermediate	Long
Non-hangared Based Aircraft		10	9	9	7
Busy Day Itinerant Operations		124	142	158	180
Local Ramp Positions	35	10	11	9	7
Transient Ramp Positions	90	62	71	79	90
Total Ramp Positions	125	72	82	88	97
Apron Area (s.y.)	66,000	29,600	33,700	36,400	40,200

GA TERMINAL SERVICES

The general aviation facilities are often the first impression of the community that corporate officials or vacationers will encounter. General aviation terminal facilities at an airport provide space for passenger waiting, pilots' lounge and flight planning, concessions, management, storage, and various other needs. This can be accommodated in a single facility or spread throughout several fixed base operators.

The methodology used in estimating general aviation terminal facility needs was based upon the number of airport users expected to utilize general aviation facilities during the design hour, as well as FAA guidelines.

Space requirements for terminal facilities were based on providing 90 square feet per design hour itinerant passenger. Space within the offices of each fixed base operator is used for general aviation terminal facilities. **Table 3M** outlines the general space requirements for general aviation terminal services at Flagstaff Pulliam Airport through the long term planning horizon. As shown in the table, the present general aviation terminal facilities are undersized and will need to be at least doubled over the long term.

GROUND ACCESS REQUIREMENTS

Access system facility requirements, based upon demand/capacity relationships, were developed for the system components of access roadway, terminal curb frontage, and vehicle parking. Phased requirements for each component are presented in the following subsection.

TABLE 3M
GA Terminal Services Requirements
Flagstaff Pulliam Airport

	Available	Existing	Short	Intermediate	Long
Itinerant Operations					
Annual		27,374	31,300	34,600	39,800
Design Hour		14	16	18	20
Pax/OP		2.3	2.4	2.5	2.6
Des. HR Pax		32	38	45	52
Terminal Space (s.f.)	2,500	2,900	3,500	4,100	4,700

TERMINAL ACCESS ROADWAY

The capacity of the airport access and terminal area roadways is the maximum number of vehicles that can pass over a given section of a lane or roadway during a given time period. The capacity or level of service of a facility is affected by a number of factors, including:

- Roadway characteristics
- Traffic factors
- Driver characteristics

The capacity of roadways providing access to the airport, as well as the terminal roadway, was determined based on the **Highway Capacity Manual** (i.e., **Highway Capacity Manual**, Transportation Research Board, Special Report 209, 1985).

It is normally preferred that a roadway operate below capacity to provide reasonable flow and minimize delay to the vehicles using it. The **Highway Capacity Manual** defines different operating conditions known as levels of service. The levels of service are functions of the volume and composition of the traffic and the speeds attained. Six levels of service have been established, designated by the letters A through F, providing for best to worst service in driver satisfaction. Level of service F defines a road operating beyond maximum capacity. Traffic is almost at a standstill causing major delays to the road users. A level of service C or D is generally the preferred level of service on a road system such as in the vicinity of Flagstaff Pulliam Airport. At this level of service, traffic flow is stable and delays are minimal.

Principal access to the airport is from the Interstate 17 interchange with John Wesley Powell Boulevard. This diamond interchange is not currently signalized. State Route 89A acts somewhat like a frontage road along the west side of the interstate. John Wesley Powell Boulevard forms a T-intersection with Route 89A a short distance from the interchange. The Arizona Department of Transportation is considering relocating this intersection to provide more separation from the interchange. As traffic increases, it is likely that this interchange will need to be signalized.

There are two entrances from John Wesley Powell Boulevard to the aviation facilities. Shamrell Boulevard provides access to the FBO and the majority of general aviation facilities. South Pulliam Drive provides access to the passenger terminal facilities. John Wesley Powell Boulevard is a two-lane roadway with intersections at Shamrell and South Pulliam. Both are non-signalized intersections. Shamrell has a stop sign, while the South Pulliam intersection is a four-way stop.

Shamrell Boulevard is a two-lane roadway which dead ends at the security fence along the general aviation apron. South Pulliam Drive is a two-lane road which splits into a one-way, two-lane loop road around the terminal parking lot.

As airport activity increases and the Airpark develops, roadway capacity will become more of a concern, particularly along John Wesley Powell Boulevard. Ultimately this road should be planned with two lanes in each direction and signals at least at South Pulliam Drive. The timing will be more dependent upon the Airpark development than the airport activity.

The terminal loop road system will accommodate an estimated 900 vehicles per hour at LOS D. This should be

adequate for the planning period, but a third lane in front of the terminal may be advantageous in the long term.

TERMINAL CURB FRONTAGE

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

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

At FLG, the terminal roadway provides one lane for loading and unloading of passengers. The curb frontage totals 300 feet in length. **Table 3N** presents the curb frontage requirements for the planning horizons. Available curb length will be adequate through at least the 124,000 enplanement level of the intermediate planning horizon. Approximately 35 percent more curb frontage will need to be planned for the long term.

VEHICLE PARKING

Airline Passenger Terminal

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

Public parking is located in a surface lot immediately north of the terminal building. This parking lot contains 396 spaces. There are currently no parking fees and employees also utilize the public lot. Rental car ready/return parking is provided in a parking lot southeast of the terminal building. There are 56 spaces for ready/return use by the rental car companies.

Table 3N presents the parking requirements for the planning horizons. Public parking requirements were based upon design hour (short term) and design day (long term) passenger levels. Public parking is presently more than adequate, but will become constrained shortly after surpassing the short term passenger activity milestone. A separate employee lot would extend the capacity of public parking to at least 100,000 annual enplanements.

TABLE 3N
Terminal Curb and Vehicle Parking
Flagstaff Pulliam Airport

		PLANNING HORIZON			
	Available	**Base Year**	**Short Term**	**Intermediate Term**	**Long Term**
Terminal (Enplanements)	NA	40,457	70,000	124,000	227,000
Curb Length (l.f.)	300	100	200	300	440
Parking					
Public	396	165	300	510	905
Short Term	NA	25	55	80	115
Long Term	NA	140	245	430	790
Employee	*	28	42	68	114
Rental Car					
Ready/Return	56	49	77	112	170
Storage (ac.)	1.5	0.5	0.8	1.5	2.7
General Aviation					
Itinerant Operations	NA	27,447	31,300	34,600	39,800
Based Aircraft	NA	116	131	139	154
GA Parking Spaces	90	99	115	130	148

* Employees presently use public parking lots.

Rental car parking needs depend upon the operational requirements of the rental car agencies. If available, the rental car companies will utilize extra spaces for storage. The further the rental car service and storage are from the airport, the more desirable it is to increase the parking capacity at the terminal. At FLG, the service and storage are relatively close, still the rental car agencies have indicated a desire for more spaces. According to the analysis summarized on **Table 3K**, the rental car ready/return area will be marginally adequate for the short term. The number of ready/return spaces may need to triple over the long term.

There is approximately 1.5 acres on the airport currently serving a service and/or storage function for the rental cars. This space should be adequate through the intermediate term, but an additional 1.2 acres could be required over the long term. In addition, as traffic increases the rental cars will likely desire more permanent facilities for servicing vehicles than are presently available.

General Aviation Parking

Vehicle parking requirements for general aviation were also examined. Space determinations were based on an evaluation of the existing airport use, as well as industry standards. General aviation spaces were calculated by multiplying design hour itinerant

passengers by the industry standard of 1.8. An additional factor was added based upon based aircraft. Auto parking requirements are summarized in **Table 3N**.

The FBO has 50 parking spaces in its lot. There are approximately 40 more spaces available around various general aviation facilities, although some may not be open to the public. The analysis indicates that the available parking is undersized. This may not be as apparent because some based aircraft users may park their vehicles in their hangars. The projected parking spaces are based upon no vehicles parked in hangars.

SUPPORT FACILITIES

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation requirements, have been identified for these remaining facilities:

- Airport Rescue and Firefighting (ARFF)
- Snow Removal Equipment
- Fuel Storage

AIRPORT RESCUE AND FIREFIGHTING

The requirements for Aircraft Rescue and Firefighting (ARFF) equipment at an airport is determined by the length of the air carrier aircraft using the airport. The following indicates the requirements for each ARFF Index and the associated equipment requirements.

Index A - Includes aircraft less than 90 feet in length
Index B - Includes aircraft at least 90 feet but less than 126 feet in length (B737)
Index C - Includes aircraft at least 126 feet but less than 159 feet in length (B757)
Index D - Includes aircraft at least 159 feet but less than 200 feet in length (B767)
Index E - Includes aircraft at least 200 feet in length (B747)

To meet Index A requirements, the following equipment is required under Part 139. One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of aqueous film forming foam (AFFF), to total 100 gallons, for simultaneous dry chemical and AFFF foam application.

To meet Index B requirements, at least one vehicle able to carry 500 pounds of sodium-based dry chemical or halon 1211, and 1,500 gallons of water, and the commensurate quantity of ARFF for foam production is required. If two ARFF vehicles are used, one must carry those agents listed for Index A requirements, and the other vehicle must carry an amount of water and the commensurate quantity of ARFF so that the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons.

The Flagstaff Pulliam Airport ARFF facility currently maintains Index A capability. The requirement to meet any higher index would need to be

based on the number of daily operations of aircraft within that index. Index A should be adequate for the scheduled passenger service both now and in the future. Index B would become necessary if departures by larger aircraft reach five per day.

The present ARFF building is located next to the GA ramp. The building's doors are barely wide enough for the equipment. A new building, meeting current FAA standards, should be considered.

Regulations require that at least one vehicle must be capable of reaching the midpoint of the farthest runway within three minutes from the time of the alarm to the time of initial agent application. With a single runway, this was readily met at FLG by maintaining the ARFF building in the middle two-thirds of the airfield. The present building is located along the south one-third of the airfield. While the time requirements are met, a location closer to midfield that does not require crossing the GA ramp would be preferable.

AIRPORT SNOW REMOVAL EQUIPMENT

The Flagstaff area receives an average of 99 inches of snow annually. Generally this occurs during the months from November through April. The heaviest snow typically falls in March. As a result, an evaluation of the snow removal equipment and storage is in order.

The **FAA Advisory Circular 5200-30A, Airport Winter Safety and Operations**, provides general guidance for snow clearance for commercial service airports. According to the Circular, "commercial service airports should have sufficient equipment to clear one inch of snow weighing up to 25 pounds per cubic foot from the primary instrument runway, one or two principal taxiways to the ramp area, emergency or firefighters' access roads, and sufficient ramp area to accommodate anticipated aircraft operations." The time that one inch of snow should be cleared is based on the number of annual operations for the airport. Flagstaff Pulliam Airport is in the highest category of over 40,000 annual operations, so the clearance time requirement is one-half hour.

Adherence to the snow removal plan constitutes approximately 1.5 million square feet of pavement to be cleared. Assuming a density of 25 pounds per cubic foot, this translates to a requirement to clear 1,600 tons per half-hour. The airport currently owns two Oshkosh snow plows and a 3,000 ton/per hour snow blower. The present equipment is marginally capable of clearing this area in the required time frame. A runway extension would increase the area to be cleared and require additional snow blower capacity.

Snow removal equipment is stored in the airport's maintenance facility. Additional bays may become necessary with additional equipment.

FUEL STORAGE

The FBO owns and operates two fuel tanks located adjacent to Shamrell Boulevard and the GA apron. Included in the fuel farm is a 12,000 gallon tank storing 100LL (Avgas), and a second 12,000 gallon tank storing Jet A.

Fuel storage requirements are typically based upon maintaining at least a two-week supply of fuel during the busy season. Avgas fuel sales at FLG average 4.5 gallons per general aviation operation. This ratio was utilized to project future Avgas sales. Projections of future Jet A fuel storage requirements were based upon an average sale per itinerant operation at the airport. A ratio of 12 gallons per itinerant operation was used.

Table 3P presents future Avgas and Jet A storage requirements for the airport based upon a two-week supply during the peak month. There is presently adequate fuel storage for Avgas. The available storage should be adequate through the intermediate planning horizon. The airport cannot currently store a two-week supply of Jet A. An additional 44,000 gallons of Jet A storage would be needed for the long term planning horizon.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet aviation demands projected for Flagstaff Pulliam Airport through the long term planning horizon. A summary of the airfield, airline terminal, and general aviation facility requirements are presented on **Exhibits 3E, 3F**, and **3G**.

Following the facility requirements determination, the next step is to develop a direction for development to best meet these projected needs. The remainder of the Master Plan will be devoted to outlining this direction, its schedule, and its costs.

TABLE 3P
Fuel Storage Requirements
Flagstaff Pulliam Airport

	Available	Existing	Short	Intermediate	Long
Avgas Supply					
Annual GA Operations	NA	43,480	53,000	56,500	64,100
Peak Month Operations	NA	4,450	5,560	5,930	6,730
Average Fuel Ratio	NA	4.5	4.5	4.5	4.5
Two-Week Storage (gal.)	12,000	9,345	11,676	12,453	14,133
Jet A Supply					
Annual Itinerant Operations	NA	37,239	43,300	50,700	63,000
Peak Month Operations	NA	3,999	4,633	5,425	6,741
Average Fuel Ratio	NA	12.0	13.0	14.0	18.0
Two-Week Storage (gal.)	12,000	22,394	28,107	35,443	56,624

CATEGORY	EXISTING	SHORT TERM	LONG RANGE
RUNWAYS 	**Runway 3-21** 6,999' x 150' 95,000# DWL	**Runway 3-21** 8,800' x 150' 95,000# DWL	**Runway 3-21** 8,800' x 150' 150,000# DWL
TAXIWAYS 	**Runway 3-21** Full Parallel Eight Exits	**Runway 3-21** Same	**Runway 3-21** Add parallel and exits to west if necessary
NAVIGATIONAL AIDS 	ATCT, ASOS, GPS, VOR, NDB, DME **Runway 3** VASI-4, GPS **Runway 21** VASI-4, ILS/DME, VOR/DME, NDB/DME, GPS	Same **Runway 3** Same **Runway 21** Same	Same **Runway 3** Same **Runway 21** VASI-4, CAT-I GPS
LIGHTING AND MARKING 	Rotating Beacon Segmented Circle **Runway 3** HIRL, MITL, Non-Precision **Runway 21** MIRL, MITL, Precision Marking, MALSR	Same **Runway 3** Same **Runway 21** Same	Same **Runway 3** Add REILs **Runway 21** Same

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Exhibit 3E
AIRFIELD FACILITY REQUIREMENTS

CATEGORY		AVAILABLE	ENPLANEMENT MILESTONES 70,000	124,000	227,000
AIRLINE COUNTER/OFFICE	Counter Frontage (l.f.)	62	30	48	72
	Counter Area (s.f.)	320	300	480	720
	Ticket Queue (s.f.)	935	600	960	1,440
	Ticket Lobby (s.f.)	375	300	480	720
	Airline Operations (s.f.)	3,200	2,400	3,840	5,760
SECURITY PROCESSING	Stations	1	1	1	1
	Screening Area (s.f.)	350	600	600	600
	TSA Office (s.f.)	320	400	400	400
CONCOURSE/GATES	Gates	3	2	3	4
	Hold Room (s.f.)	1,500	1,870	2,860	4,180
BAGGAGE CLAIM	Claim Display (l.f.)	32	68	104	152
	Claim Lobby Area (s.f.)	1,630	1,658	2,535	3,705
	Bag Input (s.f.)	0	646	988	1,444
	Rental Car Counter (l.f.)	62	24	36	48
PUBLIC SPACES	Food & Beverage (s.f.)	2,400	1,989	2,958	4,199
	Concessions/Shops (s.f.)	350	995	1,479	2,100
	Restrooms (s.f.)	850	597	887	1,260
	Public Lobby (s.f.)	1,200	938	1,424	2,063
GROSS TERMINAL AREA	Administration Offices (s.f.)	890	713	1,069	1,534
	Total Terminal Program (s.f.)	21,700	20,971	31,426	45,086

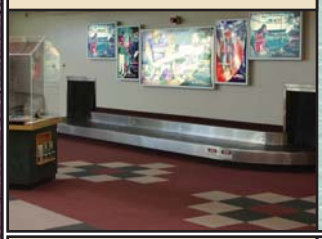

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Exhibit 3F
TERMINAL FACILITY REQUIREMENTS

CATEGORY		AVAILABLE	SHORT TERM	INTERMEDIATE	LONG RANGE
ACCESS & PARKING					
	Terminal Curb (l.f.)	300	200	300	440
	Terminal Parking Public (spaces)	396	300	510	905
	Rental Car (spaces)	56	77	112	170
	Rental Car Storage (ac)	1.5	0.8	1.5	2.7
	Employee (spaces)	--	42	68	114
	GA Parking (spaces)	90	115	130	148
FUEL STORAGE					
	Jet A (gallons)	12,000	28,000	35,000	57,000
	Avgas (gallons)	12,000	12,000	12,000	14,000
HANGARS					
	Shade/T-Hangars	80	102	107	119
	Executive/ Conventional	11	20	23	29
	Total Positions	**91**	**122**	**130**	**148**
	Service Hangar Area (s.f.)	7,500	22,900	24,300	27,000
GA APRON AREA					
	Transient	90	71	79	90
	Local	35	11	9	7
	Total Positions	**125**	**82**	**88**	**97**
	Total Apron Area (s.f.)	**66,000**	**33,700**	**36,400**	**40,200**

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Exhibit 3G
GENERAL AVIATION AND SUPPORT
FACILITY REQUIREMENTS

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Chapter Four
AIRPORT ALTERNATIVES

Chapter Four

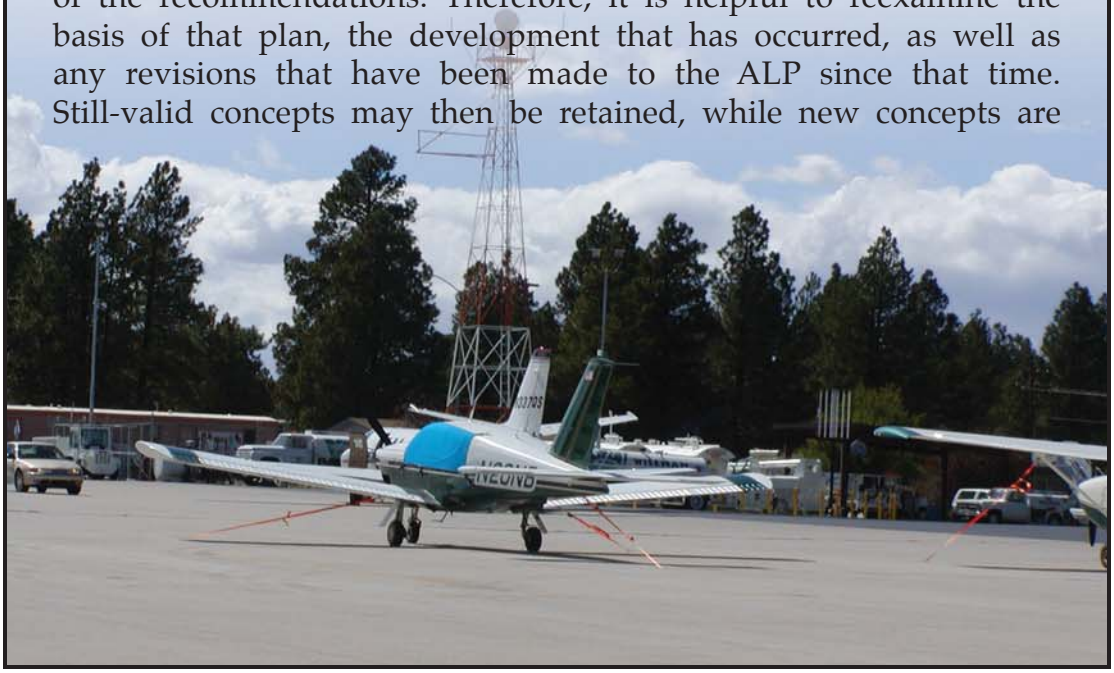
Airport Alternatives

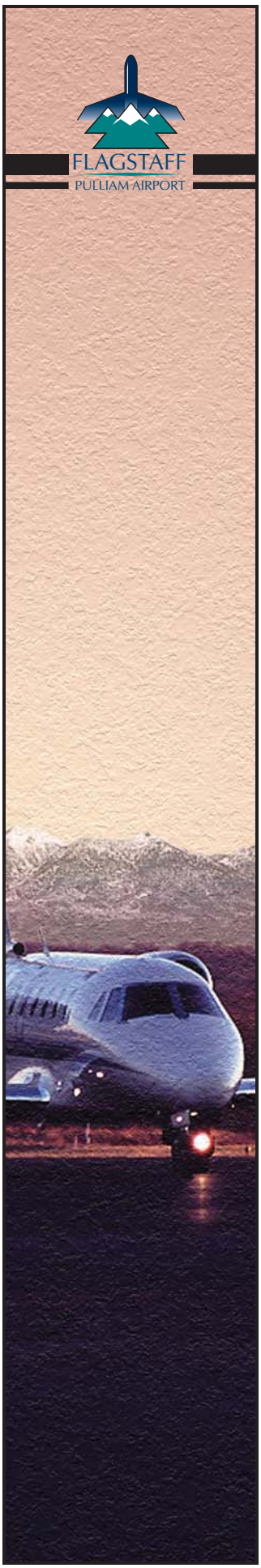
Prior to updating the development program for Flagstaff Pulliam Airport (FLG), it is important to review development potential and constraints at the airport. The purpose of this chapter is to consider the actual physical facilities which are needed to accommodate projected demand and meet the program requirements as defined in Chapter Three, Airport Facility Requirements.

The facility considerations for FLG can be categorized into two functional areas: the **airside** (airfield) and **landside** (terminal, hangars, apron, and auto parking). Within each of these areas, specific facilities are required for safety and security. Others are related to demand that can be expected to be generated in coming years. Although each functional area is treated separately, planning must integrate the individual requirements so they complement one another.

Any development proposed by a master plan evolves from an analysis of projected needs. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands through the planning period.

As indicated in earlier chapters, this master plan is not the first to be developed for this airport. The last master plan was approved in 1991. Since that time, the airport has moved forward on many of the recommendations. Therefore, it is helpful to reexamine the basis of that plan, the development that has occurred, as well as any revisions that have been made to the ALP since that time. Still-valid concepts may then be retained, while new concepts are





developed for those concepts that are either no longer valid or considered to be unacceptable or unworkable. Thus, the discussions of this chapter lead off with a review of the *1991 Master Plan*.

REVIEW OF PREVIOUS PLANNING

The previous master plan for Flagstaff Pulliam Airport was completed in 1991. At that time, the airport's passenger terminal facilities were very undersized, and co-located with the general aviation facilities. The airport lacked a precision instrument approach as well. An instrument landing system (ILS) was planned; however, this could not be accommodated without relocating many airside and landside facilities.

To meet design standards for the ILS approach, the parallel taxiway would need to be moved from 250 feet, to 400 feet from the runway centerline. To do this, much of the airport's parking ramp and flightline would need to be relocated. In addition, the plan called for extending the runway to 8,300 feet.

The master plan evaluated alternatives for providing an expanded terminal complex, with relocation to the current site the final recommendation. That site was then subject to architectural and engineering design resulting in the current terminal building, parking lot, and access road. Similarly, the parallel taxiway and general aviation areas were designed to move them further from the runway. Many of the original T-hangars were relocated to the current T-hangar area or replaced, and a new fixed base operator (FBO) building was developed. The ILS approach was planned for the northeast end of the runway as was the runway extension.

The plan also allowed for the development of an industrial airpark surrounding the aviation facilities. This plan was updated and has been platted with several lots now leased. Also included in the plan was a road system designed to provide airport and airpark access from Lake Mary Road. That system has since been reconfigured slightly to better fit into current city planning for the area.

Long term planning included reserving area that would allow for development of a parallel runway if ever needed. While not included in the 20-year development schedule, the master plan recognized that if it was not included in the plan, it would be precluded from development if ever needed sometime in the future. It also allowed for a taxiway extending into the eastside property, to provide for future landside development.

Exhibit 4A show the airport layout plan as updated in 2002 to reflect the plans that had been developed as well as those remaining for the future.

NON-DEVELOPMENT ALTERNATIVES

Non-development alternatives include the "No Action" or "Do Nothing" alternative, transferring service to an existing airport, or developing an airport at a new location. Previous

Draft 02MP09-4A-08/20/04

RUNWAY DATA

	RUNWAY 3-21	
	EXISTING	ULTIMATE
RUNWAY CATEGORY/AIRCRAFT DESIGN GROUP	C-III	SAME
RUNWAY AZIMUTH	221.1736¹¹	SAME
RUNWAY BEARING (TRUE)	N41°10'25"E	SAME
RUNWAY DIMENSIONS	6,999' X 150'	8,300' X 150'
MAXIMUM RUNWAY ELEVATION (above MSL)	7,013.9'	SAME
WIND COVERAGE (in %)	SEE WIND ROSE DATA - BELOW	
APPROACH VISIBILITY MINIMUMS (ERE)	+1 MILE - 1/2-MILE	1/2-MILE - 1/2-MILE
FAR PART 77 CATEGORY (ERE)	VISUAL/PRECISION	PRECISION/PRECISION
RUNWAY INSTRUMENTATION (ERE)	VISUAL/PRECISION	PRECISION/PRECISION
RUNWAY APPROACH SURFACES (ERE)	20:1/50:1	50:1/50:1
RUNWAY THRESHOLD DISPLACEMENT	NONE	SAME
RUNWAY STOPWAY	NONE	SAME
RUNWAY SAFETY AREA (RSA)	9,999' X 500'	11,300' X 500'
RSA DISTANCE BEYOND EACH RUNWAY END	1,000'	SAME
RUNWAY OBJECT FREE AREA (OFA)	9,999' X 800'	10,300' X 800'
RUNWAY OBSTACLE FREE ZONE (OFZ)	7,399' X 400'	8,700' X 400'
RUNWAY PAVEMENT MATERIAL	ASPHALT	SAME
PAVEMENT SURFACE TREATMENT	PFC	SAME
PAVEMENT STRENGTH (in thousand lbs.)¹	30(S), 95(D), 140(DT)	60(S), 150(D)
RUNWAY EFFECTIVE GRADIENT (in %)	.23	SAME
RUNWAY LIGHTING	HIRL	SAME
RUNWAY MARKING (ERE)	NONPREC./PRECISION	PRECISION/PRECISION
RUNWAY APPROACH LIGHTING	MALSR (RWY. 21)	SAME
TAXIWAY PAVEMENT MATERIAL	ASPHALT	SAME
TAXIWAY LIGHTING	MITL	SAME
TAXIWAY MARKING	CENTERLINE/EDGE	SAME
NAVIGATIONAL AIDS	ILS (RWY. 21) NDB VOR/DME GPS (Both)	SAME SAME SAME SAME
VISUAL AIDS	VASI-4 (Both) --	PAPI-4 (Both) REIL (Both)

¹ Pavement strengths are expressed in Single(S), Dual (D) and Dual Tandem (DT) wheel loading capacities.

AIRPORT DATA

FLAGSTAFF PULLIAM AIRPORT (FLG)

CITY: FLAGSTAFF STATE: ARIZONA COUNTY: COCONINO ACREAGE: 795
RANGE: R7E TOWNSHIP: T20N CIVIL TOWNSHIP: N/A

		EXISTING	ULTIMATE
NATIONAL PLAN of INTEGRATED AIRPORT SYSTEMS (NPIAS) SERVICE LEVEL		PRIMARY	SAME
DESIGN AIRCRAFT		B 737-300	SAME
AIRPORT REFERENCE CODE (ARC): RUNWAY CATEGORY/DESIGN GROUP		C-III	SAME
AIRPORT ELEVATION (ABOVE MEAN SEA LEVEL)		7,014'	SAME
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		81.1°F (July)	SAME
AIRPORT REFERENCE POINT	Latitude	35°08'18.400" N	35°08'23.279" N
(ARP) COORDINATES (NAD 83)	Longitude	111°40'16.400" W	111°40'11.241" W
AIRPORT and TERMINAL NAVIGATIONAL AIDS		ATCT ILS-MALSR (21) Rotating Beacon NDB (On Airport) VOR/DME VASI-4 (Both) --	SAME SAME SAME SAME SAME PAPI-4 (Both) REIL (Both)
GPS APPROACH		YES (Both)	SAME
RUNWAY END COORDINATES (NAD 83)		EXISTING	ULTIMATE
RUNWAY 3	Latitude	35°07'52.390" N	SAME
	Longitude	111°40'44.120" W	SAME
RUNWAY 21	Latitude	35°08'44.480" N	35°08'54.165" N
	Longitude	111°39'48.870" W	111°39'38.356" W

BUILDINGS/FACILITIES

EXISTING	ULTIMATE	DESCRIPTION
①		AIRPORT ADMINISTRATION
②		TERMINAL BUILDING
③		AIRPORT OPERATIONS
④		AIRPORT RESCUE and FIREFIGHTING (ARFF)
⑤	(5)	FBO HANGAR
	(6)	CORPORATE HANGAR
⑦	(7)	T-HANGAR
⑧	(8)	SHADE HANGAR
	(9)	SPECIALTY SHOP
⑩	(10)	AIRPORT MAINTENANCE
	(11)	AIRCRAFT WASH RACK
⑫		AIR TRAFFIC CONTROL TOWER (ATCT)
⑬		GUARDIAN AIR AMBULANCE
⑭		FAA FLIGHT FACILITIES SECTOR FIELD OFFICE
⑮		ARIZONA DEPARTMENT OF PUBLIC SAFETY
	(16)	FUTURE RENTAL CAR FACILITY
⑰		(ASOS) AUTOMATED SURFACE OBSERVING SYSTEM
⑱		EMERGENCY POWER SHELTER
⑲		NON-DIRECTIONAL RADIOBEACON (NDB)
㉑	(21)	WEATHER INSTRUMENTS
㉒		NOT USED
㉓		FUEL FACILITY-ABOVE GROUND STORAGE
㉔		FINAL APPROACH and TAKEOFF AREA (FATO)
㉕		PEABODY CORPORATE HANGAR
㉘	(26)	AUTOMOBILE PARKING
㉗	(27)	AIRCRAFT TIEDOWNS
	(29)	FIRE STATION / ARFF
㉚		EQUIPMENT STORAGE
㉛		AIRPORT ROTATING BEACON

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		RIGHT OF WAY
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		FUTURE LAND ACQUISITION
		BUILDING CONSTRUCTION
	BRL	BUILDING RESTRICTION LINE (BRL)
	N/A	DRAINAGE
		FACILITY CONSTRUCTION
		FENCING
VASI-4	PAPI-4	NAVIGATIONAL AID INSTALLATION
		RUNWAY EDGE LIGHTING (HIRL)
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
3426 21 3	N/A	SECTION CORNER
	N/A	SEGMENTED CIRCLE/WIND INDICATOR
1080	N/A	TOPOGRAPHIC CONTOURS
		WIND INDICATOR (Lighted)

0 1000 2000
SCALE IN FEET

Source: Original 1991 Master Plan - Coffman Associates
2002 ALP Update - Baker

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Exhibit 4A
PREVIOUS AIRPORT LAYOUT PLAN

planning efforts have also considered these alternatives. All have resulted in the same conclusion: continue to develop the existing airport site to meet the needs of the Flagstaff region.

NO ACTION

As a first step in the analysis of alternatives, it is necessary to consider the consequences of no further development at Flagstaff Pulliam Airport. The "No Action" alternative essentially considers keeping the airport in its present condition and not providing for any improvements to existing facilities. A "No Action" approach would be contrary to the activity that has occurred and is expected to continue at the airport. Because of this activity, some improvements will continue to be needed.

The previous section discussed the projects that have been completed as recommended by previous planning efforts. There are other projects that were recommended for future years that will need to be reviewed and become the new focus. The recent infrastructure development of the current terminal complex, the industrial airpark, general aviation facilities, an ILS approach, and safety design standard improvements have represented a significant financial commitment on the part of the City of Flagstaff, the FAA, the Arizona Department of Transportation (ADOT), as well as many airport tenants.

The airfield has been upgraded to meet safety standards, but the runway length still puts limitations on current users and could affect air service in the future as well. Landside facilities have been planned and designed to be constructed as the need arises. That means additional terminal gates, auto parking, hangars, apron, and other facilities will be needed to adequately serve demand. As airport safety and security standards change, the airport will need to respond.

The “No Action” alternative would continue to affect general aviation business jet aircraft that operate at the airport. As an example, the largest non-public employer in Flagstaff is one of the primary users of corporate aircraft at FLG. Their corporate aircraft makes almost daily trips to the east coast. At least two-thirds of those flights require a fuel stop in the Midwest. A longer runway would allow the aircraft to take on more fuel in Flagstaff, thereby reducing the times that a fuel stop would be needed. This would reduce flight times and operational costs for the company. The longer runway would provide similar capabilities to other business jet users, thereby improving the attractiveness of FLG and the Flagstaff area to their business.

A future concern with the No Action alternative is its potential effect on air service to Flagstaff and much of northern Arizona. The current service by America West Express (Mesa Airlines) uses Dash 8 turboprop aircraft. The airline has been growing its fleet with regional jets such as the Canadair Regional Jet 200 (CRJ-200), while reducing its fleet of turboprops. As indicated in the Facility

Requirements, the current runway length of 6,999 feet is not sufficient to support scheduled service by regional jet aircraft. Thus, the airport's ability to maintain and improve upon its current level of service could be jeopardized within the next few years.

Mesa Airlines' code-sharing contract with America West Airlines expires in 2007. Even if the current agreement is renewed, the airline is expected to continue to utilize regional jets wherever possible. If the current airline were replaced, it is expected that service would be by a commuter airline using 19-seat turboprop aircraft, unless the runway is extended. This would be a significant downgrade in service.

With the CRJ and similar regional jets continuing to grow in use by regional/commuter airlines, the runway extension is not only the best means to continue to maintain air service, but also has the potential to attract additional regional jet service from other airlines. As has been demonstrated in other markets, the attractiveness of regional jet service to air travelers has the potential to recapture some of the local market share who currently drive to and from Phoenix for air service. Additional traffic can attract more flights resulting in improved service for business travelers and tourism.

A "No Action" alternative would reduce the quality of the existing airport facilities over time, producing undesirable results. This scenario would result in overcrowded conditions in the passenger interface areas of the terminal building, curb, and parking lot. This will result in unnecessary delays and basically an unpleasant experience for visitors and residents alike. The same would hold true for general aviation users. The primary result of this alternative would be the eventual inability of the airport to satisfy the increasing demands of an economically growing airport service area.

In the case of Flagstaff Pulliam Airport, the economic service area includes not only the airport's immediate surroundings, but also a secondary area extending into north-central Arizona. The "No Action" alternative would result in adverse impacts on the economic well-being of this region. In order to continue to attract and accommodate the business and vacation travelers to the Flagstaff area, the airport's facilities must continue to provide a pleasant experience with minimal delays. To accomplish this goal, improvements to the existing facility will need to continue to be made when the need presents itself.

In summary, adverse economic, social, environmental, and political impacts are associated with the "No Action" alternative. Combined with the eventual effect on the regional community's ability to accrue additional economic growth, the "No Action" alternative would result in a substandard aviation facility and the ultimate decline or cessation of aircraft operations. Considering the substantial investments that have been made at FLG over the years, the "No Action" alternative represents an inconsistent

and irresponsible decision. In this regard, the "No Action" alternative is not considered a prudent or feasible course of action.

TRANSFERRING AVIATION SERVICES

Transferring services to another airport, existing or new, is one that will typically be favored by many residing close to the existing airport. Relocating an airport, however, is very complex and expensive, especially when commercial service is involved.

In addition to the major financial investment, the development of a new commercial airport also takes a commitment of extensive land area. The location for a new site is usually undeveloped. As a result, the potential for impacts to wildlife habitat, wetlands, and cultural resources is higher than at an existing site which still has development capability.

A new airport also requires the duplication of investment in airport facilities and supporting access and infrastructure that are already available at the existing airport site. A new airport site would require the construction of an entirely new airfield, air passenger terminal facilities, general aviation facilities, as well as ground access. In addition, utilities such as water, sewer, electricity, and gas would have to be extended to a new site.

There are several constraints to finding a suitable alternative airport site in the Flagstaff vicinity. Mountainous terrain quickly limits the available search area. The terrain would not only affect the development of airport sites, but also could impact the ability to obtain an instrument approach. Airspace for local site options is also affected by several protected wilderness areas and national monuments throughout the region.

Since a new airport would involve new development on a much larger scale, in what would likely be a more pristine location, the potential impacts to wildlife and its habitat would be greater. The undeveloped environment is home to a wide variety of biotic communities including potentially several threatened or endangered species. Archeological sites also abound in the region, further increasing the potential for significant impacts at a new site.

The economic realities of relocating to a new airport must also be considered. The construction of a new major airport can require a financial commitment of a billion dollars or more. Virtually the entire cost of this development is financed by taxes, rates, and charges that are being paid by air travelers and the aviation industry as a whole. While it is appropriate that the airport user pay for aviation facilities and their operation, the airport proprietor still has a duty to be fiscally responsible.

The high costs associated with new airport development will continue to limit the number of new major facilities that the aviation industry and the public can absorb. Therefore, it is prudent to maximize existing public

investment to meet future needs before abandoning that investment simply to duplicate it elsewhere.

There have been only two new major commercial service airports constructed in the United States in the last quarter century. Those airports were in Ft. Myers, Florida, and Denver, Colorado. Southwest Florida International Airport was constructed because the existing airport was in an urban location that was severely limited in runway length and in room for terminal development. Denver International Airport was constructed primarily to replace an airport with some of the highest operational delays in the nation and with no feasible means to increase the airfield's capacity on-site.

Flagstaff Pulliam Airport does not experience any of these constraints, nor is it expected to experience severe development constraints for many years to come. Community planning has included the airport in its long range future. Given the investment in the existing facilities, and the ability to meet future needs, relocation to another location is neither prudent nor feasible.

The alternative of relocating services to another airport in the region area has also been considered. Sedona Airport, H. A. Clark Memorial Airport in Williams, and Cottonwood Airport are the closest airports that are included in the National Plan of Integrated Airport Systems (NPIAS). Sedona Airport is the closest at 22 nautical miles, while H. A. Clark Memorial is the closest in travel time, still more than 30 minutes to the west of Flagstaff. All are general aviation airports with no provisions for certificated passenger service. H. A. Clark Memorial has the longest available runway at 5,992 feet, 1,000 feet less than the current length at FLG. Each would require even greater construction upgrades at a significantly higher cost.

In addition, the commercial service airport would be located significantly further from the City of Flagstaff, the population center of the region. The cost associated with redeveloping the facilities at another airport in the region combined with the loss of the convenience provided by FLG would result in a loss of more local passengers to the major hub in Phoenix. The loss of airport revenues generated by these passengers would only further increase the direct cost burden of the relocation on the taxpayer.

In summary, the development of a new airport or upgrade of an existing airport to replace FLG would be more expensive, more time-consuming, provide less-convenient service, and could potentially create a direct cost burden on the local tax base. The size and magnitude of the facilities required for a full replacement of FLG would dictate extensive airfield, landside, and building construction, as well as infrastructure development. The increased distance from Flagstaff would result in costs and inconvenience to the majority of existing airport users.

Given the major investment in the existing facilities at FLG, relocation to another location is not prudent or feasible since the existing airport has

the capability to accommodate future demands with far less capital improvements and disruption.

KEY PLANNING ISSUES

The previous master plan provided the impetus for the development of a new passenger terminal area, as well as airfield redevelopment to accommodate an instrument landing system (ILS). The airfield development also provided for current design standards. Analyses in the earlier chapters of this master plan indicate that several improvements will still be necessary to ensure the airport's capability to serve the needs of the Flagstaff region well into the 21st century. The primary airfield focus will be on providing adequate runway length for airline and general aviation business needs, as well as preserving the long range viability of the facility. On the landside, primary issues will be on improvements to the terminal complex to handle more passengers, and serving the needs of general aviation in a manner that is beneficial to overall community development.

Exhibit 4B outlines key considerations for this alternatives analysis. Carrying over from the previous Master Plan is the runway length issue. It is now a high priority as the airport and the community face the potential loss of air service if the runway cannot handle regional jets on a scheduled basis. The reservation of space for a parallel runway for capacity remains as a means to protect the long term viability of the airport. These two issues were addressed in the previous master plan, but have not been implemented. The runway length requirement is now 8,800 feet, requiring that the alternatives be revisited.

To go along with the future viability will be planning for taxiway access to the east side of the runway. This should include parallel taxiways to the runway, as well as access into the developable airport property on the east side.

The airport will need to continue to adapt to changes in navigational systems associated with aviation. One major ongoing change is the transformation to the global positioning system (GPS) as the primary navigation system for the FAA. While the transformation will take a longer period than originally scheduled, and may not be exactly as originally envisioned, it is still in the plans. GPS remains a key consideration for improving approach minimums at FLG. From a master planning standpoint, the objective will be to continue to plan for GPS implementation, but to also ensure that other more traditional systems are still in the plan as backups wherever possible.

The passenger terminal was determined to generally be adequate to at approximately 70,000 annual enplanements, but eventually additional space will be needed for virtually all areas of the facility. A terminal plan is in place, so the master plan will concentrate on refinements to the transition and timing of the future improvements.

02MP09-4B-8/18/04

AIRFIELD

- Extend Runway 3-21 to 8,800'
- CAT I GPS
- East side parallel taxiway (long term)
- Reserve space for GA parallel runway

TERMINAL

- Expand functional areas for 50+ seat aircraft
- Terminal parking
- Rental car areas
- Future Security mandates

GENERAL AVIATION

- Storage hangar development
  - Corporate/Executive
  - T-hangars
- FBO development
- Wash rack
- Auto parking
- Helicopter area

OPERATIONS

- ARFF Facility
- SRE Facility
- Cargo Facilities

LAND USE

- I-17 Interchange
- Industrial air park
- East side development

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Exhibit 4B
PLANNING ISSUES

The terminal parking lot is adequate for the short term planning horizon of 70,000 annual enplanements. As enplanements grow toward the intermediate horizon of 124,000, however, the lot will become undersized. Parking space will become even more limited if the long term horizon is realized. Rental car space for ready/return, as well as service and storage, will also become strained, as will space for employees to park.

General aviation hangar space is in short supply at FLG, so the master plan must consider places to locate conventional, corporate, and T-hangars. FBO development with growing general aviation traffic should also be considered. Auto parking in the GA area will need to be planned in concert with hangar development. Helicopter activity is also an important component of the airport, with medical and emergency transport services provided from the airport.

The airport rescue and firefighting (ARFF) facilities, snow removal equipment (SRE), and airport maintenance facilities were undersized and located along the ramp in the middle of the general aviation area. These airport support facilities have recently been co-located to the new operations center.

Other planning considerations on the airport include planning for air cargo possibilities, the industrial air park, the interchange with I-17, and other airport access and circulation. Also to be considered is potential acquisition of other properties that may be strategic to the long range viability of the airport.

AIRFIELD IMPROVEMENT ALTERNATIVES

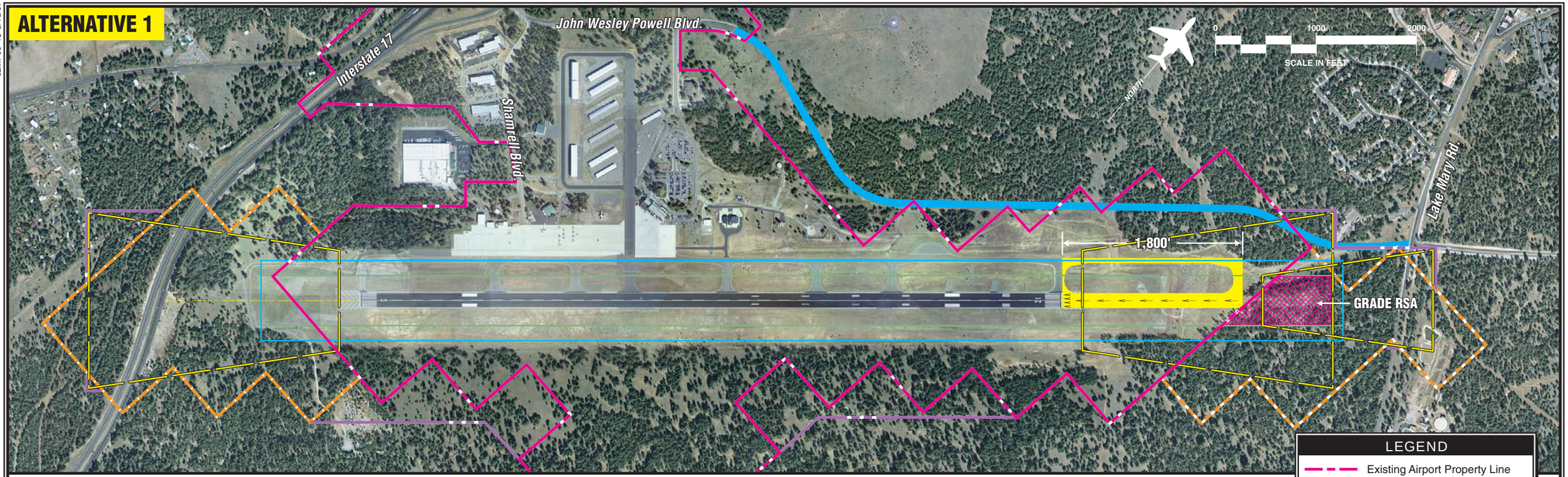
RUNWAY 3-21

As indicated earlier, the primary consideration with the airfield system is the runway length. Recent projects have brought the remainder of the airfield up to design standards. Previous master plans included a runway extension that would provide a runway length of 8,300 feet. The runway length requirement is now 8,800.

Both the 1984 and the 1991 Master Plans recommended extending the runway to the northeast over extensions to the southwest. **Exhibit 4C** depicts the proposed 1,800-foot extension entirely on the northeast end as Alternative 1.

Mt. Elden is an obstruction to the FAR Part 77 precision approach surface to Runway 21. The mountain affected the ILS approach design. Extending the runway to the northeast places Mt. Elden closer to the approach. Under current ILS procedures, it is not likely that the approach can be moved to the end of the runway. Therefore, it is expected that the landing threshold will need to remain in its current location. The runway extension is necessary for takeoff, but not for landing, so the impact to operations would be minor. Still, it is prudent to consider once more

ALTERNATIVE 1



ALTERNATIVE 2

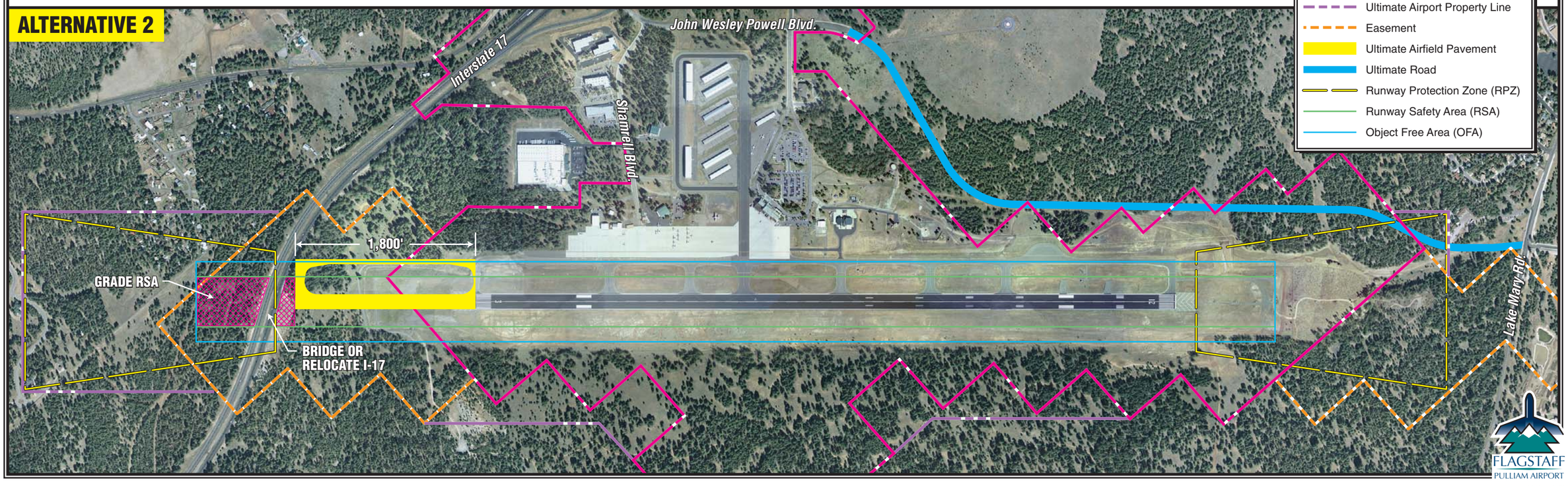


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Exhibit 4C
RUNWAY ALTERNATIVES 1 AND 2

the alternatives for placing all or part of the extension on the southwest end of the runway.

Exhibit 4C (Alternative 2) depicts placing the full extension on the southwest end of the runway. The advantage would be to ensure the use of the entire runway length for both takeoff and landing. While this would be ideal, the current 7,000 foot length is adequate for landing. Therefore, this alternative must indicate other advantages either in cost, operational efficiency, or environmental impact.

An 1,800 foot extension to the southwest would place the runway at the edge of the Interstate 17 right-of-way. To provide for adequate runway safety area (RSA) beyond the runway end, I-17 would either need to be relocated or bridged by the RSA, both very costly endeavors. Just beyond the current extended southwest RSA, earthwork fills of up to 70 feet will be required. The runway protection zone (RPZ) would extend over property beyond the current fee simple property and the current easements on U.S. Forest Service property.

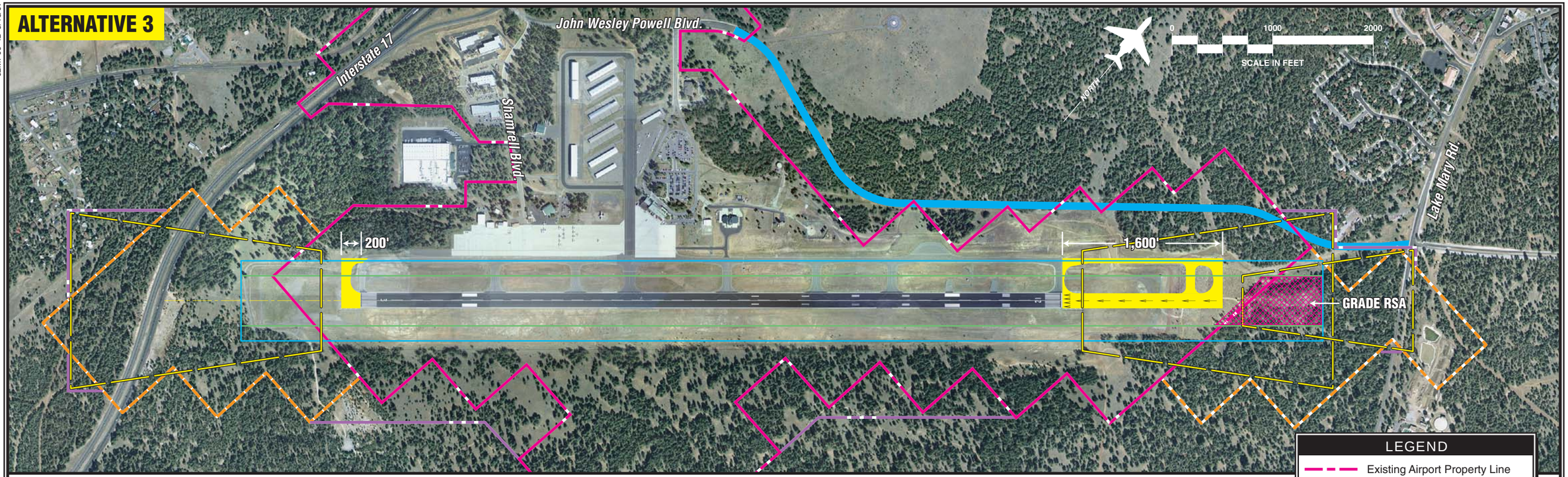
In addition, the extension would place the end of the runway closer to residences located to the southwest. By comparison, an 1,800-foot extension to the northeast would place departing aircraft higher over the residences to the southwest, reducing the potential for noise impacts.

Exhibit 4D depicts two alternatives (Alternatives 3 and 4) that use a combination of shorter extensions on each end. The previous Master Plans indicated that a 200-foot extension could be accommodated on the southwest end, but there was little advantage to the split project. The landing threshold on Runway 21 would still need to be displaced. The RSA would still require fill beyond its current grading. In addition, navigational aids associated with the southwest end of the runway would require relocation. This includes both the VASI and the localizer serving the ILS.

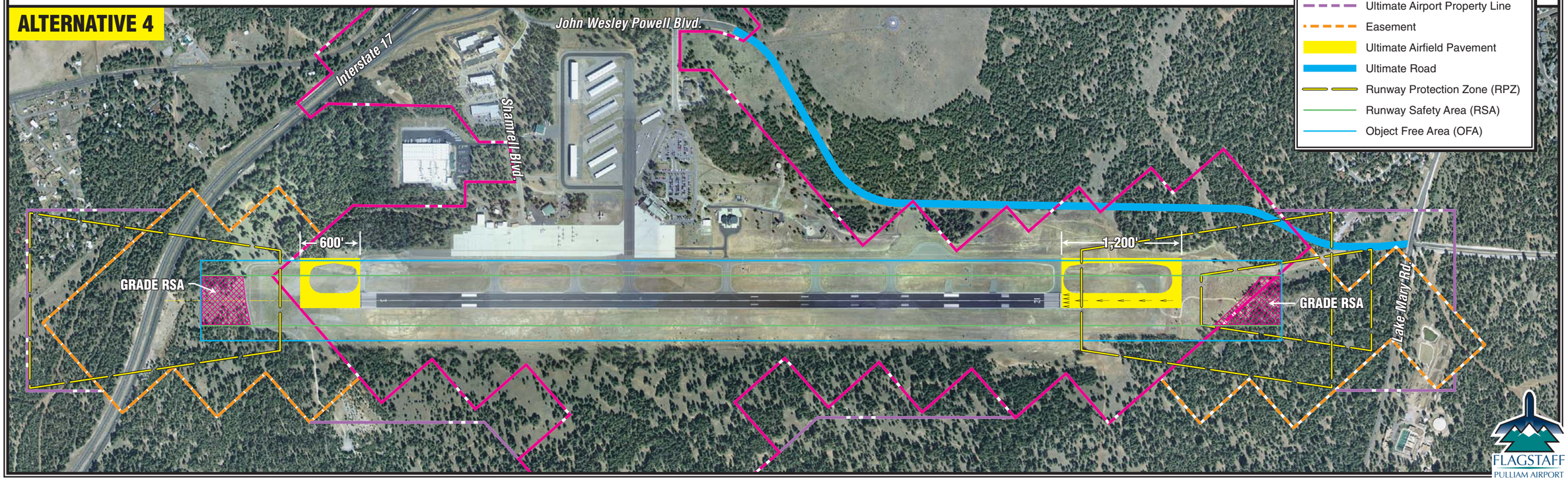
As with the full southwest extension, Alternative 3 places the runway end closer to the residences located southwest of the airport, albeit much less. Departures to the southwest will also be higher than with Alternative 2, but still slightly lower than with Alternative 1. The minimal extension simply serves to increase construction costs and time, while offering no distinct operational or environmental advantage over Alternative 1.

Alternative 4 was added to the consideration as it provides the maximum southwest extension that does not affect the interstate. All the other disadvantages of Alterative 3 remain. The development cost increases above that of Alternative 3, as does the southwest property acquisition requirements from the U.S. Forest Service. The noise potential is also between that of Alternatives 2 and 3. As a result, maintaining the entire runway extension to the northeast is recommended.

ALTERNATIVE 3



ALTERNATIVE 4



LEGEND

- Existing Airport Property Line
- Ultimate Airport Property Line
- Easement
- Ultimate Airfield Pavement
- Ultimate Road
- Runway Protection Zone (RPZ)
- Runway Safety Area (RSA)
- Object Free Area (OFA)

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Exhibit 4D
RUNWAY ALTERNATIVES 3 AND 4

ULTIMATE AIRFIELD CONSIDERATIONS

There are other considerations for the airfield that do not have a priority for anytime in the near future. Still, they need to remain in the overall plan for the airport to maintain their potential for future consideration.

The Facility Requirements chapter identified the future potential to supplement and eventually replace the existing ILS approach with a GPS approach of equal or lower minimums. The Category I GPS approach will likely require either a Wide Area Augmentation System (WAAS), or a Local Area Augmentation System (LAAS). There is also a possibility that a GPS approach could be constructed so that the landing threshold might eventually be moved to the end of the extended runway.

The other end of the runway is presently served by a GPS approach with minimums of one-mile visibility and 500-foot ceilings. With LAAS or WAAS, the lower minimums may be possible. While not a priority, a second Category I approach on Runway 3 should remain in ultimate planning for the airport. This is represented on all the runway alternatives exhibits by the large RPZ off the southwest end.

The Facility Requirements chapter also indicated the airport should have adequate capacity for the long term planning horizon. Any increase above this level, however, could call for capacity improvements. Thus, it is prudent to maintain that option by reserving space for a parallel runway.

Exhibit 4E depicts a potential location to the east of Runway 3-21. To provide for simultaneous use during visual flight rules (VFR), a minimum separation of 700 feet between runway centerlines is required. The southwest end of the proposed parallel runway is aligned with the southwest end of the current runway. The proposed runway is planned to 7,000 feet, the current length of the existing runway, and to Airport Reference Code C-III standards. The RPZs, the RSA, and the object free areas are depicted, as well as the building restriction line (BRL), to outline the minium area to be preserved.

Airfield access to the east side is also a consideration. **Exhibit 4E** presents the location for eastside parallel taxiways**.** One would run the full length of Runway 3-21, 400 feet from the runway centerline, leaving it 300 feet from the centerline of the primary runway. The other parallel taxiway would be 300 feet east of the parallel runway, and extend along its entire length.

Finally, a connecting taxiway is depicted on the exhibit. This is designed to be the primary taxiway connecting the east and west sides of the airfield. It aligns with Taxiway W (west) which extends to the back end of the general aviation hangar area. The east side is not laid out in any detail at this time, recognizing that its development will depend upon aviation growth well into the future. This

02MP09-4E-6/18/007

AIRPORT PROPERTY LINE

South Pulliam Dr.

Interstate 17

John Wesley Powell Blvd.

Shamrell Blvd.

Lake Mary Rd.

1,800'

700'

400'

300'

ULTIMATE PARALLEL RUNWAY (7,000' x 100')

EAST SIDE
TAXIWAY
ACCESS

LEGEND

- Existing Airport Property Line
- Ultimate Airport Property Line
- Easement
- Ultimate Airfield Pavement
- Ultimate Road
- Runway Protection Zone (RPZ)
- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Building Restriction Line (BRL)

0 1000 2000

SCALE IN FEET

NORTH

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Exhibit 4E
ULTIMATE AIRFIELD CONSIDERATIONS

provides flexibility to meets needs as they evolve at that time.

LANDSIDE CONSIDERATIONS

A significant amount of planning has been put into the development of the landside of the airport including the terminal, general aviation, and the airpark. The airpark and the subsequent infrastructure have established a general direction for development of the west side of the airport. Current planning also includes the extension of John Wesley Powell Boulevard to Lake Mary Road, as shown on **Exhibit 4E.**

Exhibit 4F depicts the westside airpark plan. There are 74.4 acres still available without direct airfield access. There are 24 acres with airfield access, with the Peabody Coal hangar located on a portion of one of those parcels.

ADOT plans for redevelopment of the I-17 interchange will return a portion of the current right-of-way along the east exit ramp to the airport, further expanding the airpark acreage. With plans and plats in place, the airpark marketing is ongoing. Thus, this master plan is not intended to revise the current plan for the landside of the airpark. The following subsections, however, discuss some additional considerations in the terminal area and the general aviation area.

PASSENGER TERMINAL AREA

The Facility Requirements chapter recognized that the terminal will be at capacity at approximately 70,000 annual enplanements. The parking lot would follow shortly after. The existing terminal was designed with the capability to grow by removing the glass on the northeast wall and expanding in that direction. **Exhibit 4G** depicts the general plan to extend the terminal to the northeast. The apron would be expanded in the same direction to accommodate the second-level gates.

Current plans are to provide for second-level boarding from the terminal expansion, along with baggage claim expansion. The remaining lower level was designed to be open to covered rental car parking. This is advantageous particularly during the winter months.

As the entire first level becomes needed for terminal functions, the rental car ready/return lot can be moved further to the northeast to the point where the new operations building is located. Recently constructed, the operations building houses both ARFF, SRE, and other airport operations functions. This moved these functions out of the general aviation area into a more central location along the airfield. The operations building includes garage doors in both directions, as well as access to the terminal ramp and the parallel taxiway.

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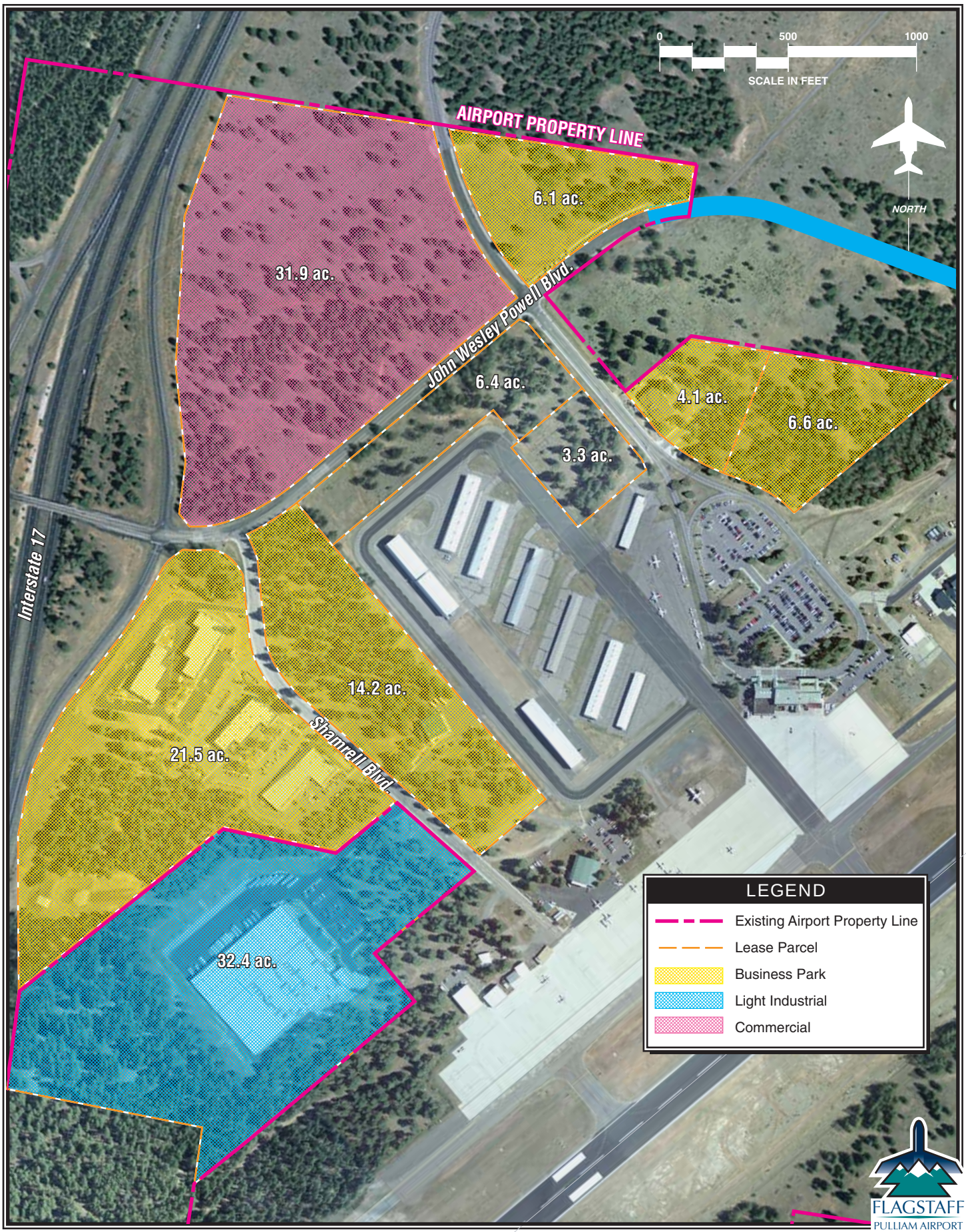

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Exhibit 4F
WEST SIDE AIR PARK PLAN

02MP09-4G-6/18/07

OPTION 1 - PARKING STRUCTURE

South Pulliam Dr.

AIRPORT PROPERTY LINE

PARKING STRUCTURE

RENTAL CAR STORAGE

RENTAL CAR WASH PLATFORM

RENTAL CAR STORAGE/ OVERFLOW

TERMINAL EXPANSION

RENTAL CAR READY/ RETURN

EMPLOYEE PARKING

APRON EXPANSION

OPERATIONS BUILDING

ATCT

NDB

OPTION 2 - SURFACE PARKING

0 300 600

SCALE IN FEET

NORTH

South Pulliam Dr.

AIRPORT PROPERTY LINE

SURFACE PARKING EXPANSION

SURFACE PARKING EXPANSION

RENTAL CAR STORAGE

RENTAL CAR WASH PLATFORM

TERMINAL EXPANSION

RENTAL CAR READY/ RETURN

EMPLOYEE PARKING

RENTAL CAR STORAGE/ OVERFLOW

APRON EXPANSION

OPERATIONS BUILDING

ATCT

NDB

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Exhibit 4G
TERMINAL CONSIDERATIONS

A new service road is planned that will extend between the terminal loop road and the Powell Boulevard extension. This is anticipated to have controlled access beyond the rental car ready/return to prohibit it from becoming a shortcut for public access to the terminal. The service road will also serve the rental car service and storage areas. The plan for a new wash platform is also included.

The DPS hangar will need to be relocated for the development of the ready/return lot. Relocation to the general aviation area would place it among similar functions.

The exhibit shows two options for expanding public parking in the future. Option One is the development of a multi-level parking structure within the existing lot. Structure parking provides for more parking in a limited space, and helps to minimize walking distances to the terminal. A parking garage also offers protection from the winter elements in climates such as Flagstaff's. Development costs can be expected to run between $12,000 and $15,000 per space.

A distinct disadvantage is that the multi-level garage could cut off views of the mountains that can currently be seen from the front of the terminal. In fact, the angle of the terminal was set, in part, to take advantage of that view.

Option Two considers the space required to provide a surface lot expansion. This would extend the surface lot to the northeast and include some in-fill as well. The in-fill areas are currently used for stormwater detention and for snow storage. If converted to a parking lot, new areas may be required for these functions. Excluding the access road relocation, the surface parking will cost between $3,000 and $5,000 per space.

Surface parking would retain the terminal's view of the mountains. Space available for other uses would be reduced. In particular, rental-car storage would need to be located further to the northeast. In addition the parking expansion shown provides an estimated 350 additional spaces. This will be as much as 150 spaces short of the long term planning horizon need. A larger lot could require more adjacent space or a remote parking lot.

GENERAL AVIATION CONSIDERATIONS

The general aviation (GA) considerations focus primarily on the use of the flightline and the addition of aircraft storage. Also, to be considered is an air cargo facility. **Exhibit 4H** outlines the general aviation considerations.

The current plan was designed to locate most private hangar storage off the flightline and into hangar area accessed by Taxiway W. There are currently three T-hangars housing 42 aircraft, and three shade hangars housing 38 aircraft. The Peabody Coal hangar is the only corporate hangar in the airpark at the present time.

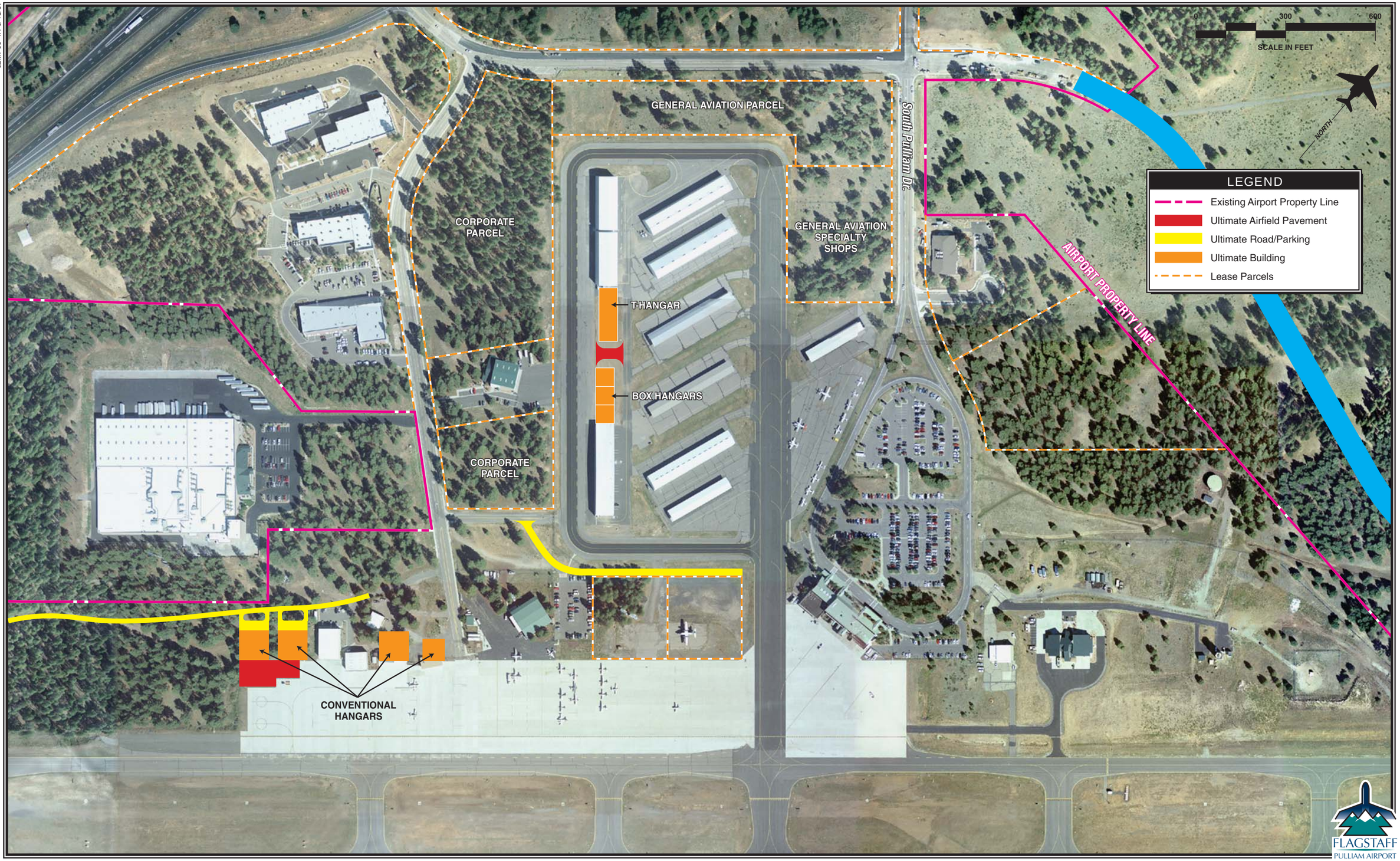

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Exhibit 4H
GENERAL AVIATION CONSIDERATIONS

It is anticipated that other corporate hangars will develop along the east and south sides of the taxiway loop. Additional T-hangars, box hangars, and a shade hangar have been planned and developed inside the taxiway loop. A wash rack has recently been developed in the eastern corner of the loop next to Taxiway W. A parcel on the north side of the loop is planned for uses such as general aviation specialty shops.

With storage hangars primarily to the east, this retains the flightline for fixed base operator and other higher activity uses. The relocation of the ARFF and SRE to the new operations building northeast of the terminal opens up even more of the flightline. **Exhibit 4H** indicates where additional conventional hangars can be developed. The south end of the ramp is well designed to serve helicopters and other operations by the DPS and the air ambulance agencies based at the airport. The relocation of the DPS operation to this area will also open up the area northeast of the terminal for the passenger-related functions discussed earlier.

At the north end of the ramp is an undeveloped area that can be subdivided into two parcels. The north parcel would be best reserved for an air cargo function. The location provides close access to both general aviation and commercial ramps. Ground access would extend from the current FBO access road.

This would allow the cargo facility to process belly freight from the passenger airlines as well as all-cargo aircraft. The southernmost parcel could be reserved for additional cargo activity or for FBO facilities.

SUMMARY

The process used in formulating and evaluating airfield and landside development alternatives involves an analysis of short and long range requirements, as well as future growth potential. Compliance with airport design standards was considered in every scenario. Safety, both air and ground, were given high priority in the analyses, as were potential effects on the environment.

Upon review of this draft working paper by the Planning Advisory Committee (PAC) and the public, the master plan concept will be updated. The resultant plan will represent an airfield facility that fulfills airline and corporate aviation needs and preserves long range viability while conforming to safety and design standards. It also maintains a landside complex that can be developed as demand dictates.

The remaining chapters will be dedicated to refining the updated concept into the final plan, with recommendations to ensure proper implementation as a demand-based program.

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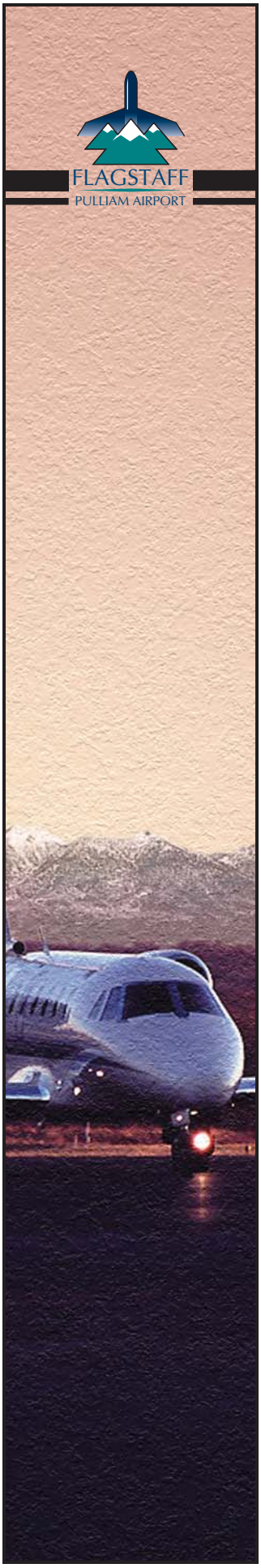
Chapter Five
AIRPORT PLANS

Airport Plans



The airport master planning process has evolved through several analytical efforts in the previous chapters intended to analyze future aviation demand, establish airside and landside facility needs, and evaluate options for the future development of the airside and landside facilities. The planning process, thus far, has included the presentation of four working papers (representing the first four chapters of the master plan) to the Planning Advisory Committee and the interested public. A master plan concept has evolved with their input. This plan will be subsequently refined into final airport layout drawings which will represent the extent of future improvements at the airport for the long-range planning period. The airport layout plan (ALP) set will be included as Appendix B in the final Master Plan.

AIRPORT DESIGN STANDARDS

As a commercial service airport, Flagstaff Pulliam Airport (FLG) must comply with Federal Aviation Administration (FAA) design and safety standards. FAA Advisory Circular 150/5300-13, *Airport Design*, is the key reference used to ensure compliance with these standards. These design and safety standards are based primarily upon the characteristics of aircraft expected to use the airport on a regular basis.

As previously discussed in Chapter Three, the design codes are based upon the approach speeds and wingspans of these critical aircraft. This is comprised of the most demanding

aircraft or "family" of aircraft conducting at least 500 annual operations at the airport. The airport has been served in the past by aircraft in Airport Reference Code (ARC) C-III. The current commercial service is provided by Dash 8 aircraft, which are in ARC A-III. The airport is also utilized extensively by business jets in ARC C-II and D-II. The regional jets that are anticipated to serve the airport are ARC C-II. For the long-term, however, the ARC C-III design should be maintained. A combination of some business jets, commercial charters, and possible air cargo activity could readily make C-III critical for airport design once more.

The plan also calls for the reservation of space for an ultimate parallel runway. This runway will likely be designed for use primarily by general aviation and commuter aircraft. As a result, its ultimate design should be ARC C-II. Since a number of design standards are affected by these classifications, a summary of the runway and taxiway standards has been provided in **Table 5A**. It is critical to remember that pavement may be designed to the currently justified ARC, but separation standards should consider the ultimate ARC.

RECOMMENDED MASTER PLAN CONCEPT

The recommended master plan concept provides for anticipated facility needs over the long-range planning horizon, while ensuring a viable aviation facility for Flagstaff and the surrounding area well beyond this period. The recommended concept is depicted on **Exhibit 5A**. The following paragraphs summarize the airside and landside recommendations.

AIRFIELD RECOMMENDATIONS

The principal airfield recommendations focus first upon safety and security. Of key importance is ensuring that airport design standards are met, particularly in relation to the runway safety area (RSA). Recommendations are then provided to improve the efficiency and circulation on the airfield. The following subsections discuss the recommendations as they pertain to each runway, the taxiway system, and the airfield support facilities.

Primary Runway 3-21

Runway 3-21 is currently the only runway and will remain the primary runway for the future. It is 6,999 feet in length, with a pavement strength of 95,000 pounds dual wheel loading (DWL). This runway length is not adequate for the airport to be able to support business aircraft today and regional jet service in the future. Additional runway length is needed to assist business jet users on the long haul trips they regularly make from FLG.

The runway length evaluation in Chapter Three indicated that a takeoff length of 8,800 feet would meet the needs of regional jets, as well as best serve the local business jet users. This is included in the plan with a 1,801-foot extension to the northeast

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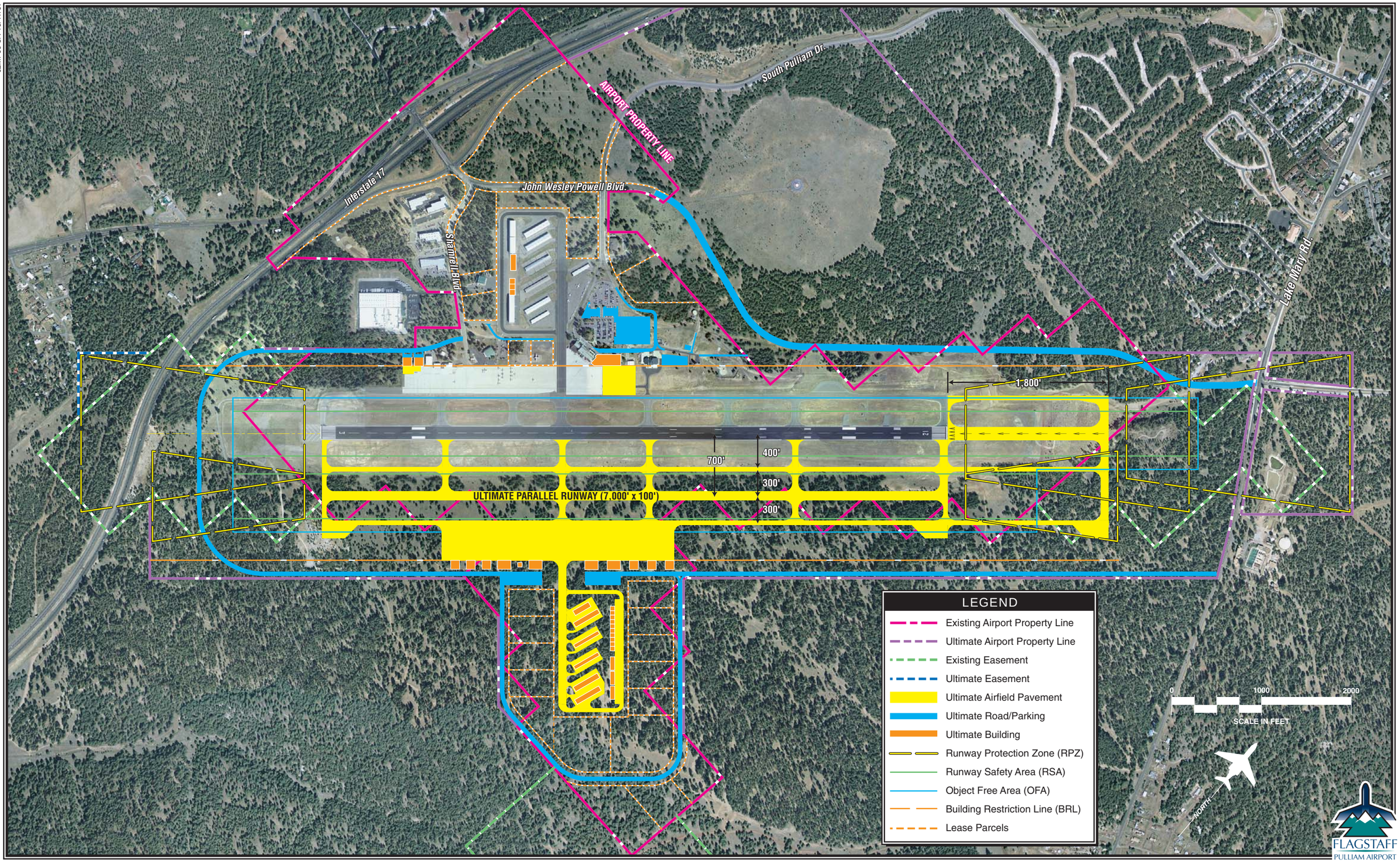

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Exhibit 5A
AIRPORT DEVELOPMENT PLAN

end of Runway 3-21. This extension results in a pavement length of 8,800 feet, but the landing distance available on Runway 21 will remain at 6,999 feet. This displaced threshold will remain necessary to ensure clearances for the existing instrument landing system (ILS) approach to Runway 21.

TABLE 5A
Runway Design Standards
Flagstaff Pulliam Airport

	Runway 3-21	Ultimate 3R-21L
Airport Reference Code	C-III	C-II
Approach Visibility Minimums	½ Mile	Mile+
Runway		
Width (ft.)	150	100
Runway Safety Area (RSA)		
Width (centered on runway centerline) (ft.)	500	500
Length Beyond Runway End (ft.)	1,000	1,000
Object Free Area (OFA)		
Width (ft.)	800	800
Length Beyond Runway End (ft.)	1,000	1,000
Obstacle Free Zone (OFZ)		
Width (ft.)	400	400
Length Beyond Runway End (ft.)	200	200
Runway Centerline to:		
Parallel Runway (ft.)	700	700
Parallel Taxiway Centerline (ft.)	400	300
Edge of Aircraft Parking Apron (ft.)	500	400
Runway Protection Zones (RPZ)		
Inner Width (ft.)	1,000	500
Outer Width (ft.)	1,750	1,010
Length (ft.)	2,500	1,700
Obstacle Clearance		
Approach Slope	50:1	34:1

Taxiway and Taxilane Design Standards

	ADG III	ADG II	ADG I
Taxiways			
Width (ft.)	50	35	25
Shoulder Width (ft.)	20	10	10
Safety Area Width (ft.)	118	79	49
Object Free Area Width (ft.)	186	131	89
Taxiway Centerline to:			
Parallel Taxiway/Taxilane (ft.)	152	105	69
Fixed or Moveable Object (ft.)	93	65.5	44.5
Taxilanes			
Taxilane Centerline to:			
Parallel Taxilane Centerline (ft.)	140	97	64
Fixed or Moveable Object (ft.)	81	57.5	39.5

Source: FAA Airport Design Software Version 4.2D

As indicated, Runway 21 is equipped with a full ILS, which currently provides the airport with Category (CAT) I minimums of ½-mile visibility and 300-foot cloud ceilings. Runway 3 currently has a straight-in Global Positioning System (GPS) approach with minimums of one-mile visibility and 400-foot cloud ceilings. It is recommended that Runway 3 be ultimately planned to allow for a Category I approach should CAT I GPS approaches be approved. With the CAT I upgrade, it will be necessary to add a medium

intensity approach light system with runway alignment indicator lights (MALSR) to the Runway 3 end.

Parallel Runway 3R-21L

A parallel runway is shown on the plan to the east of Runway 3-21. This runway is planned to be 7,000 feet long and ultimately meet C-II design standards. The centerlines of the parallel runways are planned to a 700-foot separation. This will permit simultaneous operations during visual meteorological conditions. Both ends of the parallel runway are planned to one-mile visibility minimums, ultimately utilizing GPS.

While it is not anticipated that the runway will be developed within the planning horizons as outlined in this Master Plan, it is still important to reserve this area for the runway to ensure that development on the east side of the airfield does not preclude the runway's development in the future.

Full-length parallel taxiways are planned along both sides of the parallel runway, with exits matching those on Runway 3-21. The middle parallel taxiway would be positioned 400 feet from the primary runway. Both taxiways can be located 300 feet from the parallel runway. To serve development on the east side of the airfield prior to the need for the parallel runway, the exterior parallel taxiway is expected to be developed first.

Support Facilities

Airport support facilities include facilities necessary for the maintenance and operation of the airport. These include the airport rescue and fire-fighting facility (ARFF), snow removal equipment (SRE) and airport maintenance facilities, perimeter roads, and the airport traffic control tower (ATCT).

The ARFF and SRE equipment are now housed in the newly constructed operations building located to the north of the passenger terminal complex. This centralized location will provide rapid response to the terminal for emergencies, as well as be centrally located along the runway.

The ATCT is located to the north of the operations building. While it may become necessary to update and replace the tower in the future, a location in proximity to the new tower should suffice. This keeps these key support facilities centrally located along the airport operations area (AOA) and within the secure area of the airport.

A perimeter road system that will ultimately encompass the entire airport is also depicted on **Exhibit 5A**. This will include a roadway on the west side extending north to Lake Mary Road. A road around the south end of the runway will connect the west airport area to the east side development. This road will continue around the perimeter of the east side development, then turn north to connect with Lake Mary Road.

Property Acquisition

Exhibit 5A also depicts property acquisitions recommended for the airport. Property recommended for acquisition includes the VOR/DME navigational aid site, future runway protection zones (RPZs), and property needed to preserve the capability for a parallel runway.

The RPZ acquisition includes the relocated RPZ resulting from the north extension of Runway 3-21. The ultimate CAT I RPZ for the south end of the runway will also need to be positively controlled either by fee simple or easement. The approaches and the alignment for the parallel runway should also be acquired. This includes adequate sideline clearances for the runway and a supporting perimeter road system.

LANDSIDE RECOMMENDATIONS

The landside plans include recommendations for the passenger terminal area, general aviation areas on the west side, and the future development of additional aviation-related facilities on the east side of the airport. The following subsections discuss each component of the landside recommendations.

PASSENGER TERMINAL

With the increased awareness for airport security since the events of September 11, 2001, Flagstaff Pulliam Airport continues to work with the FAA and the Transportation Security Administration (TSA) to ensure compliance with all new security requirements. While security has increased at FLG and other commercial service airports across the nation, the two entities continue to evaluate the best means to meet current and future requirements on a long-term basis. This Master Plan is not directly involved in the development of these measures; however, it remains important that the Master Plan maintain flexibility to adjust to evolving security needs.

The basic plan for the passenger terminal area is depicted on **Exhibit 5B** and calls for expansion of each of its various components as needed. The plan allows for the expansion of the terminal building to the north. This will allow for all functions within the terminal building to grow to meet future demand. The new terminal expansion is planned for more depth within the building and also allows for second-level boarding if desired.

The plan also allows for the expansion of the terminal apron to accommodate additional gates and second-level boarding. This would involve an extension of the apron to the north to coincide with the terminal building extension.

The access road directly in front of the terminal would be realigned slightly and extended further north, along with the building expansion. The alignment adjustment allows the capability to add depth inside the terminal building. The loop road would also be realigned on its northeast side to

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0 300 600
SCALE IN FEET

NORTH

LEGEND
- Existing Airport Property Line
- Ultimate Airfield Pavement
- Ultimate Road/Parking
- Ultimate Building
- Lease Parcels

GENERAL AVIATION PARCEL
South Pulliam Dr.
CORPORATE PARCEL
GENERAL AVIATION SPECIALTY SHOPS
AIRPORT PROPERTY LINE
T-HANGARS
BOX HANGARS
SURFACE PARKING EXPANSION
CORPORATE PARCEL
SURFACE PARKING EXPANSION
RENTAL CAR STORAGE
RENTAL CAR WASH PLATFORM
RESERVED FOR CARGO FACILITY
TERMINAL EXPANSION
RENTAL CAR READY/ RETURN
EMPLOYEE PARKING
RENTAL CAR STORAGE/ OVERFLOW
ATCT
NDB
CONVENTIONAL HANGARS
APRON EXPANSION

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Exhibit 5B
WEST SIDE TERMINAL PLAN

provide for more surface parking inside the loop.

Rental car ready/return parking would need to move further to the northeast, with the terminal building expansion covering the current lot. This is planned to be located between the expanded terminal and the operations building. Employees currently park in the public parking lot. A separate employee lot is planned to the north of the operations building. This would be developed when the public parking lot no longer has surplus spaces.

The area to the northeast of the terminal and the loop road is also planned to continue to be used for rental car service and storage, as shown on **Exhibit 5B**.

AIR CARGO

There are presently no air cargo facilities at the airport. Under the plan depicted on **Exhibit 5B**, a parcel would be reserved for the development of an air cargo building and related facilities. This tract is in close proximity to the terminal to handle airline belly freight. It is also adjacent to the parking apron to handle all-cargo aircraft.

GENERAL AVIATION

General Aviation Areas

The general aviation (GA) facilities at FLG are all presently located on the west side of the airfield. As shown on **Exhibit 5B**, no major changes are planned for this area. Most development will involve fill-in of hangars in available open areas. There will be an additional parcel available next to the air cargo parcel. This should be reserved for either the expansion of the fixed base operator (FBO) or the air cargo facilities.

As the need for additional space becomes necessary, a new area is planned for the east side of the airfield. **Exhibit 5C** outlines the proposed plan for the east side GA facilities. A ramp is planned along the exterior parallel taxiway that would be fronted with conventional hangars to house aircraft, FBO, and specialty services. Access is planned from both the north and the south via a perimeter road that will ultimately surround the airport.

A taxiway loop similar to that on the west side of the airport is planned for the east side. This would include the extension of the east taxiway into the depth of the available airport property. The taxiway loop would encompass a new T-hangar area, as well as provide access to corporate parcels. These would support businesses that utilize aviation in their operation.

AIRPORT LAND USE PLAN

The objective of airport land use planning is to coordinate uses of the airport property in a manner that is both functional with the design of the airport and compatible with the airport environs. There are two primary considerations for on-airport land use planning. First is to secure those areas essential to the safe and efficient

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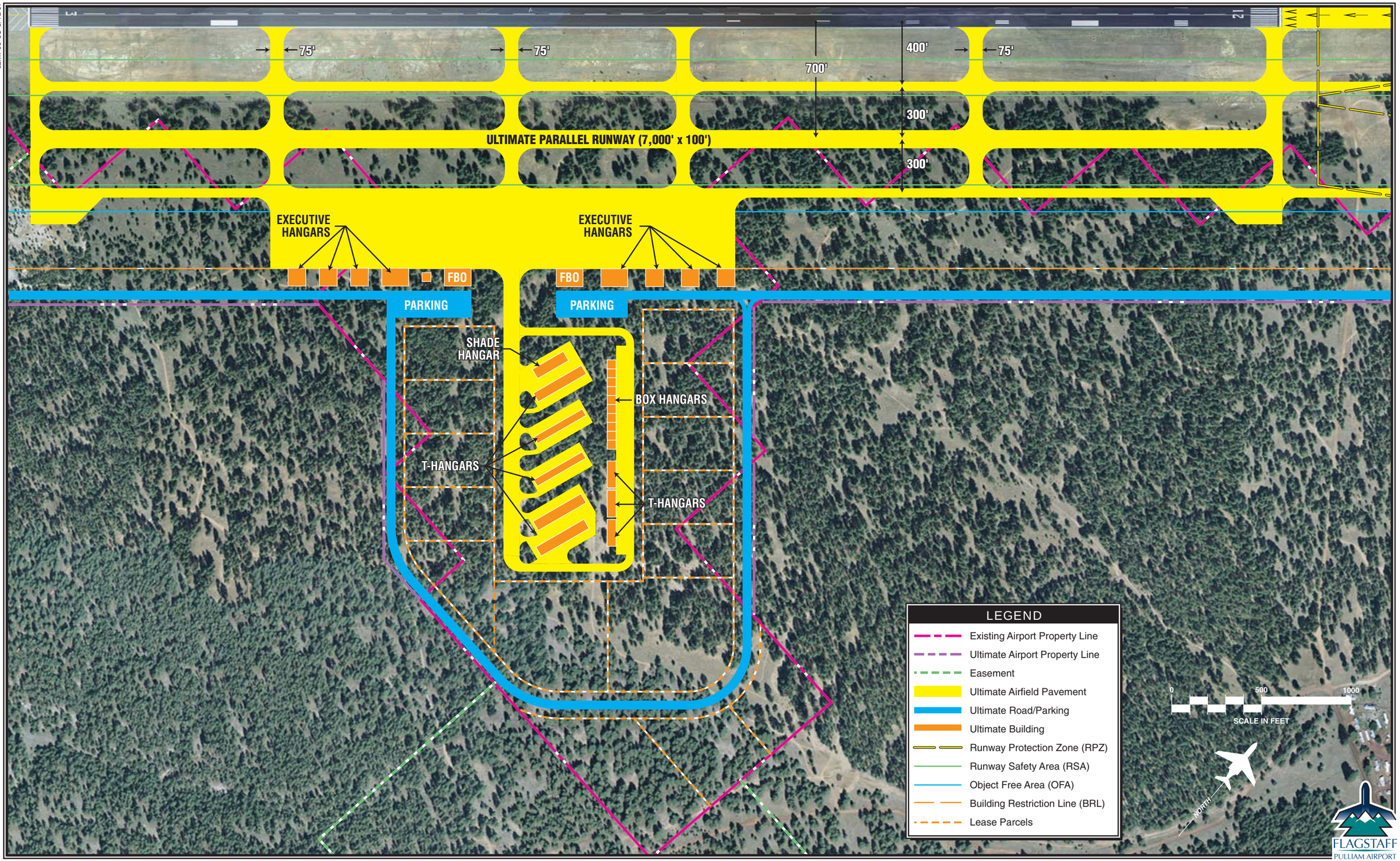

Exhibit 5C
EAST SIDE TERMINAL PLAN

operation of the airport. Second is to determine compatible land uses for the balance of the property which would be most advantageous to the airport and the community.

Exhibit 5D depicts the recommendations for the ultimate land use development on the airport. The long-range future for an area may differ from the current use of the property. In these areas, major expansion or improvements of the existing use should be discouraged. If expansion is needed, it should be directed to the appropriate use areas depicted on the land use plan.

Several airport land use categories have been identified. They include passenger terminal, air cargo, general aviation, airport support, and revenue support. This is in addition to the Airpark categories previously defined as business park, light industrial, and commercial. All but the Airpark were essentially discussed in the previous subsections. The Airpark remains as a means of revenue support and utilizes areas that are within the airport boundaries for compatibility purposes. Remnants on the east side have been categorized for these types of uses as well.

SUMMARY

The recommended master plan concept has been developed in cooperation with the advisory committees, interested citizens, and the airport commission. It is designed to assist the City of Flagstaff, the Arizona Department of Transportation, and the FAA in making decisions relative to future development and growth at Flagstaff Pulliam Airport. The plan provides for development to satisfy expected airport needs over the next 20 years and beyond.

Flexibility will be a key to future development since activity may not occur exactly as forecast. The plan has considered demands that could be placed upon the airport even beyond the normal 20-year planning period, to ensure that the facility is capable of accommodating a variety of circumstances. The recommended master plan concept provides the City with options to pursue in marketing the assets of the airport for community development. Following the general recommendations of the plan, the airport can maintain its long-term viability and continue to provide air transportation services to the region.

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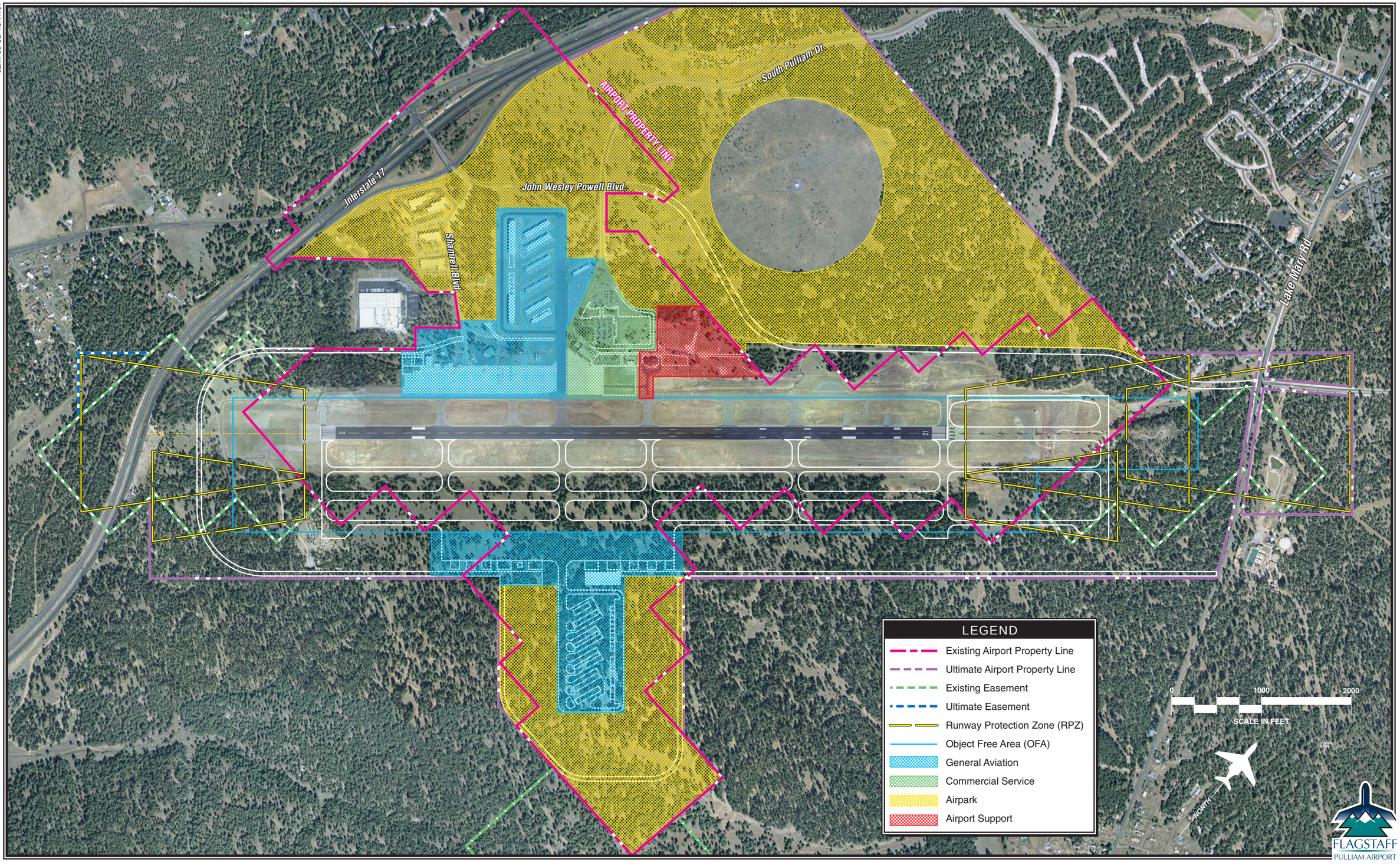


FLAGSTAFF
PULLIAM AIRPORT

Exhibit 5D
AIRPORT LAND USE PLAN

FLAGSTAFF
PULLIAM AIRPORT

Chapter Six
FINANCIAL PLAN

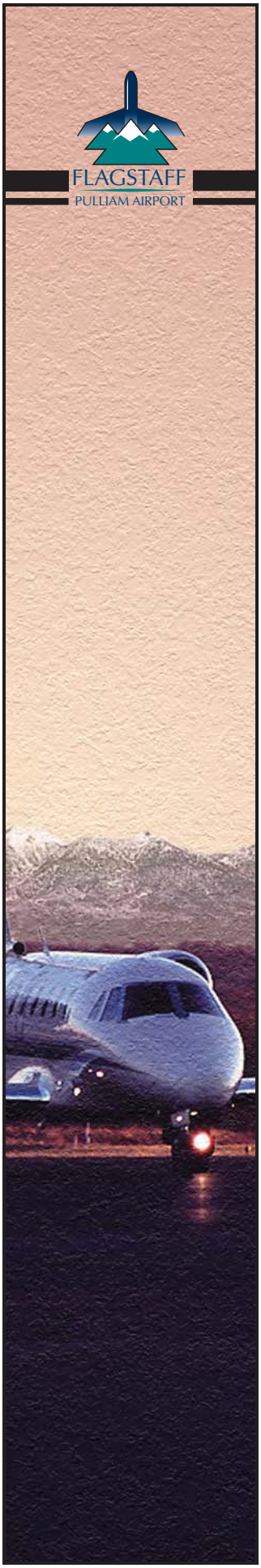
Financial Plan

The successful implementation of the Master Plan for Flagstaff Pulliam Airport (FLG) will require sound judgment on the part of airport management to meet changing needs, especially since September 11, 2001. Among the more important factors influencing decisions to carry out a recommendation are timing and airport activity, which have been affected by terrorism and the economic recession. Both of these factors should be used as references in plan implementation.

Experience has indicated that problems have materialized from the standard time-based format of traditional planning documents. The problems center around their inflexibility and inherent inability to deal with unforeseen changes that may occur.

While it is necessary for scheduling and budgeting purposes to consider the timing of airport development, the actual need for facilities is established by airport activity. Proper master planning implementation suggests the use of airport activity levels rather than time as guidance for development.

This chapter of the Master Plan is intended to become one of the primary references for decision-makers responsible for implementing master plan recommendations. Consequently, the narrative and graphic presentations must provide understanding of each recommended development item. This understanding will be critical in maintaining a realistic and cost-effective program that provides maximum



benefit to the City, the Arizona Department of Transportation - Aeronautics Division (ADOT), and the Federal Aviation Administration (FAA).

CAPITAL IMPROVEMENT PROGRAM

Once the specific needs and improvements for the airfield have been established, the next step is to determine a realistic schedule and costs for implementing the plan. This subsection examines the overall cost of development and a demand-based schedule for airport improvements.

The development schedule can be initially established by dividing the improvement needs into three planning horizons of short term, intermediate term, and long range. For the airfield, the key activity indicator is aircraft operations. For hangar development, based aircraft will be the indicator. **Table 6A** summarizes the operational milestones for each planning horizon.

TABLE 6A
Aviation Demand Planning Horizons
Flagstaff Pulliam Airport

	Base Year	Short Term	Intermediate Term	Long Term
ANNUAL OPERATIONS				
Airline	3,324	4,800	8,200	14,200
Air Taxi	5,965	6,400	7,100	8,200
Military	824	800	800	800
General Aviation				
Itinerant	27,447	31,300	34,600	39,800
Local	16,033	20,400	21,900	24,300
TOTAL OPERATIONS	53,593	63,700	72,600	87,300
Annual Enplanements	37,257	70,000	124,000	227,000
BASED AIRCRAFT	116	131	139	154

Exhibit 6A summarizes capital needs for Flagstaff Pulliam Airport through the planning horizons of this master plan. An estimate has been included with each project of federal and state funding eligibility, although this amount is not guaranteed. For larger capital projects, it may be necessary for the City of Flagstaff to apply for discretionary funds (discussed in more detail in the following paragraphs).

Individual project cost estimates account for engineering and other contingencies that may be experienced during the implementation of the project, and are in current (2004) dollars. Due to the conceptual nature of a master plan, implementation of capital improvement projects should occur only after further refinement of their design and costs through engineering and/or architectural analyses. Capital costs in this chapter should be viewed only as estimates subject to further refinement during design.

		PROJECT DESCRIPTION	PROJECT COST	FAA SHARE	ADOT SHARE	CITY SHARE
SHORT TERM						
2005	1	Access Road Improvements Design	$180,000	$0	$162,000	$18,000
	2	Apron Preservation (Joint Reseal)	75,000	0	67,500	7,500
		2005 Subtotal	**$255,000**	**$0**	**$229,500**	**$25,500**
2006	1	Extend Runway 3-21 1,800 ft.	$11,200,000	$10,640,000	$280,000	$280,000
	2	Property Acquisition (640 ac.)	$1,140,000	1,083,000	28,500	28,500
		2006 Subtotal	**$12,340,000**	**$11,723,000**	**$308,500**	**$308,500**
2007	1	Access Road Improvements	$1,060,000	$1,007,000	$26,500	$26,500
	2	North Perimeter Road Design	800,000	0	720,000	80,000
		2007 Subtotal	**$1,860,000**	**$1,007,000**	**$746,500**	**$106,500**
2008	1	Extend Perimeter Road North	$4,800,000	$4,560,000	$120,000	$120,000
	2	Design Loop Taxiway Overlay	540,000	0	486,000	54,000
		2008 Subtotal	**$5,340,000**	**$4,560,000**	**$606,000**	**$174,000**
2009	1	Loop Taxiway Overlay	$1,280,000	$1,216,000	$32,000	$32,000
	2	Design East Parallel Taxiway South	1,000,000	0	900,000	100,000
		2009 Subtotal	**$2,280,000**	**$1,216,000**	**$932,000**	**$132,000**
2010	1	Develop East Parallel Taxiway South	$7,000,000	$6,650,000	$175,000	$175,000
	2	Design East Parallel Taxiway North	1,300,000	0	1,170,000	130,000
		2010 Subtotal	**$8,300,000**	**$6,650,000**	**$1,345,000**	**$305,000**
SHORT TERM TOTAL			**$30,375,000**	**$25,156,000**	**$4,167,500**	**$1,051,500**
INTERMEDIATE TERM (2011-2015)						
	1	Relocate/Expand Rental Car Parking	$148,000	$0	$0	$148,000
	2	Expand Terminal Building (10,000 sf)	3,250,000	1,000,000	500,000	1,750,000
	3	Expand Terminal Parking (120 spaces)	360,000	342,000	9,000	9,000
	4	Develop East Parallel Taxiway North	11,700,000	11,115,000	292,500	292,500
	5	Develop South Perimeter Road	5,600,000	5,320,000	140,000	140,000
	6	Construct East Parking Lot	1,700,000	1,615,000	42,500	42,500
	7	Install East Side Utilities	1,500,000	950,000	475,000	75,000
	8	Pavement Preservation Projects	2,000,000	1,900,000	50,000	50,000
	9	Capital Equipment	1,000,000	950,000	25,000	25,000
INTERMEDIATE TERM TOTAL			**$27,258,000**	**$23,192,000**	**$1,534,000**	**$2,532,000**
LONG TERM (2016-2025)						
	1	Extend Terminal Loop Road	$620,000	$589,000	$15,500	$15,500
	2	Construct Terminal Area Service Road	340,000	323,000	8,500	8,500
	3	Expand Terminal Parking (400 spaces)	1,080,000	0	0	1,080,000
	4	Construct Employee Parking	210,000	0	0	210,000
	5	Expand Terminal Building (15,000 sf)	5,850,000	1,000,000	500,000	4,350,000
	6	Expand Terminal Apron	1,280,000	1,216,000	32,000	32,000
	7	Construct Taxiway E	1,380,000	1,311,000	34,500	34,500
	8	Terminal Loop Taxiway	1,160,000	1,102,000	29,000	29,000
	9	Extend East Parking Apron	1,700,000	1,615,000	42,500	42,500
	10	Complete East Perimeter Road	6,200,000	5,890,000	155,000	155,000
	11	Extend East Utilities	960,000	608,000	304,000	48,000
	12	Pavement Preservation Projects	4,000,000	3,800,000	100,000	100,000
	13	Capital Equipment	2,000,000	1,900,000	50,000	50,000
LONG TERM TOTAL			**$26,780,000**	**$19,354,000**	**$1,271,000**	**$6,155,000**
GRAND TOTAL			**$84,413,000**	**$67,702,000**	**$6,972,500**	**$9,738,500**

Exhibit 6A
CAPITAL IMPROVEMENT PROGRAM

The short term horizon covers items of highest priority, as well as items that should be developed as the airport approaches the short term activity milestones. Priority items should include improvements related to the runway safety areas and the approaches. Improvements to facilities that are inadequate for present demand should also be included in the short term. Because of their priority, these items should be incorporated into FAA, ADOT, and City five-year programming. In fact, the development schedule already conforms to the Airport Capital Improvement Program (ACIP) that the City has submitted to the FAA and ADOT for 2006-2010.

When short term horizon activity milestones are reached, it will be time to program for the intermediate term based upon the next set of milestones. The following briefly discusses the improvements anticipated at each planning horizon through the long term.

SHORT TERM IMPROVEMENTS

As indicated earlier, the short term planning horizon is the only development stage that is correlated to time. This is because development within this initial period is concentrated on the most immediate needs of the airfield and landside areas. Therefore, the program is presented year-by-year through 2010, to assist in capital improvement programming. **Short term improvements presented in Exhibit 6A and depicted on Exhibit 6B are estimated at $30.4 million**.

The major focus in the short term period is to respond to the need for additional runway length to accommodate business and regional jets. Many business jet users face operational restrictions on a regular basis today. This will also become more critical for the airport to be able to maintain and improve upon its current level of commercial service. The extension of Runway 3-21 to a length of 8,800 feet will meet this need. The parallel taxiway is included in this extension project.

The runway extension will require the acquisition of property for the runway protection zone. There are also several other tracts around the airport that are recommended for acquisition. These include the area around the VOR/DME, the south runway protection zone, areas that need to be protected for the parallel runway, and parcels associated with east side development. These are recommended to be placed under airport control in the short term.

The development of the perimeter road to the north is also planned for the short term. This road would connect to Lake Mary Road and serve as a portion of the perimeter road planned to provide access around the airport. This section of roadway might initially serve as a haul road for the runway extension.

Maintenance projects in the short term include rehabilitation and improvement of John Wesley Powell Boulevard and Pulliam Drive. Other items include apron rehabilitation and an overlay of the loop taxiway.

A project included near the end of the short term is designed to make the east side of the airport accessible for aircraft. The south portion of the east parallel taxiway will be the first step to opening up the east for aviation development. The next steps follow in the intermediate and long term programs.

INTERMEDIATE TERM IMPROVEMENTS

Intermediate term improvements are also presented on **Exhibit 6A** and depicted on **Exhibit 6B**. The mid-range improvements focus more on the projects related to growth in demand. It is anticipated that service by regional jets will encourage more passenger use of the airport. As the short term planning horizon of 70,000 annual enplaned passengers is surpassed, the terminal building will become undersized. A 10,000-square-foot expansion is included in this phase. To accommodate the expansion, the rental car parking will need to be moved further north. Some fill-in of space in the public parking lot will also become necessary.

The development on the east side will also continue with the construction of a perimeter service road around the south end of the airfield. The east side parallel taxiway will also be completed to the north end of Runway 3-21. Utilities and the start of a general aviation apron will make the east side ready for aviation use.

An allowance is provided in the program for continued pavement preservation projects, as well as equipment purchases designed to replace and update current airport support vehicles and equipment. **The estimated cost to fully undertake the intermediate horizon projects is $27.3 million.**

LONG RANGE IMPROVEMENTS

Development in the long range (**Exhibits 6A and 6B**) will focus further on demand-related improvements. Additional growth in airline traffic will trigger the need for the second phase of terminal expansion projects. This is expected to include an additional 15,000-square-foot building expansion. To accommodate a widening of the expanded portion of the building, the terminal road in front of the building will be realigned slightly. This will also serve to extend the terminal curb front.

This leads to the extension of the terminal loop road to the north to make room for additional auto parking within the loop. The employee lot is also included in the long term plan.

General aviation development focuses on the east side with the extension of Taxiway E to the east from the east side ramp. This will be followed by the development of a taxiway loop, as well as the extension of utilities and the perimeter road around the east side. Developing this road north to Lake Mary Road will complete the perimeter road system during this period.

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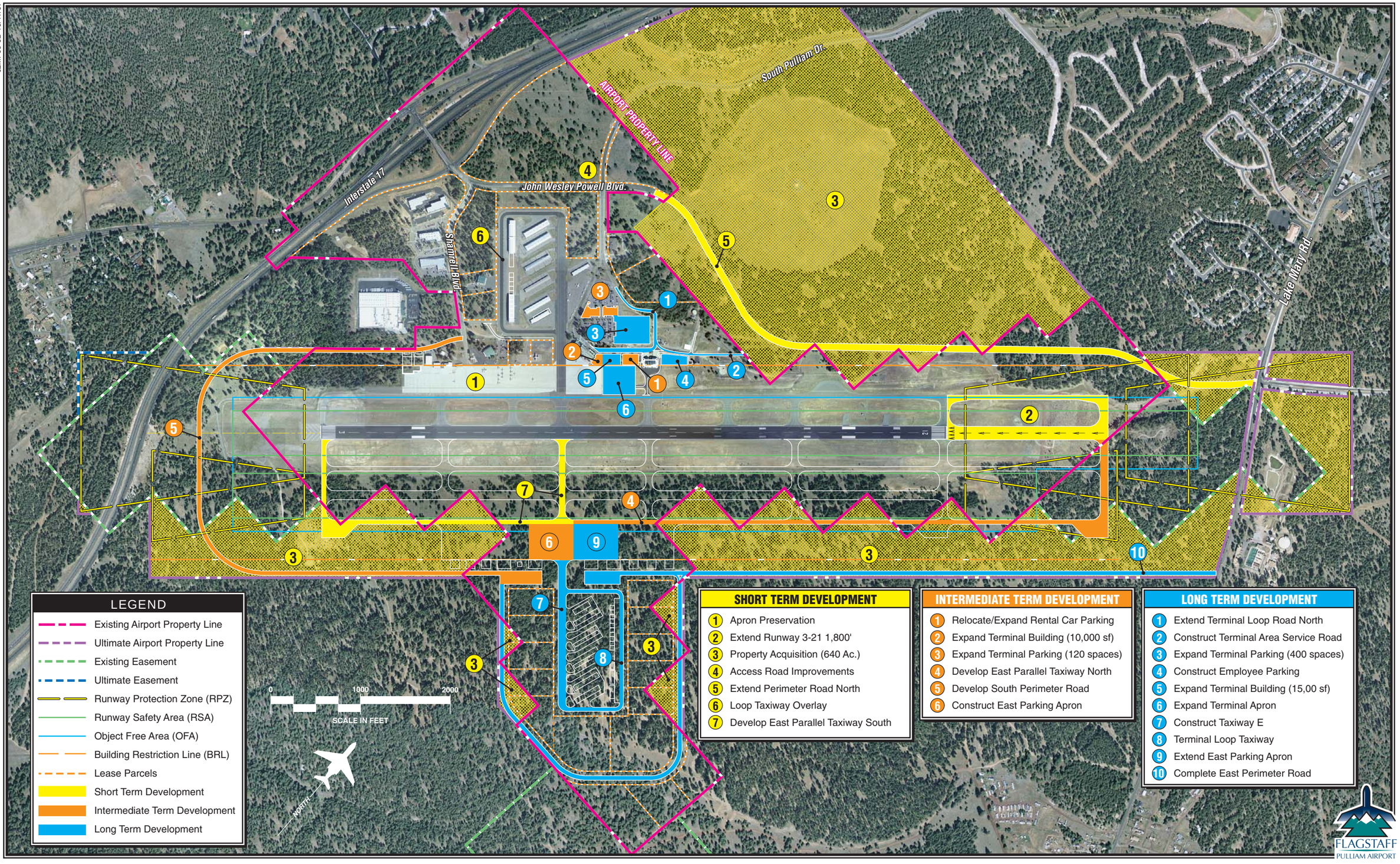


LEGEND

- Existing Airport Property Line
- Ultimate Airport Property Line
- Existing Easement
- Ultimate Easement
- Runway Protection Zone (RPZ)
- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Building Restriction Line (BRL)
- Lease Parcels
- Short Term Development
- Intermediate Term Development
- Long Term Development

SHORT TERM DEVELOPMENT

1. Apron Preservation
2. Extend Runway 3-21 1,800'
3. Property Acquisition (640 Ac.)
4. Access Road Improvements
5. Extend Perimeter Road North
6. Loop Taxiway Overlay
7. Develop East Parallel Taxiway South

INTERMEDIATE TERM DEVELOPMENT

1. Relocate/Expand Rental Car Parking
2. Expand Terminal Building (10,000 sf)
3. Expand Terminal Parking (120 spaces)
4. Develop East Parallel Taxiway North
5. Develop South Perimeter Road
6. Construct East Parking Apron

LONG TERM DEVELOPMENT

1. Extend Terminal Loop Road North
2. Construct Terminal Area Service Road
3. Expand Terminal Parking (400 spaces)
4. Construct Employee Parking
5. Expand Terminal Building (15,00 sf)
6. Expand Terminal Apron
7. Construct Taxiway E
8. Terminal Loop Taxiway
9. Extend East Parking Apron
10. Complete East Perimeter Road

FLAGSTAFF PULLIAM AIRPORT

Exhibit 6B
DEVELOPMENT STAGING

As with the intermediate term, an allowance is included for on-going pavement preservation and capital equipment replacement and updating. **Total costs for the long range program are estimated at $26.8 million.**

CAPITAL IMPROVEMENTS FUNDING

Financing for capital improvements comes from several sources. Contributors to the airport's development are its users, through a system of user taxes, lease rents, fees, and charges. These sources include not only the rates and charges for airport use imposed by the City of Flagstaff, but also federal and state airport improvement programs and passenger facility charges. The following paragraphs outline the key sources for funding.

FEDERAL GRANTS

The United States Congress has long recognized the need to develop and maintain a system of aviation facilities across the nation for the purpose of national defense and promotion of interstate commerce. Various grants-in-aid programs to public airports have been established over the years for this purpose. The most recent legislation is the *Airport Improvement Program* (AIP) of 1982. The AIP has been reauthorized several times, with the most recent legislation enacted in late 2003 and entitled the *Vision 100 - Century of Aviation Reauthorization Act.*

The newly enacted four-year program covers FAA fiscal years 2004, 2005, 2006, and 2007. This Bill presented similar funding levels to the previous reauthorization – *AIR-21*. Funding was authorized at $3.4 billion in 2004, $3.5 billion in 2005, $3.6 billion in 2006, and $3.7 billion in 2007. This allows the FAA the opportunity to plan for longer-term projects versus single-year reauthorizations.

The source for AIP funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Trust Fund also finances the operation of the FAA. It is funded by user fees, taxes on airline tickets, aviation fuel, and various aircraft parts. The funds are distributed under appropriations set by Congress to airports in the United States which have certified eligibility. The distribution of grants is administered by the Federal Aviation Administration. Funds are distributed each year by the FAA, from appropriations by Congress. A portion of the annual distribution is to primary commercial service airports, based upon enplanement levels. Airports with qualifying levels of air cargo shipments can receive additional entitlements. After all specific-funding mechanisms are distributed, the remaining AIP funds are disbursed by the FAA, based upon the priority of the project for which they have requested federal assistance through discretionary apportionments. A national priority system is used to

evaluate and rank each airport project. Those projects with the highest priority are given preference in funding.

Under the AIP program, examples of eligible development projects include the airfield, aprons, and access roads. Passenger terminal building improvements (such as bag claim and public waiting lobbies) may also be eligible for FAA funding. Under the newest version of AIP, *Vision 100*, automobile parking at small hub airports can also be eligible. Improvements such as fueling facilities, utilities (with the exception of water supply for fire prevention), hangar buildings, airline ticketing, and airline operations areas are not typically eligible for AIP funds.

Under *Vision 100*, Flagstaff Pulliam Airport is eligible for 95 percent funding assistance from AIP grants, as opposed to the previous *AIR-21* level of 90 percent.

Entitlement Funds

AIP provides funding for eligible projects at airports through an entitlement program. Primary commercial service airports receive a guaranteed minimum of federal assistance each year, based on their enplaned passenger levels and Congressional appropriation levels. A primary airport is defined as any commercial service airport enplaning at least 10,000 passengers annually.

Under the entitlement formula, airports enplaning 10,000 or more passengers annually will receive the higher of $1.0 million or an amount based upon the entitlement formula. The entitlement formula is based upon $15.60 per enplaned passenger for the first 50,000 enplanements and $10.40 per enplanement for the next 50,000 boardings. The next 400,000 enplanements provide $5.20 each, and an airport receives $1.30 for the next 500,000 boardings.

For each annual enplanement above one million, the airport will receive $1.00. While the entitlement amounts are double the levels authorized previously, they may be reduced proportionally if Congress does not annually appropriate at least $3.2 billion.

A primary airport will receive the minimum entitlement level until annual boardings exceed 71,154. Flagstaff Pulliam Airport, with boardings at the 40,000 level, currently receives the minimum entitlement level of $1.0 million each federal fiscal year. Shortly after enplanements exceed the short term planning horizon level of 70,000 annual enplanements, the airport can expect to begin to receive annual entitlements in excess of $1.0 million based upon the formula above.

Discretionary Funds

In a number of cases, airports face major projects that will require funds in excess of the airport's annual entitlements. Thus, additional funds from discretionary apportionments under AIP become desirable. The primary feature about discretionary funds is that they are distributed on a priority basis. These priorities are established by the FAA, utilizing a priority code

system. Under this system, projects are ranked by their purpose. Projects ensuring airport safety and security are ranked as the most important priorities, followed by maintaining current infrastructure development, mitigating noise and other environmental impacts, meeting standards, and increasing system capacity.

Whereas entitlement monies are guaranteed on an annual basis, discretionary funds are not assured. If the combination of entitlement and discretionary funding does not provide enough capital for planned development, projects would either be delayed or require funding from the airport's revenues or other authorized sources, such as those described in the following subsections.

Passenger Facility Charges

The *Aviation Safety and Capacity Expansion Act of 1990* contained a provision for airports to levy passenger facility charges (PFCs) for the purposes of enhancing airport safety, capacity, security, or to reduce noise or enhance competition.

14 CFR Part 158 of May 29, 1991, establishes the regulations that must be followed by airports choosing to levy PFCs. Passenger facility charges may be imposed by public agencies controlling a commercial service airport with at least 2,500 annual passengers with scheduled service. Authorized agencies were allowed to impose a charge of $1.00, $2.00, or $3.00 per enplaned passenger. Legislation (*AIR-21*) passed in 2000 allowed the cap to increase to $4.50, which remains the current cap level under *Vision 100*.

Prior approval is required from the Department of Transportation (DOT) before an airport is allowed to levy a PFC. The DOT must find that the projected revenues are needed for specific, approved projects. Any AIP-eligible project, whether development or planning related, is eligible for PFC funding. Gates and related areas for the movement of passengers and baggage are eligible, as are on-airport ground access projects. Any project approved must preserve or enhance safety, security, or capacity; reduce/mitigate noise impacts; or enhance competition among carriers.

PFCs may be used only on approved projects. However, PFCs can be utilized to fund 100 percent of a project. They may also be used as matching funds for AIP grants or to augment AIP-funded projects. PFCs can be used for debt service and financing costs of bonds for eligible airport development. These funds may also be commingled with general revenue for bond debt service. Before submitting a PFC application, the airport must give notice and an opportunity for consultation with airlines operating at the airport.

PFCs are to be treated similar to other airport improvement grants, rather than as airport revenues, and are administered by the FAA. Airlines retain up to 11 cents per passenger for collecting PFCs. It should also be noted that only revenue passengers pay PFCs. Non-revenue passengers such as those using frequent flier re-

wards or airline personnel are counted as enplanements, but do not generate PFCs.

Flagstaff Pulliam Airport was authorized to impose a PFC of $3.00 beginning December 1, 1992. As the airport sponsor, the City of Flagstaff was approved to collect up to $2,463,581 by January 1, 2015. These funds are designated to retire debt from the construction of the terminal building. At current traffic levels, the PFC generates approximately $120,000 annually. If traffic increases, the annual PFC revenues would also increase. Any increases above current enplanement levels will assist in an earlier retirement of the current authorization. The current program will also allow the City to increase its PFC collection by $1.50, if desired, to fund new projects. Projected PFC funds not previously committed are presented in **Table 6B** for each planning horizon. The short term is based upon six years, the intermediate five years, and the long term is projected as occurring over a ten-year period.

FAA Facilities And Equipment (F&E) Program

The Airway Facilities Division of the FAA administers the Facilities and Equipment (F&E) Program. This program provides funding for the installation and maintenance of various navigational aids and equipment of the national airspace system. Under the F&E program, funding is provided for FAA airport traffic control towers, enroute navigational aids, on-airport navigational aids, and approach lighting systems.

STATE AID TO AIRPORTS

In support of the state airport system, the State of Arizona also participates in airport improvement projects. The source for state airport improvement funds is the Arizona Aviation Fund. Taxes levied by the state on aviation fuel, flight property, aircraft registration tax, and registration fees (as well as interest on these funds) are deposited in the Arizona Aviation Fund. The Transportation Board establishes the policies for distribution of these state funds.

Under the State of Arizona grant program, an airport can receive funding for one-half (2.5 percent) of the local matching share of projects receiving federal AIP funding. The state can also provide up to 90 percent funding for projects which are typically not eligible for federal AIP funding or not likely to receive federal funding.

The Arizona Department of Transportation - Aeronautics Division (ADOT) Airport Loan Program was established to enhance the utilization of state funds and provide a flexible funding mechanism to assist airports in funding improvement projects. Eligible projects include runway, taxiway, and apron improvements; land acquisition; planning studies; and the preparation of plans and specifications for airport construction projects; as well as revenue-generating improvements such as hangars and fuel storage facilities.

Projects which are not currently eligible for the State Airport Loan Program are considered if the project would enhance the airport's ability to be financially self-sufficient.

There are three ways in which the loan funds can be used: Grant Advance, Matching Funds, or Revenue Generating Projects. The Grant Advance loan funds are provided when the airport can demonstrate the ability to accelerate the development and construction of a multi-phase project. The project(s) must be compatible with the Airport Master Plan and be included in the ADOT 5-year Airport Capital Improvement Program. The Matching Funds are provided to meet the local matching fund requirement for securing federal airport improvement grants or other federal or state grants. The Revenue Generating funds are provided for airport-related construction projects that are not eligible for funding under another program.

FUNDING PLAN

The underlying strategy used to develop the funding plan of the development program involves first applying projected annual entitlement funding to eligible project costs. Potential state funding is then considered. The net balances of AIP-eligible costs, local matching shares, and the costs of non-eligible projects result in the remaining costs to be funded.

Table 6B outlines the maximum potential FAA entitlement funding that could be attained during each planning horizon, based upon the activity levels forecast. Funding from the state is assumed to be 2.5 percent on all projects funded by FAA, and 90 percent on eligible projects not funded by the FAA. As can be seen from the upper section of the table, the airport's entitlement funding, combined with the ADOT match, will not be sufficient to fund FAA/ADOT-eligible projects.

The middle section of the table lists the airport's local matching share that will need to be provided either by airport revenues, the City, a PFC, or a combination of the three sources. For the purposes of this analysis, a PFC is considered as the principal revenue source for local capital improvement funding. Under this scenario, a PFC could fund the entire local share, with remaining fees put toward the remaining FAA/ADOT-eligible portion of the costs.

The lower section of the table indicates that the PFCs will not be adequate to fund the entire remaining costs. It is apparent that the airport will likely need to seek discretionary funding from the FAA to complete the full range of projects. If not, state and local funding will need to be increased. Another option will be to secure financing using the PFCs and/or airport revenues to pay back the debt. In some cases, projects may simply need to be delayed until adequate funding becomes available.

TABLE 6B
Development Funding Sources
Flagstaff Pulliam Airport
(2004 $)

	Short Term	Intermediate Term	Long Range
Total Project Costs	$30,375,000	$27,258,000	$26,780,000
Grant Eligible Costs	$29,323,500	$24,726,000	$20,625,000
AIP Entitlements	6,000,000	6,007,600	16,645,200
ADOT Funding	4,167,500	1,534,000	1,271,000
Remaining FAA-Eligible Costs	$19,156,000	$17,184,400	$2,708,800
Local Matching Share	$1,051,500	$2,532,000	$6,155,000
Potential PFC Revenue	377,000	1,980,000	7,134,300
Remaining Airport Match	$674,500	$552,000	$0
Remaining FAA-Eligible Costs	$19,156,000	$17,184,400	$2,708,800
Remaining PFCs	0	0	1,159,300
Discretionary Grant Need	$19,156,000	$17,184,400	$1,549,500

It should be noted that hangar projects are excluded from this analysis. Hangars are typically considered as income-producing projects that should attain sufficient rents to amortize their development costs over time.

Appendix A
GLOSSARY AND ABBREVIATIONS

Glossary of Terms

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of non-regulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: An alphabetic classification of aircraft based upon 1.3 times the stall speed in a landing configuration at their maximum certified landing weight.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA: A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- *Category A:* Speed less than 91 knots.
- *Category B:* Speed 91 knots or more, but less than 121 knots.
- *Category C:* Speed 121 knots or more, but less than 141 knots.
- *Category D:* Speed 141 knots or more, but less than 166 knots.
- *Category E:* Speed greater than 166 knots.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- *Group I:* Up to but not including 49 feet.
- *Group II:* 49 feet up to but not including 79 feet.
- *Group III:* 79 feet up to but not including 118 feet.
- *Group IV:* 118 feet up to but not including 171 feet.
- *Group V:* 171 feet up to but not including 214 feet.
- *Group VI:* 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides enroute air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATED WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dewpoint, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 50 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.

CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- *CLASS A:* Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- *CLASS B:* Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

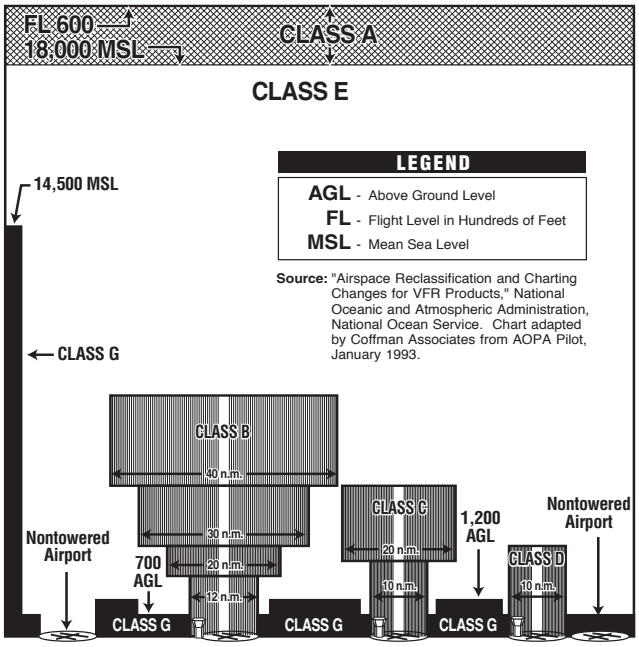
- *CLASS C:* Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- *CLASS D:* Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach proce dures. Unless otherwise authorized, all persons must establish two-way radio communication.

- *CLASS E:* Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument

procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- *CLASS G:* Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.



CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- *TAKEOFF RUNWAY AVAILABLE (TORA):* The runway length declared available and suitable for the ground run of an airplane taking off;

- *TAKEOFF DISTANCE AVAILABLE (TODA):* The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA;

- *ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):* The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff; and

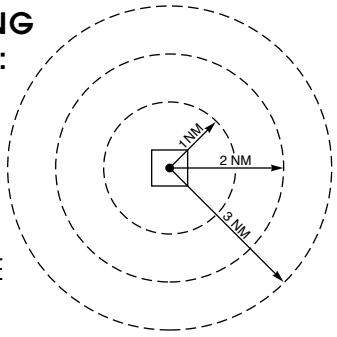
- *LANDING DISTANCE AVAILABLE (LDA):* The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL: The 24-hour average sound level, in A-weighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and non-scheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects ar legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a

significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A designation for altitude within controlled airspace.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy, integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch-and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for enroute navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace.

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function,
in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

OPERATION: A take-off or a landing.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from

the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- *CATEGORY I (CAT I):* A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.

- *CATEGORY II (CAT II):* A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- *CATEGORY III (CAT III):* A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Sevice Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering enroute clearances, issuing departure authorizations, and

acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used enroute and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY END IDENTIFIER LIGHTS (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line-of-site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRPLANE: An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined

dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- *ALERT AREA:* Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- *CONTROLLED FIRING AREA:* Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- *MILITARY OPERATIONS AREA (MOA):* Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.

- *PROHIBITED AREA:* Designated airspace within which the flight of aircraft is prohibited.

- *RESTRICTED AREA:* Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

- *WARNING AREA:* Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD TERMINAL ARRIVAL (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

TACTICAL AIR NAVIGATION (TACAN): An ultra-high frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting

instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high-levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

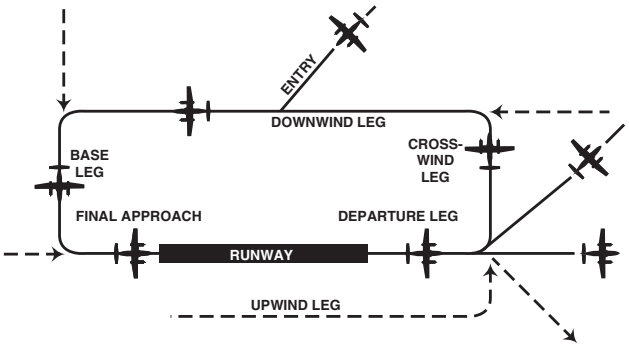
TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.

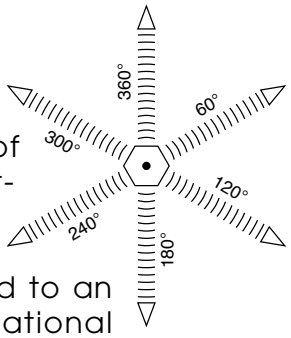


UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM): A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."



VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE STATION (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE STATION/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan,
operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Abbreviations

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and firefighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulations

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity for aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity fo aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator
FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LOC: ILS localizer

LOM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system

MALSR: medium intensity approach lighting system with runway alignment indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076 .1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rulemaking

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW: public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: Poor visibility and ceiling.

RCO: remote communications outlet

REIL: runway end identifier lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: Runway Safety Area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with sequenced flashers

SSALR: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel type landing gear

STWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TDZ: touchdown zone

TDZE: touchdown zone elevation

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

FLAGSTAFF
PULLIAM AIRPORT

Appendix B
BASED AIRCRAFT LIST

APPENDIX B
Flagstaff Pulliam Airport Based Aircraft List (2002)

N-Number	Model	Type	N-Number	Model	Type
1			6		
1538L	BEECH 36TC	SE	60JL	BELLANCA	SE
1730E	GLASSAIR III	SE	6271Y	PA 23-250	ME
1757T	CHEROKEE	SE	6334V	HELIO COUR	SE
182GG	C-182N	SE	6501X	C-210	SE
18978	HARLOW PJCZ	SE	65477	C-180	SE
1921M	C-182	SE	65CF	C-182	SE
1940P	PA 22-150	SE	6746U	MOONEY	SE
1Y	BEECH-95	ME	6877B	CENTURION	SE
2			7		
20730	C-182	SE	7025J	GRUMMAN HU-16	SE
2108G	C-175	SE	7027X	C-150	SE
228RA	BEECH E-90	TP	70337	LANCAIR	SE
2330G	C-182B	SE	70618	C-182	SE
234WA	C-172	SE	7079W	PA 28-180	SE
23979	BEECH SUNDOWNER	SE	71518	C-182	SE
24101	PA 38-112	SE	7284N	C-182	SE
243A	DH-2	SE	7347N	C-TU-206G	SE
25LR	BEECH 36	SE	739HS	C-172M	SE
2688F	C-182	SE	7525X	C-172	SE
273EB	C-172	SE	76282	C-120	SE
2811X	C-177	SE	76927	C-182	SE
286AZ	RANS COYOTE II	SE	76KF	BELLANCA	SE
2949M	PA 12	SE	7736G	C-172	SE
3			7791X	C-172M	SE
305PC	B-1900D	TP	78513	C-172M	SE
3163V	C-182	SE	7974Y	PA 30	ME
3286X	C-310	ME	8		
3433X	MOONEY	SE	8AE	Lear 24	J
3477J	C-150	SE	8188U	BEECH F33A	SE
34914	CARDINAL	SE	8250M	C-210	SE
37494	C-414	ME	829FT	KITFOX IV	SE
3875B	BEECH V35	SE	8322N	C-172	SE
39577	PA 32RT-300T	SE	8370S	SKYLANE	SE
4			8453U	C-172F	SE
407GA	BELL 407	R	8592U	C-172F	SE
4102W	PA 32	SE	8646D	PA 22-160	SE
42AZ	BELL 407	R	8759Z	C-206	SE
421GW	C-421B	TP	888CT	C-182	SE
4232P	PA-23-160	ME	888GB	C-210	SE
42474	C-182	SE	8930J	PA 28-180	SE
4261Q	C-182	SE	8972G	C-182	SE
431DL	CARDINAL	SE	89KS	C-172	SE
444AW	AMERICAN CHAMP	SE	9		
450RE	C-195	SE	9092C	C-182	SE
4515U	GRUMMAN AA-5B	SE	9237Y	PA-31-350	ME
45350	C-150	SE	9278W	PA 28-235	SE
4696B	C-180	SE	92DV	BEECH E-90	TP
4706K	C-182	SE	940AC	ROCKWELL COMM	TP
5			9435P	PA 24-260	SE
5018A	C-172	SE	9481Q	BEECH F33A	SE
5041H	C-172	SE	9607D	PA 22-150	SE
512SF	COMMANDER	SE	96906	C-182	SE
5155X	CITABRIA	SE	9737H	C-172	SE
5225T	PA 28R-200	SE	9869A	C-195	SE
52ER	GRUMMAN AA5B	SE	987GM	BEECH E-90	TP
5319W	PA 28-375	SE	989GM	BEECH E-90	TP
5402U	BEECH B35	SE	995FE	C-208	SE
5421B	C-182	SE	9968C	C-182RG	SE
5711B	C-182	SE	9SW	C-182	SE
57JT	CHAMP SCOUT	SE	Other		
5816T	MOONEY 201	SE			
5832K	BEECH BONANZA	SE			
58701	C-182P	SE			

Appendix C
ECONOMIC BENEFIT ANALYSIS

EXECUTIVE SUMMARY

This report presents an analysis of the economic benefits of Flagstaff Pulliam Airport for the economy of the airport service area, including the City of Flagstaff and the Northern Arizona region.

At the time this economic benefit study was undertaken (2002) there were 116 based aircraft on the airport, including 99 single engine planes, 7 multi-engine aircraft, 7 turboprops, 1 jet and 2 rotary craft.

In 2002, Flagstaff Pulliam Airport recorded more than 38,000 commercial airline passenger enplanements. Just over 5 out of ten of these (53%) were visitors to the region.

Total Economic Benefits

Economic benefits (revenues, employment and earnings) are created when economic activity takes place both on and off the airport. The economic benefits of Flagstaff Pulliam Airport for 2002 are shown in Table C1.

The total benefits of the airport, the sum of the direct benefits and the indirect benefits, which result as dollars recirculate in the regional economy, were calculated to be:

- **$100.3 Million Revenues**
- **$38.7 Million Earnings**
- **1,392 Total Employment**

Measuring Economic Benefits

Flagstaff Pulliam Airport serves as a gateway that welcomes commerce and visitors into the region and provides access for the citizens and businesses of Northern Arizona to travel outward to the economy at large.

Commercial airline travelers from Flagstaff can make connections for national and global flights. General aviation allows business travelers to reach destinations without the delays and uncertainty of today's airline flights and provides access to more than 5,300 airports in the nation, compared to approximately 565 served by scheduled airlines.

The presence of an airport creates benefits for a community in other ways. Airports bring essential services, including enhanced medical care (such as air ambulance service), support for law enforcement and fire control, and courier delivery of mail and high value parcels. These services raise the quality of life for residents and maintain a competitive environment for economic development.

Although qualitative advantages created by the presence of an airport are important, they are also difficult to measure. In studying airport benefits, regional analysts have emphasized indicators of economic activity for airports that can be quantified, such as dollar value of output, number of jobs created, and earnings of workers and proprietors of businesses.

Economic benefit studies differ from cost-benefit analyses, which are often called for to support decision-making, typically for public

TABLE C1
Summary of Economic Benefits: 2002
Flagstaff Pulliam Airport

	BENEFIT MEASURES		
Source	**Revenues**	**Earnings**	**Employment**
On-Airport Aviation Employers	**$27,900,000**	**7,200,000**	**176**
On-Airport Non-Aviation Employers	**10,000,000**	**2,400,000**	**100**
Capital Projects	**3,500,000**	**2,200,000**	**60**
All On-Airport Economic Benefits	**41,400,000**	**11,800,000**	**336**
Air Visitor Benefits	**16,000,000**	**6,700,000**	**335**
Direct Benefits: Sum of On-Airport & Air Visitor Benefits	**57,400,000**	**18,500,000**	**671**
Indirect Benefits (Multiplier Effects of Secondary Spending)	***42,900,000***	***20,200,000***	***721***
TOTAL BENEFITS	**$100,300,000**	**$38,700,000**	**1,392**

sector capital projects. Study of economic benefit is synonymous with measurement of economic performance. The methodology was standardized in the publication by the Federal Aviation Administration, *Estimating the Regional Economic Significance of Airports*, Washington DC, 1992.

Following the FAA methodology, this study views Flagstaff Pulliam Airport as a source of measurable economic output (the production of aviation services) that creates revenues for firms, and employment and earnings for workers on and off the airport.

Business spending on the airport injects revenues into the community when firms buy products from suppliers and again when employees of the airport spend for household goods and services. In addition, spending by air visitors produces revenues for firms in the hospitality sector as well as employment and earnings for workers.

Benefit Measures

The quantitative measures of economic benefits of the Flagstaff Pulliam Airport are each described below.

Revenue is the value in dollars of the output of goods and services produced by businesses. For government units, the budget is used as the value of output.

Output is equivalent to revenue or spending or sales. From the perspective of the business that is the supplier of goods and services, the dollar value of output is equal to the revenues received by that producer. From the viewpoint of the consumer, the dollar value of the output is equal to the amount that the consumer spent to purchase those goods and services from the business.

Earnings are a second benefit measure, made up of employee compensation (the dollar value of payments received by workers as wages and benefits) and proprietor's income of business owners.

Employment is the third benefit measure, the number of jobs supported by the revenues created by the airport.

To measure the economic benefits of the airport, information on revenues, employment and earnings was obtained directly from suppliers and users of aviation services including private sector firms on the airport, government agencies, airport staff, commercial and general aviation air travelers, and based aircraft owners.

On-Airport Direct Benefits

Operations on Flagstaff Pulliam Airport supported a total of 20 private and public employers including passenger services such as airline ticketing and auto rental, FBO services, charter, aircraft rental and sales, pilot training, avionics, maintenance, storage, air cargo and express delivery services as well as government agencies such as the forest service, police, TSA, airport administration and the tower. In addition, on-going airport capital improvement projects created benefits on the airport during the year.

Including the revenues and employment created by outlays for airport capital projects, these economic units were responsible for on-airport benefits of:

- **$41.4 Million Revenues**
- **$11.8 Million Earnings**
- **336 On-Airport Jobs**

Air Visitor Direct Benefits

An important source of aviation-related spending comes from visitors to the area that arrive at Flagstaff Pulliam Airport. When air travelers make off-airport expenditures these outlays create revenues (sales) for firms that supply goods and services to visitors. During a typical year, there are more than 35,000 air visitors that arrive at the airport by commercial, private, or chartered aircraft.

Visitors traveling for business or personal reasons spend for lodging, food and drink, entertainment, retail goods and services, and ground transportation including auto rental and taxis, creating annual airport service area output, employment and earnings of:

- **$16 Million Revenues**
- **$6.7 Million Earnings**
- **335 Off-Airport Jobs**

Combined Direct Benefits

The combined direct benefits represent the sum of on-airport and off-airport (visitor) revenues, earnings and employment due to the presence of the airport. Direct benefits are the "first round" impacts and do not include any multiplier effects of secondary spending. The direct benefits of on-airport and off-airport economic activity related to Flagstaff Pulliam Airport were:

- **$57.4 Million Revenues**
- **$18.5 Million Earnings**
- **671 Jobs**

Combined revenue flows for businesses and employers on and off the airport sum to a value of $57.4 million. The airport presence created benefits to workers by providing incomes within the region of $18.5 million. There were 671 jobs supported directly by the suppliers and users of aviation services.

Indirect Benefits (Multiplier Effects)

Indirect benefits (multiplier effects) are created when the initial spending by airport employers or visitors circulates and recycles through the economy. In contrast to initial or direct benefits, the indirect benefits measure the magnitude of successive rounds of re-spending as those who work for or sell products to airport employers or the hospitality sector spend dollars.

For example, when an aircraft mechanic's wages are spent to purchase food, housing, clothing, and medical services, these dollars create more jobs and income in the general economy of the region through multiplier effects of re-spending.

The initial direct revenue stream in the service area of $57.3 million created by the presence of Flagstaff Pulliam Airport was estimated to stimulate indirect benefits from multiplier effects within the airport service area of:

- **$42.9 Million Revenues**
- **$20.2 Million Earnings**
- **721 Jobs**

Value of Based Aircraft Travel

The general aviation aircraft based at the airport flew 31,008 travel hours in 2002. The Charter Equivalent Value of this travel was computed as $11.2 million, or more than $98,000 of equivalent value per aircraft per year.

ON-AIRPORT BENEFITS

This section provides more detail on the economic benefits associated with activity on site at Flagstaff Pulliam Airport.

Table C2 illustrates the annualized employment, earnings and value of output (revenues) produced by airport tenants in 2002. Values shown for revenues, employment and earnings are the direct benefits and do not include multiplier effects of indirect benefits.

On-Airport Output

On-airport economic activity created annual output of $41.4 million (including $3.5 million budgeted for capital projects). Private sector aviation revenues were $22.7 million and governmental budgets were $5.2 million.

Businesses at Flagstaff Pulliam Airport offer passenger services including airline ticketing, auto rental and food service. Based on figures from the U. S. Department of Transportation, the dollar value of outbound airline travel from Flagstaff Pulliam Airport was over $2.6 million in 2002.

Full FBO services available for the aviation community include aircraft rental, maintenance, avionics, storage, and fueling for various categories of aircraft including piston, turboprop, jet and rotary.

Aviation activities on the airport include corporate hangars for private aircraft and firms that provide services to the public such as flight training for those interested in learning to fly and sales, leasing and exchange of aircraft, as well as pilot supplies.

Air cargo and expedited delivery services are available for consumers, business, and medical users requiring secure and speedy transport of packages and products.

There are several government agencies supporting aviation, including the Flagstaff Pulliam Airport staff from the City of Flagstaff, police, the Transportation Security Administration (TSA) and the airport tower. In addition, the airport serves the entire Northern Arizona area as a site for U. S. Forest Service and Arizona Department of Public Safety activities.

Capital Projects

Capital projects are vital for airports to maintain safety and provide for growth. Capital spending for airport improvements also creates jobs and injects dollars into the local economy. Spending for improvements for 2002 were budgeted at $3.5 million.

Employment and Earnings

There were 10 private sector aviation employers on the airport in 2002, 1 non-aviation employer, and 8 administrative or government units.

Surveys and interviews with on-airport employers provided a tally of 336 jobs on the airport (including 60 workers for capital projects). These employees brought home annual earnings of $11.8 million.

Summary of On-Airport Benefits

On-airport activity created $41.4 million in value of output. This activity supported employment of 336 workers on the airport, with 82% of these jobs in the private sector.

TABLE C2
On-Airport Benefits: Revenues, Earnings and Employment
Flagstaff Pulliam Airport

	BENEFIT MEASURES		
Sources of On-Airport Benefits	**Revenues**	**Earnings**	**Employment**
Private Aviation Employers **Commercial Airlines** **Auto Rental & Parking** **FBO Services & Fueling** **Avionics & Maintenance** **Aircraft Rental & Sales** **Food Services & Retailing** **Aircraft Storage** **Pilot Training & Supplies** **Air Cargo/Courier** **Corporate Aviation**	**$22,700,000**	**$5,000,000**	**126**
Non-Aviation Employers	**10,000,000**	**2,400,000**	**100**
Capital Projects	**3,500,000**	**2,200,480**	**60**
Government Agencies/Services **City of Flagstaff** **U. S. Forest Service** **Arizona Dept. of Public Safety** **Police** **TSA** **Tower**	**5,200,000**	**2,200,000**	**50**
ON-AIRPORT BENEFITS	**$41,400,000**	**$11,800,000**	**336**

Source: Survey of Employers, Flagstaff Pulliam Airport, 2002

AIR VISITOR BENEFITS

Flagstaff Pulliam Airport attracts commercial airline and general aviation visitors from throughout the region and the nation who come to the area for business, recreational and personal travel.

This section provides detail on economic benefits from commercial and general aviation air travelers who use the airport. Values shown for spending (revenues), employment and earnings are direct benefits of initial visitor outlays and do not include multiplier effects of indirect benefits.

Commercial Airline Visitors

During 2002 there were 38,455 airline enplanements at Flagstaff Pulliam Airport. According to an analysis of the air traveler origin and destination data bank of the U. S. Department of Transportation, 52.7 percent or 20,266 enplaning passengers were visitors to the area (Table C3).

Based on figures provided for Flagstaff and Coconino County air visitors by the Arizona Division of Tourism, the average length of stay for travel parties in 2002 was 3.1days.

The average spending per visitor per trip was $650 (figures are rounded to the nearest dollar to simplify tables).

Travel party information on air visitor spending for lodging, food, retail goods and services and ground transportation was based on figures compiled especially for this study by Runzheimer International, a private travel services firm.

Multiplication of $649.52 by 22,266 annual airline passenger visitors yields total airline visitor spending of $13.2 million for the year.

Airline travelers contributed 63,432 visitor days in 2002. On a typical day, there were 174 airline travelers in the Flagstaff area spending an average of $208 per person per day, creating revenues exceeding $36,000 each day.

TABLE C3
Airline Visitor Travel Patterns
Flagstaff Pulliam Airport

Category	Value
Enplanements	**38,455**
Percent Visitors	**52.7%**
Number of Visitors	**20,266**
Average Stay (Nights)	**3.1**
Avg. Spending per Visitor per trip	**$650**
Visitor Spending	**$13,200,000**

Source: Passenger Data, U. S. Department of Transportation, Runzheimer International

The figures for spending per person per trip can be used to derive the economic value of visitor expenditures from a typical passenger aircraft arriving at Flagstaff Pulliam Airport (Table C4).

Based on current characteristics of arriving passenger aircraft, the average passenger count is 23 persons, 12 visitors. These 12 visitors per aircraft will spend on average $650 per person per trip to the area.

TABLE C4
Economic Value of Arriving Airliner
Flagstaff Pulliam Airport

Item	Value
Average Passengers Per Aircraft	**23**
Percent Visitors	**52.7%**
Number of Visitors Per Aircraft	**12**
Trip Expenditures/Person	**$650**
Value of Arriving Airliner	**$7,921**

Source: US Dept. Transportation and visitor spending survey

Total airline visitor spending of $7,921 is injected into the local economy for each arriving airliner, on average.

Spending by category and resulting economic benefits from all airline visitors are shown in Table C5. The largest spending category is lodging ($264 per person per trip), which is also the source of the greatest annual revenues (at $5.4 million), earnings ($2.2 million) and employment (102 workers).

Airline visitor spending in eating and drinking places created the second largest revenues ($2.9 million), earnings ($1.2 million) and number of jobs (83). The $13.2 million of visitor spending by airline travelers created a total of 262 direct jobs in the service area, with earnings to workers and proprietors of $5.3 million.

TABLE C5
Economic Benefits from Airline Visitors: Revenues, Earnings and Employment
Flagstaff Pulliam Airport

Category	Spending Per Trip	Revenues	Earnings	Jobs
Lodging	**$264**	**$5,400,000**	**$2,200,000**	**102**
Food/Drink	**141**	**2,900,000**	**1,200,000**	**83**
Retail Sales	**29**	**600,000**	**400,000**	**16**
Entertainment	**22**	**400,000**	**200,000**	**12**
Ground Trans	**194**	**3,900,000**	**1,300,000**	**49**
TOTAL	**$650**	**$13,200,000**	**$5,300,000**	**262**

Note: Earnings and employment figures were derived from the IMPLAN input-output model based on data for Coconino County from the Arizona Department of Economic Security and the United States Bureau of Economic Analysis. Employment is not necessarily full time equivalents; includes full and some part time workers, figures rounded to head counts.

General Aviation Visitors

In order to analyze general aviation traffic patterns at the airport, a database of 1,200 general aviation flight plans involving Flagstaff Pulliam Airport as either destination or origin for travel was obtained from the FAA.

TABLE C6
GA Aircraft Origination
Flagstaff Pulliam Airport

Rank and Origin	State
1. Phoenix Sky Harbor	AZ
2. Chinle Municipal	AZ
3. Winslow-Lindbergh	AZ
4. San Jose International	CA
5. Laughlin/Bullhead Int'l	AZ
6. Scottsdale	AZ
7. Page Municipal	AZ
8. Kayenta	AZ
9. Phoenix Goodyear	AZ
10. Kingman	AZ
11. Phoenix Deer Valley	AZ
12. Salina Municipal	KS
13. Four Corners Regional	NM
14. Tucson International	AZ
15. Springerville Babbitt	AZ

Source: FAA Flight Plan Data Base and Flagstaff Pulliam Airport

In this sample for 2002, the most frequent source of itinerant flights arriving at Flagstaff Pulliam Airport was Phoenix Sky Harbor. Second in importance was Chinle Municipal, followed by Winslow-Lindbergh, San Jose International and Laughlin-Bullhead International rounding out the top five (Table C6). Overall, general aviation aircraft arriving at FLG during the study period originated at more than 90 airports around the nation.

Past years have often seen more than 35,000 itinerant general aviation operations annually at Flagstaff Pulliam Airport. Operations involve both arrivals and departures. It is necessary to differentiate between itinerant operations by based and transient aircraft. An itinerant operation typically involves an origination or destination airport other than Flagstaff Pulliam Airport. However, both based and non-based aircraft contribute to itinerant activity in any given day.

When a based aircraft returns to Flagstaff Pulliam Airport from PHX (Phoenix), for example, that is an itinerant operation. When an aircraft based at an airport other than Flagstaff Pulliam arrives at Flagstaff Pulliam Airport that aircraft is classified as a transient itinerant.

According to analysis of flight records, there were 12,645 transient aircraft arrivals at Flagstaff Pulliam Airport in 2002. Of these, 2,501 brought overnight visitors and 10,144 were one-day visitors (Table C7).

Separate analyses were conducted for those GA visitors with an overnight stay and those whose visit was one day or less in duration. To compute economic benefits based on visitor spending, one day aircraft were further partitioned into those staying less than 4 hours and 4 hours or more. Visitor spending estimates were computed only for those aircraft staying 4 hours or longer at Flagstaff Pulliam Airport, reflecting the fact that many aircraft stop only for fuel and travelers do not spend for food, retail shopping, or ground transportation off the airport. There were

2,640 general aviation aircraft that stayed on the ground 4 hours or more during the year (see below, Table C10).

TABLE C7
General Aviation Transient Aircraft
Flagstaff Pulliam Airport

Item	Annual Value
Itinerant AC Arrivals	18,620
Transient AC Arrivals	12,645
Overnight Transient AC	2,501
One Day Transient AC	10,144

Source: Derived from FAA Flight Plan Data Base and Flagstaff Pulliam Airport Records

Overnight GA Visitors

Information on visiting general aviation aircraft was derived from a mail survey of visiting aircraft owners and pilots. Visitors were asked about the purpose of their trip, the size of the travel party, length of stay, type of lodging, and outlays by category.

The travel patterns underlying the calculation of overnight GA visitor economic benefits are shown in Table C8, for the 2,501 transient overnight aircraft arrivals during the year.

The average party size was 2 persons and the average overnight travel party stayed in the area for 2.08 days. There were 7,503 overnight visitors for the year, including crew, with a combined total of 15,607 visitor days. Spending per travel party per aircraft averaged $926. Total spending by all GA overnight visitors summed to $2.3 million for the year.

TABLE C8
General Aviation Overnight Visitors
Flagstaff Pulliam Airport

Item	Annual Value
Transient AC Arrivals	12,645
Overnight Transient AC	2,501
Avg. Party Size	2
Number of Visitors, including crew	7,503
Average Stay (nights)	2.08
Visitor Days	15,607
Spending per Aircraft	$926
Total Expenditures	$2,300,000

Source: Derived from FAA Flight Plan Data Base and Flagstaff Pulliam Airport Records

Table C9 shows the percentage distribution of outlays by overnight travel parties at Flagstaff Pulliam Airport. Lodging accounts for 47 percent of visitor spending, averaging $435 per aircraft travel party.

Food and drink, at $248 per overnight aircraft, made up 27 percent. Ground transportation (auto rental, taxi or car service) at $177 and 19 percent was next in importance, followed by retail spending per aircraft at $38, and 4 percent for the average travel party.

Entertainment was the smallest expenditure category, at $28 for each visiting overnight general aviation travel party.

TABLE C9
Spending Per Overnight GA Aircraft
Flagstaff Pulliam Airport

Category	Spending	Percent
Lodging	$435	47
Food/Drink	248	27
Retail	38	4
Entertainment	28	3
Transportation	177	19
TOTAL	$926	100

Source: GA Visitor Survey 2002

Day GA Visitors

According to flight operations records, 58 percent of itinerant general aviation, or ninety one percent of transient general aviation aircraft arriving at Flagstaff Pulliam Airport were transients that stayed on the airport for one day or less.

During the year, there were 10,144 aircraft that stopped at the airport for one day. Some were only on the ground for a few minutes while others were parked several hours when the travel party had their aircraft serviced, pursued a personal activity or conducted business.

The economic benefits from arriving aircraft travel parties are of two types. Those pilots or aircraft owners that buy fuel or have their aircraft serviced on the airport are making purchases which contribute to the revenue stream received by aviation businesses on the airport. That type of spending creates output, employment, and earning on the airport. Those economic benefits are shown in Table C2 as on-airport benefits.

TABLE C10
General Aviation Day Visitors
Flagstaff Pulliam Airport

Item	Annual Value
Transient AC Arrivals	12,645
One Day Transient AC	10,144
Stay >/= 4 Hours	2,640
Average Stay (Hours)	6.2
Avg. Party Size	2
Number of GA Visitors Including Crew	7,920
Spending per Aircraft	$199
Total Expenditures	$525,000

Source: Source: Derived from FAA Flight Plan Data Base and GA Visitor Survey

However, if the aircraft travel party leaves the airport to visit a corporate site, conduct a business meeting, or attend a sporting or cultural event, these off-airport activities may generate off-airport spending that create jobs and earnings in the local community.

For the purposes of this study, those travel parties that arrived and departed within four hours were assumed to have not left the airport and not contributed any significant spending off the airport.

Of the 10,143 transient aircraft that stopped at Flagstaff Pulliam Airport during the past year, there were 2,640 that were parked for more than four hours but not overnight (Table C10). The average stay in the area for those travel parties was 6.2 hours, according to arrival and departure records, with a range of 4 to 12 hours.

TABLE C11
Spending Per Day Visitor Aircraft
Flagstaff Pulliam Airport

Category	Spending	Percent
Lodging	**$ 0**	
Food/Drink	**114**	**57**
Retail	**19**	**10**
Entertainment	**14**	**7**
Transportation	**52**	**26**
TOTAL	**$199**	**100**

Source: GA Visitor Survey 2002

Day trip aircraft brought 7,920 visitors, including crew, to the Flagstaff Pulliam area during the year. The average spending per one-day aircraft was $199. The total economic benefits created by off-airport spending by one-day general aviation visitors tallied to $525,000 of output (revenues or sales off the airport).

The largest expenditure category for one-day visiting travel parties was food and drink, which averaged $114 per aircraft travel party for the day and accounted for 57 percent of outlays (Table C11). Spending for ground transportation was the second largest category, at $52 per aircraft.

Combined GA Visitor Spending

Table C12 shows the economic benefits resulting from spending in the region by combined overnight and day general aviation visitors arriving at Flagstaff Pulliam Airport.

To recap, there were 12,645 transient general aviation aircraft that brought visitors to the airport during the year. Of these, 2,501 were arriving overnight general aviation aircraft and 2,640 were one day visiting aircraft that were parked more than 4 hours, long enough to make off-airport expenditures.

Each overnight travel party spent an average of $926 during their trip to the airport service area and travelers on each day visitor aircraft spent an estimated $199 per trip.

Multiplying the expenditures for each category of spending by the number of aircraft yields the total outlays for lodging, food and drink, entertainment, retail spending and ground transportation due to GA visitors during the year. This spending summed to $2.8 million in revenues.

There were 23,527 visitor days attributable to general aviation travelers during the year. Sixty six percent of visitor days (15,607) were due to overnight GA travelers and thirty three percent (7,920) were from one-day visitors.

On an average day, there were 42 visitors in the service area that had arrived by general aviation aircraft. Average daily spending by all GA air travelers was $7,787 within the airport service area. The average economic impact of any arriving GA transient aircraft (combined overnight and day visitors staying

more than 4 hours) was $552.

The largest spending category by general aviation visitors was expenditures for lodging, with outlays of $1,100,000 or 39 percent of the total. Spending for food and beverages accounted for 32 percent of GA visitor spending and was the second largest category, with outlays of $900,000 for the year.

Taken together, these two categories accounted for 71 percent of the economic benefits from GA visitors to Flagstaff Pulliam Airport.

Of total spending of $2.8 million created by GA visitors, an average of 47 cents of each dollar was used within the service area by employers as earnings paid out to workers.

Wages taken home by tourism/visitor sector workers for spending in their own community summed to $1,300,000 during the year. Earnings in the lodging industry accounted for nearly 38 percent of total earnings from visitor spending.

Expenditures by GA visitors created 73 direct jobs in the tourist sector in the Flagstaff Pulliam Airport service area. Food and drink spending created the greatest number of jobs, 36, followed by the lodging industry with 19 workers.

TABLE C12
Economic Benefits from GA Visitors - Revenues, Earnings and Employment
Flagstaff Pulliam Airport

Category	Spending per AC		Revenues	Earnings	Employment
	Overnight	Day			
Lodging	**$435**		**$1,100,000**	**$400,000**	**19**
Food/Drink	**248**	**$114**	**900,000**	**500,000**	**36**
Retail Sales	**38**	**19**	**100,000**	**100,000**	**6**
Entertainment	**28**	**14**	**100,000**	**100,000**	**5**
Ground Trans.	**177**	**52**	**600,000**	**200,000**	**7**
TOTAL	**$926**	**$199**	**$2,800,000**	**$1,300,000**	**73**

Note: Earnings and employment figures were derived from the IMPLAN input-output model based on data for Coconino County from the Arizona Department of Economic Security and the United States Bureau of Economic Analysis. Employment is not necessarily full time equivalents; includes full and some part time workers, figures rounded to head counts.

Combined Airline and GA Visitors

There were 86,959 visitor days attributable to commercial and general aviation travelers during the year. Seventy three percent of visitor days (63,432) were due to commercial air travelers and twenty seven percent (23,527) were from general aviation visitors.

On an average day, there were 98 visitors in the service area. Average daily spending by all air travelers was $43,856 within the airport service area.

Table C13 shows that the largest spending category by aviation visitors was expenditures for lodging, with outlays of $6.5 million, or 41 percent of the total. Spending for food and drink accounted for 24 percent of visitor spending and was the second largest category, with outlays of $3.8 million for the year.

Airline and general aviation visitors combined to spend $16 million in the service area during the year, creating 335 jobs with earnings to workers of $6.6 million.

TABLE C13
Economic Benefits from Airline and GA Visitors: Revenues, Earnings and Employment
Flagstaff Pulliam Airport

Category	Revenues	Earnings	Employment
Lodging	**$6,500,000**	**$2,700,000**	**121**
Food/Drink	**3,800,000**	**1,700,000**	**119**
Retail Sales	**700,000**	**500,000**	**22**
Entertainment	**500,000**	**300,000**	**17**
Ground Transport	**4,500,000**	**1,400,000**	**56**
TOTAL	**$16,000,000**	**$6,600,000**	**335**

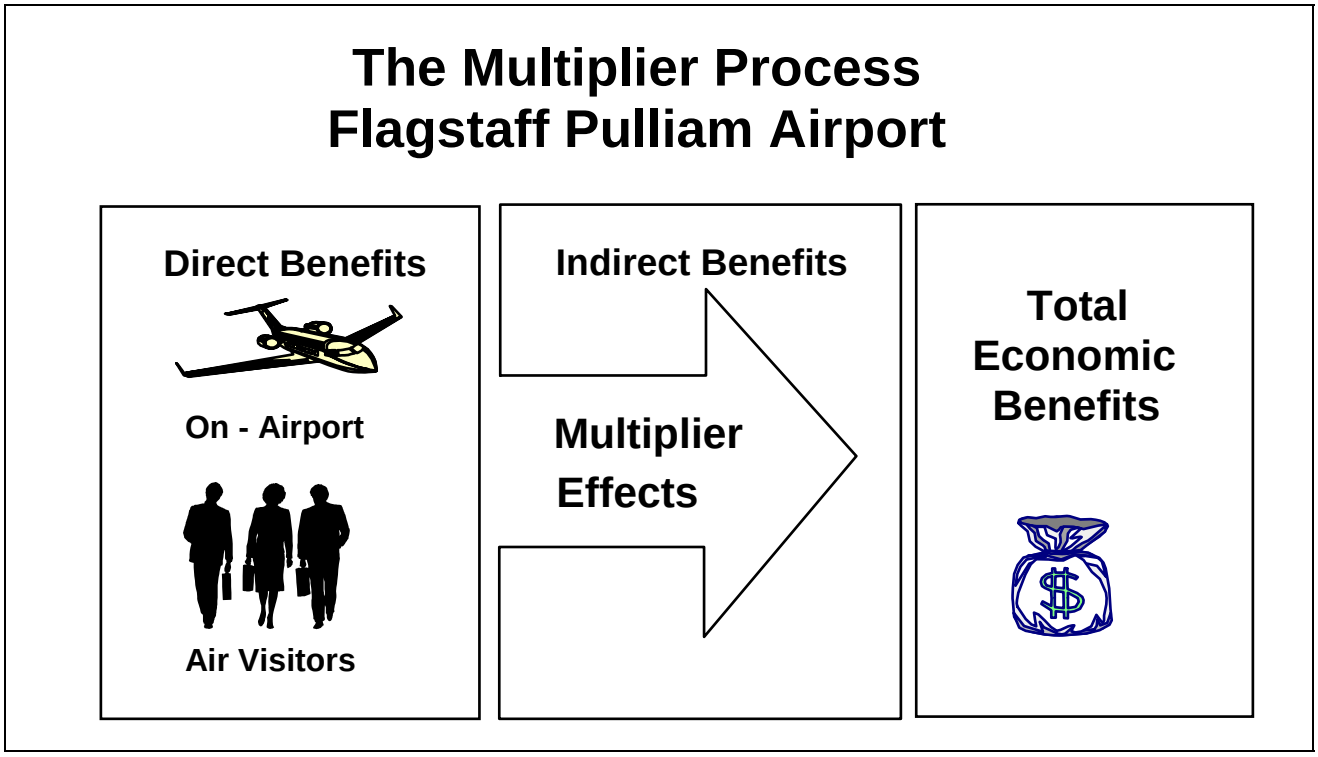
Note: Earnings and employment figures were derived from the IMPLAN input-output model based on data for Coconino County from the Arizona Department of Economic Security and the United States Bureau of Economic Analysis. Employment is not necessarily full time equivalents; includes full and some part time workers, figures rounded to head counts.

INDIRECT BENEFITS: MULTIPLIER EFFECTS

The output, employment, and earnings from on-airport activity and off-airport visitor spending represent the computed direct benefits from the presence of Flagstaff Pulliam Airport. For the service area, these direct benefits summed to $57.4 million of output (measured as revenues to firms and budgets of administrative units), 671 jobs, and earnings to workers and proprietors of $18.5 million. These figures for initial economic activity created by the presence of the airport do not include the "multiplier effects" that result from additional spending induced in the economy to produce the initial goods and services.

Production of aviation output requires inputs in the form of supplies and labor. Purchase of inputs by aviation firms has the effect of creating secondary or indirect revenues and employment that should be included in total benefits of the airport. Airport benefit studies rely on multiplier factors from input-output models to estimate the impact of secondary spending on output, earnings and employment to determine indirect and total benefits, as illustrated in the figure below.

The multipliers used for this study were from the IMPLAN input-output model based on data for Coconino County obtained from the Arizona Department of Economic Security and the U. S. Bureau of Economic Analysis. To demonstrate the methodology, average Coconino County multipliers are shown in Table C14.



The multipliers represent weighted averages for combined industries in each category. For example, the visitor benefits multipliers shown combine lodging, food services, retailing, auto rental and entertainment multipliers used in the analysis.

The multipliers in this table illustrate the process for calculating the indirect and total impacts on all industries of the regional economy resulting from the direct impact of each aviation related industry. The multipliers for output show the average dollar change in revenues for all firms in the service area due to a one-dollar increase in revenues either on the airport or through visitor spending.

For example, each dollar of new output (revenue) created by on-airport employers circulates through the economy until it has stimulated total output in all industries in the service area of $1.6787 or, put differently, the revenue multiplier of 1.6787 for on-airport activity shows that for each dollar spent on the airport there is additional spending created of $0.6787 or 67.87 cents of indirect or multiplier spending.

Direct revenues from all sources associated with the presence of Flagstaff Pulliam Airport were $57.4 million for the year. After accounting for the multiplier effect, total revenues created within the service area were $100.3 million. Indirect or secondary revenues were $42.9 million, the difference between total and direct revenues.

The multiplier for earnings shows the dollar change in earnings for the service area economy due to a one-dollar increase in earnings either on the airport or in the visitor sector. The earnings multipliers determine how wages paid to workers on or off the airport stay within the economy and create additional spending and earnings for workers in non-aviation industries. For example, each dollar of wages paid for workers on the airport stimulates an additional $1.1440 of earnings in the total economy.

The initial direct wages of $18.5 million for aviation workers and proprietors on the airport were spent for consumer goods and services that in turn created additional earnings of $20.2 million for workers and proprietors in the general economy.

The total earnings benefit of the airport was $38.7 million, consisting of $18.5 million of direct benefits and $20.2 million of indirect benefits. The economic interpretation is that the presence of the airport provided employment and earnings for workers, who then re-spent these dollars in the service area.

The multipliers for employment show the total change in jobs for the service area economy due to an increase of one job on or off the airport. Each job on the airport is associated with 1.4196 jobs in the rest of the airport service area economy. Similarly, each job in the hospitality industry supported by air visitor spending is associated with 1.7283 additional jobs in the general economy.

The overall result is that the 671 direct jobs created by the airport supported an additional 721 jobs in the service area as indirect employment. The sum of the direct aviation related jobs and indirect jobs created in the general economy is the total employment of 1,392 workers that can be attributed to the presence of the airport.

The information above is intended for illustration only. In the full analysis separate multipliers were used for on-airport aviation employers and visitor spending categories (lodging, eating places, retail, entertainment, and ground transportation).

TABLE C14
Average Multipliers and Indirect Benefits Within the Airport Service Area
Flagstaff Pulliam Airport

Revenue Source	Direct Revenues	Average Output Multipliers	Indirect Revenues	Total Revenues
On-Airport Benefits	$41,400,000	1.6787	$28,100,000	$69,500,000
Visitor Benefits	16,000,000	1.9250	14,800,000	30,800,000
Revenues	*$57,400,000*		*$42,900,000*	*$100,300,000*
Earnings Source	**Direct Earnings**	**Average Earnings Multipliers**	**Indirect Earnings**	**Total Earnings**
On-Airport Benefits	$11,800,000	2.1440	$13,500,000	$25,300,000
Visitor Benefits	6,700,000	2.0000	6,700,000	13,400,000
Earnings	*$18,500,000*		*$20,200,000*	*$38,700,000*
Employment Source	**Direct Employment**	**Average Employment Multipliers**	**Indirect Employment**	**Total Employment**
On-Airport Benefits	336	2.4196	477	813
Visitor Benefits	335	1.7283	244	579
Employment	*671*		*721*	*1,392*

Notes: Multipliers above are weighted averages intended to illustrate how indirect and total benefits were calculated for Flagstaff Pulliam Airport. In the full analysis, separate multipliers were used for on-airport employers (airlines, FBO, other aviation businesses), and visitor spending (lodging, eating places, retailing, entertainment, and ground transportation). Multipliers were for Flagstaff Pulliam Airport service area (Coconino County) as produced by the IMPLAN input-output model based on data from the Arizona Department of Economic Security and U. S. Bureau of Economic Analysis.

BASED AIRCRAFT BENEFITS

A survey of owners of aircraft based at Flagstaff Pulliam Airport was conducted to compile information on private aircraft usage patterns, including number of trips per year, purpose of travel, average party size, and average hours flown per trip. Questions were also posed concerning the importance of the airport for residential location and businesses of flyers.

TABLE C15
Based Aircraft Profile
Flagstaff Pulliam Airport

Type	Number
Total Based Aircraft	**116**
Single Engine Piston	**99**
Multi-Engine Piston	**7**
Jet & Turboprop	**8**
Helicopter	**2**

Source: Flagstaff Pulliam Airport and Coffman Associates, 2002

There were 116 based-aircraft at Flagstaff Pulliam Airport in 2002 (Table C15). Of these, 99 were single engine, 7 were multiengine aircraft, 8 were business jet or turboprop and 2 were rotary aircraft. A total of 39 aircraft owners returned surveys for this study, to provide a response rate of 34 percent.

The presence of the airport as a factor affecting the personal quality of life and business success of aircraft owners was measured by survey questions asking respondents to rate the airport as "very important, important, slightly important, or not important" to their residential location decision and their business.

The survey results show that Flagstaff Pulliam Airport is a significant factor in influencing the success of business and professional activity of aircraft owners.

- Six out of ten of all responding based aircraft owners (62%) said that the airport is "very important" or "important" to the success of their business location.

- Further, over three-fourths of aircraft owners (77%) stated that the airport is "very important" or "important" to their residential location decision.

Those who reported the airport as important to their business were also asked for information about their business.

- Firms represented by users of based aircraft for business purposes accounted for 924 employees in the county and surrounding area, and the businesses of the combined respondents produced a reported $188.2 million of annual sales.

Drawing from these results, it is evident that Flagstaff Pulliam Airport plays a key role in the overall quality of life and level of economic activity in the Coconino County area, and particularly supports the business community.

TABLE C16
Based Aircraft Characteristics And Business Activity
Flagstaff Pulliam Airport

Category	All Based AC
Average AC Value	**$113,525**
Maintenance/Yr	**$10,200**
Business Hours/Yr	**20,862**
Business Trips – Party Size	**1.9**
Airport "Very Important or "Important" to Business	**61%**
Employees of Owners of Based Aircraft	**924**
Annual Sales of Firms with Aircraft	**$188,200,000**

Source: Based Aircraft Owner Survey

Characteristics of based aircraft at Flagstaff Pulliam Airport are set out in Table C16. The table illustrates that the average value for an individual aircraft was $113,525 and annual outlays were $10,200 for maintenance, upkeep, storage, and other expenses such as insurance.

Multiplying the average expenditures per aircraft of $10,200 times 116 aircraft gives total outlays by aircraft owners of more than $1.1 million injected into the economy, much of it going to the immediate airport service area.

The aircraft based at Flagstaff Pulliam Airport represent assets to their owners with estimated total value of $13.2 million. Based aircraft are investments that provide returns through enhanced revenues and timesavings when compared to scheduled airline travel.

The table illustrates the relation between private aircraft ownership and business activity in the Coconino County area served by the airport. Aircraft owners contribute to the economy when they use their aircraft for business purposes. Faster travel and more responsive businesses make the entire region more competitive. According to the aircraft owner survey, the average aircraft is used for business 183 hours per year, or more than 15 hours per month.

Based aircraft owners at Flagstaff Pulliam Airport reported flying an average of 272 non-training hours per year (Table C17), or 5.2 hours per week. The range of annual hours reported by aircraft owners included some who used one plane for up to 2,200 hours per year. Of all owners, 67 percent reported some business use for their aircraft.

TABLE C17
Based Aircraft Use Patterns
Flagstaff Pulliam Airport

Usage Measure	Annual Hours
Avg. Number of Hours	272
Avg. Business Hours	183
Avg. Personal Hours	89
Percent Business Hours	67%
Percent Personal Hours	33%

Source: Based Aircraft Owner Survey

The average aircraft based at Flagstaff Pulliam Airport was flown 89 hours on personal trips per year. The typical round trip for pleasure, recreation or other personal reasons had 2.2 persons in the travel party (Table C18). There were an estimated 22,321 passenger hours flown for personal reasons that originated at Flagstaff Pulliam Airport during the year.

The typical business use for a general aviation aircraft had 1.9 persons in the travel party (Table C19). Flagstaff Pulliam Airport based aircraft flew 20,862 business hours for the year and 39,638 passenger hours.

(Note: Passenger hours flown on business or personal use were computed from multiplying average party size by hours flown, to obtain total passenger hours.)

TABLE C18
Based Aircraft - Personal Use
Flagstaff Pulliam Airport

Usage Measure	Annual Value
Avg. Party Size	2.2
Avg. Round Trip Hours/Year	89
AC Personal Hours	10,146
Passenger Hours	22,321

Source: Based Aircraft Owner Survey

TABLE C19
Based Aircraft - Business Use
Flagstaff Pulliam Airport

Item	Annual Value
Avg. Party Size	1.9
Avg. Round Trip Hours/Year	183
AC Business Hours	20,862
Passenger Hours	39,638

Source: Based Aircraft Owner Survey

An estimate of the value of travel on based aircraft may be obtained by computing the cost of making these same trips on a chartered flight. This is one approach approved by the Internal Revenue Service for valuation of aircraft travel use by corporate executives.

The weighted average round trip hours for based aircraft trips from the survey was 152 hours per year. The cost of charter flights varies by distance and type of aircraft. Table C20 shows charter rates for round trips of two to four hours from Flagstaff Pulliam Airport at mid-year 2002. A weighted average charter cost was determined by assigning a cost equivalent to the number of each aircraft type based at the airport. For example, since 87% of the aircraft are single engine, the cost of a single engine charter had a weight of .87 in the overall charter cost.

Excluding helicopters the 114 based aircraft flew a total of 31,008 hours during the year. Assigning an average charter value of $361 per hour, the "charter equivalent value" of general aviation business travel originating at Flagstaff Pulliam Airport for the year totaled $11,194,000.

This value of travel estimate, while very large, does not accurately measure all the associated economic gains and benefits that very often can result from business trips, which may be substantial. A single air trip can result in additional profits, fees, or revenues to a business firm. Trips for medical reasons often have high economic value as well. Further, the flexibility compared to scheduled airline travel and the time saved by general aviation travel compared to automobile use is not calculated here, but certainly has economic significance.

TABLE C20
Charter Equivalent Value of General Aviation Travel By Based Aircraft
Flagstaff Pulliam Airport

Aircraft Type	Number	Weights	Hourly Charter Cost	Weighted Cost
Single Engine	**99**	**0.87**	**312**	**217**
Twin Engine	**7**	**0.06**	**473**	**29**
Turboprop	**7**	**0.06**	**1,208**	**74**
Jet	**1**	**0.01**	**4,620**	**41**
TOTAL	**114**			**$361**

Charter Equivalent Value Based On Above Cost Per Flight

Hours	Trip Cost	Total Value
31,008	**$361**	**$11,194,000**

Note: Charter costs by aircraft type for 2 hour round trip, average of various charter firms, summer 2002. Does not include standby time, landing fees, other charges. Distance range 250-300 miles.

SUMMARY & FUTURE BENEFITS

Airports are available to serve the flying public and support the regional economy every day of the year. On a typical day at Flagstaff Pulliam Airport, there are more than 100 operations by aircraft involved in local or itinerant activity including flight training, cargo and courier service, corporate travel, or commercial aircraft bringing passengers visiting the area for personal travel or on business.

During each day of the year, Flagstaff Pulliam Airport generates $275,000 of revenues within its service area (see box). Revenues and production support jobs, not only for the suppliers and users of aviation services, but throughout the economy.

Each day Flagstaff Pulliam Airport provides 336 jobs directly on the airport and in total supports 1,392 local jobs in the airport service area. Service area workers bring home daily earnings of $106,000 for spending in their home communities.

On an average day during the year, there are 98 visitors in the area who arrived at Flagstaff Pulliam Airport. Some will stay in the Flagstaff area for only a few hours while they conduct their business, and others will stay overnight. The average spending by these visitors on a typical day injects $43,800 into the local economy.

Table C21 shows a summary of current economic benefits associated with the airport. Direct benefits to the service area, without multiplier effects, include revenues of $57.4 million, 671 jobs and earnings to workers and proprietors of $18.5 million.

Flagstaff Pulliam Airport Daily Economic Benefits

- **$275,000 Revenue**
- **1,392 Local Jobs Supported**
- **$43,800 Visitor Spending**
- **98 Air Visitors**

TABLE C21
Summary of Economic Benefits: 2002
Flagstaff Pulliam Airport

	Revenues	Earnings	Employment
On-Airport Activity	**$41,400,000**	**$11,800,000**	**336**
Air Visitors	**16,000,000**	**6,700,000**	**335**
Direct Benefits	***57,400,000***	***18,500,000***	***671***
Indirect Benefits	**42,900,000**	**20,200,000**	**721**
Total Benefits	**$100,300,000**	**$38,700,000**	**1,392**

Note: Revenues, earnings and employment benefits reflect activity associated with 37,239 operations in 2002, 20,266 commercial air passenger visitors and capital improvement budget of $3.5 million.

Including indirect or multiplier effects, total benefits to the service area are $100.3 million in revenues, 1,392 jobs and earnings of $38.7 million.

Flagstaff Pulliam Airport is the origin of thousands of general aviation trips per year. Corporate and other private aircraft are used to visit other parts of the nation and the globe, and to bring visitors, customers and employees to the Flagstaff area. The estimated cost of chartering aircraft to serve the business needs of these travelers was found to be $11.1 million. In addition, the presence of the Flagstaff Pulliam Airport provides unmeasured benefits in the form of flexibility in travel not found through reliance on scheduled air carriers.

It is important for citizens and policy makers to be aware that there are unmeasured but qualitative benefits from aviation that represent significant social and economic value created by airports for the regions which they serve. In addition to exerting a positive influence on economic development in general, aviation often reduces costs and increases efficiency in individual firms. Annual studies by the National Business Aviation Association show that those firms with business aircraft have sales 4 to 5 times larger than those that do not operate aircraft.

In 2000, the net income of aircraft operating companies was 6 times larger than non-operators. Two thirds of the *Fortune* 500 firms operate aircraft and 88 percent of the top100 have business aircraft (see National Business Aviation Association, *Fact Book*, 2002).

As aviation activity increases in the airport service area, the economic benefits of the airport to the regional economy can be expected to increase (forecasts below do not include capital projects pending approval).

The short term planning horizon for the airport is associated with an increase in operations to an annual level of 70,500. Not including outlays for capital projects, on-airport revenues will be $49.8 million, employment on the airport will be 363 workers and jobs related to air visitors will increase to 441 (Table C22).

Visitor spending will reach $21.1 million (measured in 2002 dollars) and the revenue benefits due to the presence of the airport will rise to $124 million, including all multiplier effects.

The intermediate term planning horizon is based on 80,100 operations (Table C23). Employment on the airport will rise to 413 jobs and the total employment impact on and off the airport after all multiplier effects is 1,895 jobs, with earnings rising to $51.1 million. Revenues will increase to $140.8 million (2002 dollars) in the intermediate term.

The long term is defined as an airport activity level of 95,800 operations per year. The long-term projections imply on-airport employment of 493 workers with earnings from on-airport jobs reaching $17.3 million. Spending by air visitors will be $28.6 million, with employment of 599 workers in visitor industries.

Accounting for all multiplier effects, jobs supported in the airport service area under the long-term assumptions total 2,265. Revenues will be $168.4 million, and earnings will be $61.1 million, measured in 2002 dollars (see table C24).

TABLE C22
Summary of Economic Benefits: Short Term
Flagstaff Pulliam Airport

	Revenues	Earnings	Employment
On-Airport Activity	**$49,800,000**	**$12,700,000**	**363**
Air Visitors	**21,100,000**	**8,800,000**	**441**
Direct Benefits	*70,900,000*	*21,500,000*	*804*
Indirect Benefits	**53,100,000**	**23,500,000**	**863**
Total Benefits	**$124,000,000**	**$45,000,000**	**1,667**

Note: Revenues, earnings and employment for short-term forecast period reflect activity associated with 70,500 operations per year.

TABLE C23
Summary of Economic Benefits: Intermediate Term
Flagstaff Pulliam Airport

	Revenues	Earnings	Employment
On-Airport Activity	**$56,600,000**	**$14,400,000**	**413**
Air Visitors	**23,900,000**	**10,000,000**	**501**
Direct Benefits	***80,500,000***	***24,400,000***	***914***
Indirect Benefits	**60,300,000**	**26,700,000**	**981**
Total Benefits	**$140,800,000**	**51,100,000**	**1,895**

Note: Revenues, earnings and employment for intermediate term forecast period reflect activity associated with 80,100 operations per year.

TABLE C24
Summary of Economic Benefits: Long Term
Flagstaff Pulliam Airport

	Revenues	Earnings	Employment
On-Airport Activity	**$67,700,000**	**$17,300,000**	**493**
Air Visitors	**28,600,000**	**11,900,000**	**599**
Direct Benefits	***96,300,000***	***29,200,000***	***1,092***
Indirect Benefits	**72,100,000**	**31,900,000**	**1,173**
Total Benefits	**$168,400,000**	**$61,100,000**	**2,265**

Note: Revenues, earnings and employment for long term forecast period reflect activity associated with 95,800 operations per year.

Tax Impacts

Because of the spending, jobs, and earnings created by the presence of Flagstaff Pulliam Airport, the facility is an important source of public revenues. As airport activity expands, tax revenues will continue to grow.

Estimated tax potential is set out in Table C25. The table shows the revenues for each tax category that could potentially be collected based on current average tax rates relative to output and personal income (earnings) for Flagstaff, Arizona and Coconino County.

The first column in Table C25 shows tax revenues associated with the current level of Flagstaff Pulliam Airport operations. The total of 1,392 workers with jobs supported by the presence of the airport have earnings of $38.7 million. Federal personal income taxes are estimated at $3.9 million, the largest component of federal taxes. The second largest federal tax category is social security contributions of $3.6 million. Corporate profits taxes on a revenue base of $100.3 million are estimated as $1.1 million.

Overall, federal tax revenues collected due to economic activity associated with Flagstaff Pulliam Airport are estimated to be $10.2 million (in 2002 dollars).

State and local tax revenues are shown in the lower portion of the table. State and local tax revenues sum to $4.9 million for the current level of airport operations.

The largest single component is sales taxes of $2.2 million (this figure includes combined estimates for both state and local sales taxes). Property taxes are the second largest source of revenues, estimated as $1.3 million.

Combined federal, state, and local taxes are $15.1 million at the current level of operations and are projected to rise to $19.8 million at the short term operations level of 70,500. The long-term level of 95,800 operations would bring tax revenues of $18.2 million federal taxes and $8.8 million state and local revenues, which figures sum to a total tax revenue potential at long run operations levels of $27 million per year.

TABLE C25
Tax Impacts From On-airport and Air Visitor Economic Activity
Flagstaff Pulliam Airport

Federal Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	**$1,100,000**	**$1,400,000**	**$1,600,000**	**$1,900,000**
Personal Income Tax	**3,900,000**	**5,100,000**	**5,800,000**	**7,000,000**
Social Security Taxes	**3,600,000**	**4,700,000**	**5,400,000**	**6,400,000**
All Other Federal Taxes	**1,600,000**	**2,100,000**	**2,400,000**	**2,900,000**
Total Federal Taxes	**$10,200,000**	**$13,300,000**	**$15,200,000**	**$18,200,000**
State and Local Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	**$100,000**	**$200,000**	**$200,000**	**$300,000**
Motor Vehicle Taxes	**100,000**	**100,000**	**100,000**	**200,000**
Property Taxes	**1,300,000**	**1,700,000**	**1,900,000**	**2,200,000**
Sales Taxes	**2,200,000**	**2,800,000**	**3,200,000**	**3,900,000**
Personal Income Tax	**600,000**	**800,000**	**900,000**	**1,000,000**
All Other State & Local Taxes	**600,000**	**900,000**	**1,000,000**	**1,200,000**
Total State & Local Taxes	**$4,900,000**	**$6,500,000**	**$7,300,000**	**$8,800,000**
TOTAL TAX REVENUES	**$15,100,000**	**$19,800,000**	**$22,500,000**	**$27,000,000**

Notes: All figures are in FY2002 dollars. Derived from average tax rates in Flagstaff, Coconino County, Arizona and federal sources. Current impact estimate based on economic activity associated with 53,593 operations. Short term operations = 70,500; intermediate term = 80,100; long term = 95,800.

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Appendix D
ENVIRONMENTAL EVALUATION

Appendix D
ENVIRONMENTAL EVALUATION

A review of the potential environmental impacts associated with proposed airport improvements is an important consideration in the Airport Master Plan process. Prior to the FAA's approval of development projects at an airport, some form of environmental review must be undertaken. The *National Environmental Policy Act (NEPA) of 1969*, as amended, outlines the general format of this review. The FAA has established airport-specific NEPA environmental review processes which are outlined in detail within FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*. The NEPA process for a project typically takes one of three forms. The simplest and least time consuming form of review is the categorical exclusion, often referred to as a Cat-Ex. Historically, the FAA has completed most of the Cat-Ex documents in-house; however, as the documentation requirements have increased, they are requesting project sponsors complete the documentation then submit it to FAA for review. A detailed list of projects which can often be categorically-excluded, pending no extraordinary circumstances, is found in paragraphs 307 through 312 of FAA Order 1050.1E. Extraordinary circumstances exist if the project could have an adverse effect within any of the resource categories discussed in the following sections of this evaluation, (i.e. cultural or biological resources, wetlands, floodplains, etc.).

The second level of NEPA documentation takes the form of an Environmental Assessment, commonly referred to as an EA. EAs are typically prepared when a project is not categorically excluded; is normally categorically excluded but, in this instance, involves at least one extraordinary circumstance that may significantly af-

fect the human environment; or, when the action is not one known to require a higher level of environmental review. Actions which typically require an EA are listed in paragraph 401 of FAA Order 1050.1E and include items such as the acquisition of more than three acres of property, runway extensions, new runways, and runway strengthening projects which have the potential to increase off-airport noise by 1.5 decibels within the 65 CNEL noise contour.

The third level of NEPA documentation is an Environmental Impact Statement, commonly referred to as an EIS. This form of documentation is fairly rare when compared to the number of Cat-Ex and EA documents which are prepared. EISs are required when the impacts of the proposed action are significant, even with the incorporation of mitigation.

The purpose of this environmental evaluation is to provide a preliminary review of environmental issues that would need to be analyzed in further detail during the NEPA process. As a result, this analysis does not address mitigation or resolution of any identified environmental impacts.

Proposed Airport Improvements

As a result of the Airport Master Plan analysis, a number of airport improvement projects have been recommended for implementation over the long-range planning horizon. Many of these projects may qualify for a Cat-Ex; however, a number of the projects will likely require, at a minimum, an EA. Specific projects included within the development plan include among others a 1,801-foot extension to Runway 3-21, construction of a parallel runway, development of additional aviation facilities on the south side of the airport, terminal area improvements, and property acquisition.

During the development of this master plan, the City of Flagstaff undertook an EA for the 1,801 foot extension of Runway 3-21 and associated property acquisition. Information gathered during the preparation of the EA will be utilized for this evaluation.

EVALUATION OF POTENTIAL IMPACTS

Guidance contained within Appendix A of FAA Order 1050.1E as well as FAA Order 5050.4A, *Airport Environmental Handbook*, was utilized for the preparation of this evaluation. Discussion regarding each of the eighteen impact categories contained within the FAA guidance is provided.

Noise/Compatible Land Use

For aviation noise analysis, the FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from aviation activities must be established in terms of yearly day/night average sound level (DNL). DNL is the metric currently accepted as an appropriate measure of cumulative noise exposure by not only the FAA, but also the Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD). These three agencies have each identified the 65 DNL noise contour as the threshold of incompatibility; therefore, noise-sensitive land uses such as schools, places of worship, or homes should be located outside this contour.

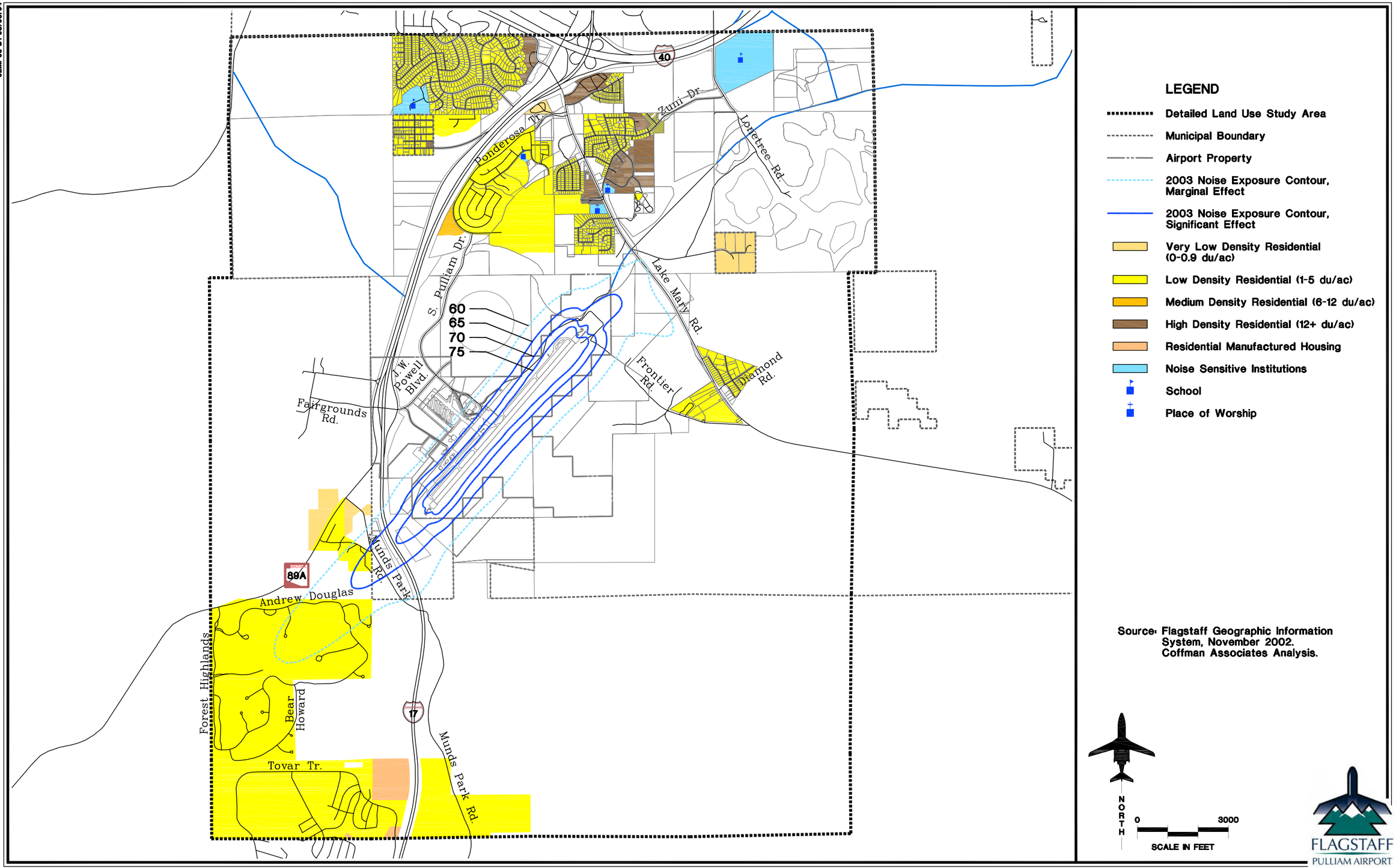
To assist local governments with addressing the noise impacts of airports, the *Aviation Safety and Noise Abatement Act of 1979* (ASNA, P.L. 96-193), signed into law on February 18, 1980, was enacted. The purpose of this law is ". . . to provide and carry out noise compatibility programs, to provide assistance to assure continued safety in aviation, and for other purposes." The FAA was vested with the authority to implement and administer the Act. Federal Aviation Regulation (F.A.R.) Part 150, the administrative rule promulgated to implement the Act, sets requirements for airport operators who choose to undertake an airport noise compatibility study with federal funding assistance. Part 150 provides for the development of two documents: the Noise Exposure Maps (NEM) and the Noise Compatibility Program (NCP).

The NEM document contains a baseline analysis which shows existing and potential future noise conditions at the airport. The NCP document presents a plan for effectively dealing with adverse noise impacts based on a three-step process. First, it addresses alternatives to abate or reduce aircraft noise. Second, it addresses noise mitigation techniques to reduce the impact of noise on sensitive land uses in the area. Third, it addresses land use planning to encourage future development that is compatible with the airport.

In 2002, Flagstaff Pulliam Airport undertook an F.A.R. Part 150 Study. The study resulted in a number of recommendations which have the potential to reduce noise impacts on sensitive land uses and provide recommendations for future land use planning around the airport. The noise contours prepared for the study indicated that the future noise contours for the airport are smaller than the existing condition. **Exhibits D1, D2,** and **D3** depict the 2003, anticipated 2008, and anticipated 2025 noise contours for the airport. As indicated on the exhibits, the residential areas contained within the 65 DNL noise contour will diminish over time, partially as a result of the extension of Runway 3-21 and partially as a result of the phase-out of older, louder aircraft.

As future NEPA evaluations are undertaken for proposed improvements at the airport, the noise contours will likely need to be updated to take into account future

02MP09-D1-05/06/04



LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- 2003 Noise Exposure Contour, Marginal Effect
- 2003 Noise Exposure Contour, Significant Effect
- Very Low Density Residential (0-0.9 du/ac)
- Low Density Residential (1-5 du/ac)
- Medium Density Residential (6-12 du/ac)
- High Density Residential (12+ du/ac)
- Residential Manufactured Housing
- Noise Sensitive Institutions
- School
- Place of Worship

Source: Flagstaff Geographic Information System, November 2002.
Coffman Associates Analysis.

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Exhibit D1
2003 NOISE EXPOSURE CONTOUR WITH NOISE-SENSITIVE LAND USE

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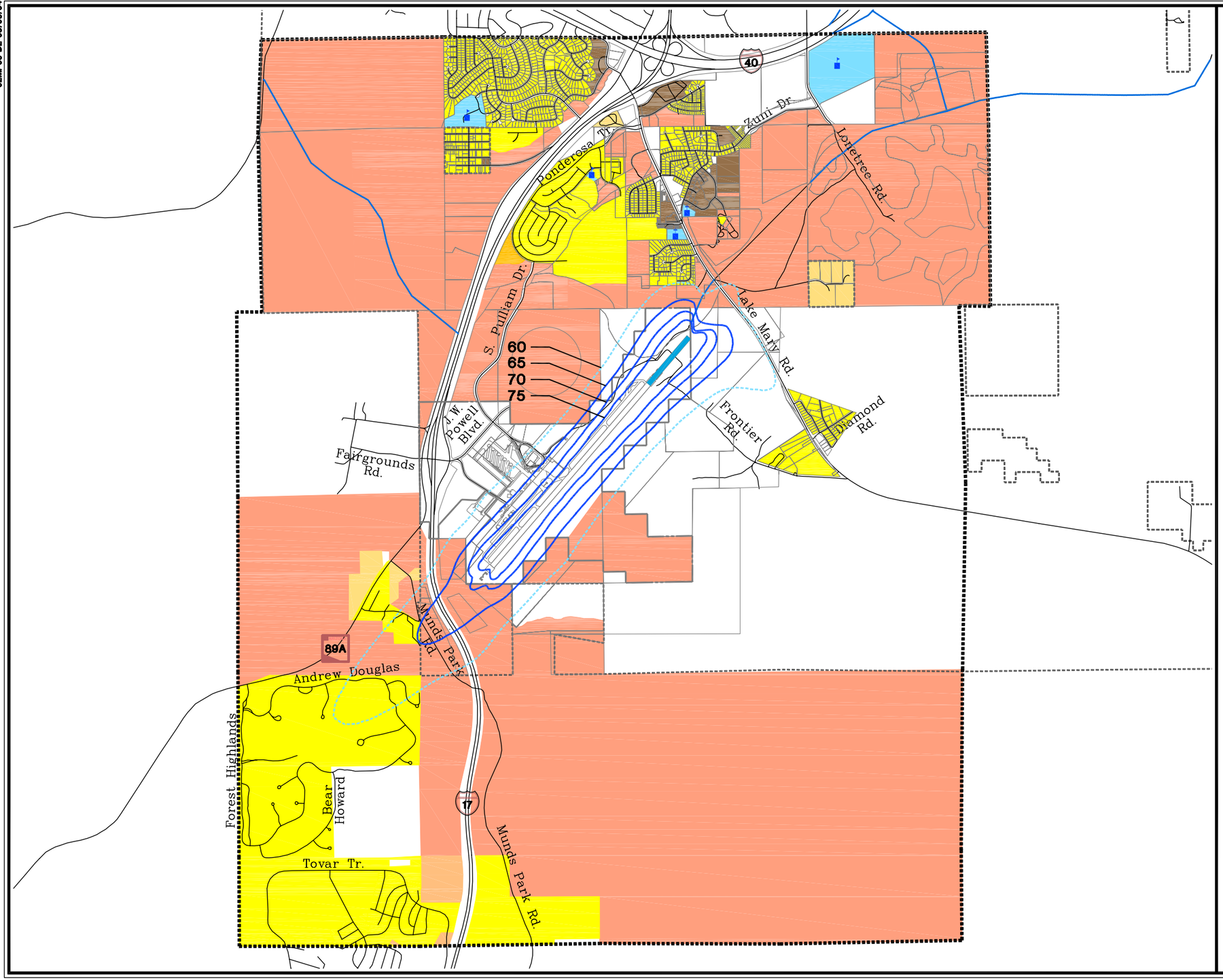

LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- 2008 Noise Exposure Contour, Marginal Effect
- 2008 Noise Exposure Contour, Significant Effect
- Runway Extension Per 2003/04 Airport Master Plan Update
- Very Low Density Residential (0-0.9 du/ac)
- Low Density Residential (1-5 du/ac)
- Medium Density Residential (6-12 du/ac)
- High Density Residential (12+ du/ac)
- Residential Manufactured Housing
- Noise Sensitive Institutions
- Potential Noise-Sensitive Growth Risk Areas
- School
- Place of Worship

Source: Flagstaff Geographic Information System, November 2002.
Coffman Associates Analysis.

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FLAGSTAFF PULLIAM AIRPORT

Exhibit D2
2008 NOISE EXPOSURE CONTOUR WITH NOISE-SENSITIVE LAND USE

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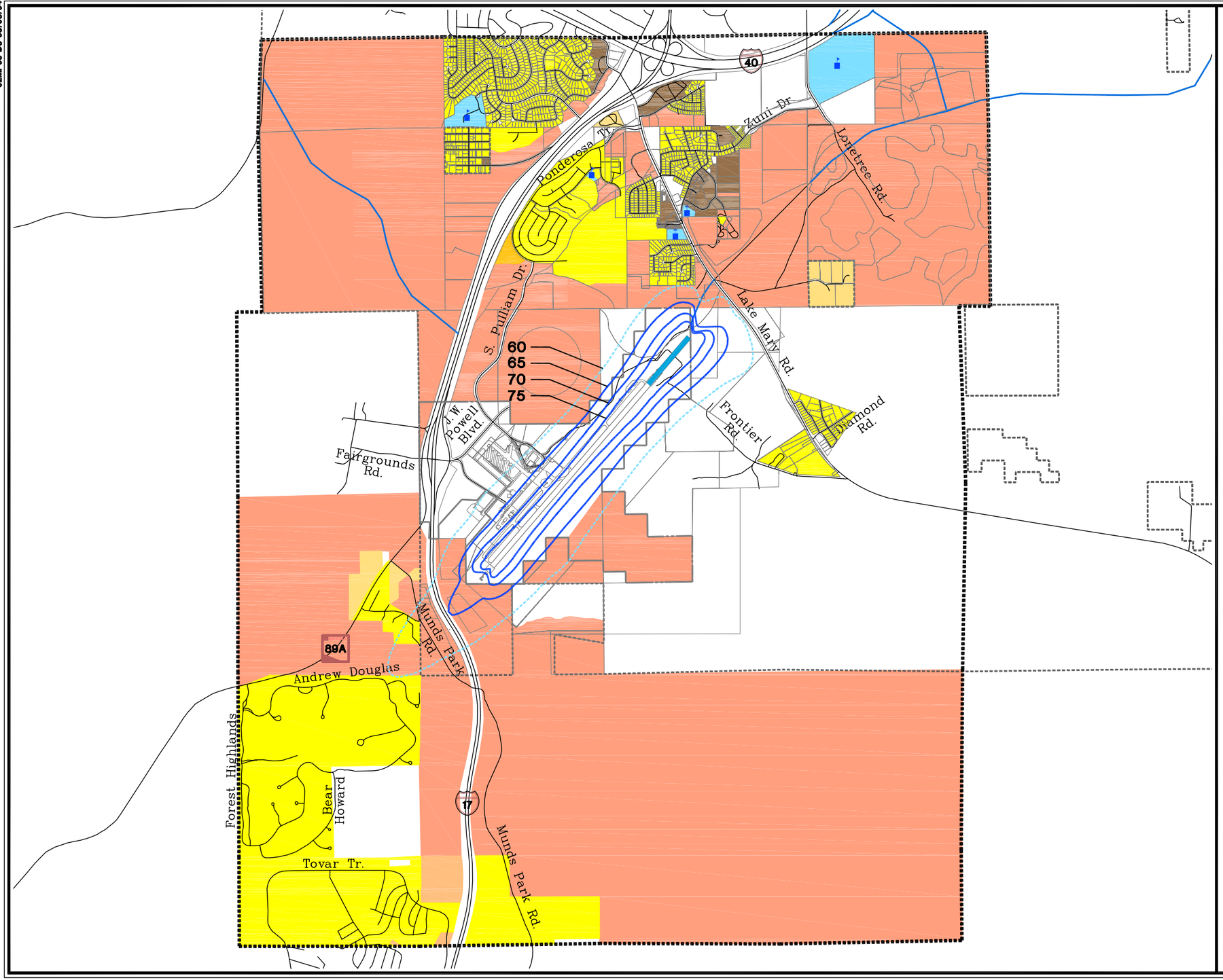

LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- 2025 Noise Exposure Contour, Marginal Effect
- 2025 Noise Exposure Contour, Significant Effect
- Runway Extension Per 2003/04 Airport Master Plan Update
- Very Low Density Residential (0-0.9 du/ac)
- Low Density Residential (1-5 du/ac)
- Medium Density Residential (6-12 du/ac)
- High Density Residential (12+ du/ac)
- Residential Manufactured Housing
- Noise Sensitive Institutions
- Potential Noise-Sensitive Growth Risk Areas
- School
- Place of Worship

Source: Flagstaff Geographic Information System, November 2002.
Coffman Associates Analysis.

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Exhibit D3
2025 NOISE EXPOSURE CONTOUR WITH NOISE-SENSITIVE LAND USE

changes in the fleet mix of aircraft utilizing the airport, as well as the planned improvements such as the parallel runway. The City of Flagstaff has taken a proactive position in land use planning around the airport; therefore, the development of non-compatible uses within the 65 DNL noise contour is not anticipated in the future. The future land use plan for the airport environs indicates that the undeveloped areas surrounding the airport are planned for compatible future land uses. Additionally, the city requires the issuance of avigation easements as a condition of development for areas contained within the Airport Influence Area (AIA).

Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks

Socioeconomic impacts known to result from airport improvements are often associated with relocation activities or other community disruptions, including alterations to surface transportation patterns; division or disruption of existing communities; interferences with orderly, planned development; or an appreciable change in employment related to the project. Social impacts are generally evaluated based on areas of acquisition and/or areas of significant project impact, such as areas encompassed by noise levels in excess of 65 DNL.

Planned improvements at the airport which could result in socioeconomic impacts will primarily relate to the development of the connection of John Wesley Powell Boulevard to Lake Mary Road. Development of the aviation facilities on the south side of the runway system may result in economic impacts; however, these impacts would likely be beneficial.

Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations,* the accompanying Presidential Memorandum, and Order DOT 5610.2, *Environmental Justice,* require the FAA to provide for meaningful public involvement by minority and low-income populations, as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse.

During the preparation of the EA for the extension of Runway 3-21, it was determined that the airport is located in an area which does not contain a disproportionate number of low-income or minority populations.

Pursuant to Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they may be exposed to.

Due to the industrial nature of an airport, a number of substances which could affect a child's health or safety are present. However, measures are in place at the airport which would make it very hard for a child, or an adult, to access these substances.

The airport is located away from schools, playgrounds, athletic fields, and other areas attractive to children. The airport runway, land, and airside facilities are secured by a perimeter security fence to restrict wildlife and unauthorized people, including children, from accessing the airport. Health and safety risks for children will be most likely to occur during construction of airport improvements; however, these impacts can be reduced through the use of standard construction practices, such as safety fencing and signage.

Secondary (Induced) Impacts

Secondary impacts are those that include shifts in patterns of population growth, public service demands, and changes in business and economic activity to the extent influenced by airport development.

Significant shifts in patterns of population movement or growth, or an increase in public service demands are not anticipated as a result of the proposed development. Proposed development at the airport will be undertaken over a period of years which will help to ensure that public services are not impacted. Changes in business and economic activity can be anticipated as the airport's business park continues to develop and the development on the south side of the runway system is undertaken.

Air Quality

The FAA is responsible for ensuring that appropriate analysis be contained within NEPA documents to disclose the potentially significant impact of a proposed action on the attainment and maintenance of air quality standards established by law or administrative determination. It is also the FAA's responsibility to assure that proposed actions conform with applicable State Implementation Plans (SIPs) when they have been prepared and adopted.

Air quality in a given location is described by the concentrations of various pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing it to the state and federal ambient air quality standards. The United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), lead (Pb), ozone (O_3), and particulate matter (PM-10 and PM-2.5).

Based upon both federal and state air quality standards, a specific geographic area can be classified under the federal and state *Clean Air Act* as either being an "attainment," "non-attainment," or "maintenance" area for each criteria pollutant. The criterion for non-attainment designation varies by pollutant.

Within the Flagstaff area, the air quality programs are coordinated through the Arizona Department of Environmental Quality (ADEQ). Air quality programs are coordinated at the federal level by the EPA, Region IX. The airport is located in an area currently in attainment for all pollutants. Consequently, there are no SIP requirements or specific control measures with respect to ambient air quality in the Flagstaff area as the area currently meets federal and state health standards for air pollution levels, including particulates. As projects are proposed for development, the air quality attainment status of the area will need to be evaluated and a conformity determination may be required.

Water Quality

The *Clean Water Act* provides the authority to establish water quality standards, control discharges, develop waste treatment management plans and practices, prevent or minimize the loss of wetlands, and regulate other issues concerning water quality. Water quality concerns related to airport development most often relate to the potential for surface runoff and soil erosion as well as the storage and handling of fuel, petroleum products, solvents, etc.

Water quality regulations and issuance of permits will normally identify any deficiencies in the proposed development with regard to water quality or any additional information necessary to make judgments on the significance of impacts. Difficulties in obtaining needed permits for the projects, such as the Arizona Pollutant Discharge Elimination System (AZPDES) or Section 404 permits, typically indicates a potential for significant water quality impacts. As proposed improvements are undertaken at the airport, the existing AZPDES Operating Permit will need to be modified and an AZPDES Construction Permit will need to be obtained. If it is determined that proposed projects will impact wetlands or Waters of the U.S., a Section 404 permit from the U.S. Army Corps of Engineers may be required along with 401 Water Quality Certification from the ADEQ.

Wetlands and Waters of the U.S.

The U.S. Army Corps of Engineers (COE) regulates the discharge of dredged and/or fill material into waters of the United States, including adjacent wetlands, under Section 404 of the *Clean Water Act*.

Wetlands are defined by Executive Order 11990, *Protection of Wetlands*, as those areas that are inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances, does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Categories of wetlands include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mud flats, natural ponds, estuarine areas, tidal overflows, and shallow lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: hydrology, hydrophytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained soils.

A wetland delineation was undertaken by the U.S. Army Corps of Engineers during the preparation of the EA for the extension of Runway 3-21. The delineation was limited to the areas which would be impacted during the construction of the runway extension. It was determined that a jurisdictional wash is located parallel to Taxiway A. This wash may be impacted by construction of the connection of John Wesley Powell Boulevard with Lake Mary Road. Prior to undertaking projects in areas which are currently undeveloped, coordination with the U.S. Army Corps of Engineers should be undertaken to determine the presence of wetlands or other Waters of the U.S.

Floodplains

Executive Order 11988 directs federal agencies to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by the floodplains. Department of Transportation (DOT) Order 5650.2 contains DOT's policies and procedures for implementing the executive order. Agencies are required to make a finding that there is no practicable alternative before taking action that would encroach on a base floodplain based on a 100-year flood.

No 100-year floodplains are present within the vicinity of the airport.

Historical, Architectural, Archeological, and Cultural Resources

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act (NHPA) of 1966*, as amended, the *Archaeological and Historic Preservation Act (AHPA) of 1974*, the *Archaeological Resources Protection Act (ARPA)*, and the *Native American Graves Protection and Repatriation Act (NAGPRA) of 1990*. In addition, the *Antiquities Act of 1906*, the *Historic Sites Act of 1935*, and the *American Indian Religious Freedom Act of 1978* also protect historical, architectural, archaeological, and cultural resources.

Section 106 of the NHPA of 1966, as amended, requires federal agencies to take into account the effects of their undertakings on historic properties and determine if any properties in, or eligible for inclusion in, the National Register of Historic Places are present in the area. In addition, it affords the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the council.

Cultural resource surveys were undertaken during the preparation of the EA for the extension of Runway 3-21. Much of airport property was surveyed at this time and no historical or cultural resources were identified. Additional surveys may be required prior to the development of projects in areas which have not been previously disturbed and have not been surveyed in the past.

Department of Transportation Act: Section 4(f)

Section 4(f) of the DOT Act, which was recodified and renumbered as section 303(c) of 49 USC, provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly-owned land from historic sites, public parks, recreation areas, or waterfowl and wildlife refuges of national, state, regional, or local importance unless there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from use.

During preparation of the EA for the extension of Runway 3-21, concerns were raised by the National Park Service (NPS) regarding potential impacts on National Park units located in close proximity to the airport, as well as the Grand Canyon National Park. A supplemental noise analysis was undertaken as part of the EA to assess noise impacts on these resources. Concerns were not raised by any other entities regarding potential impacts on Section 4(f) resources.

Studies are currently underway to potentially expand the boundaries of Walnut Canyon National Monument to the west. This would bring the boundaries of this NPS unit much closer to the airport, potentially resulting in Section 4(f) issues for future airport development. The presence of the airport, as well as future development plans for the airport, should be taken into account during the formulation of the expanded boundaries to ensure that the presence of the NPS unit does not hinder the future development of the airport.

Fish, Wildlife, and Plants

Section 7 of the *Endangered Species Act* (ESA), as amended, applies to federal agency actions and sets forth requirements for consultation to determine if the proposed action “may affect” a federally-endangered or threatened species. If an

agency determines that an action "may affect" a federally-protected species, then Section 7(a)(2) requires each agency to consult with the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (MNFS), as appropriate, to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species or result in the destruction or adverse modification of critical habitat. If a species has been listed as a candidate species, Sec. 7 (a)(4) states that each agency must confer with the FWS and/or MNFS.

It was found, during the Section 7 consultation process for the runway extension EA, that a number of protected species are present in the Flagstaff area. Species which were identified as occurring or having habitat present within the airport environs included:

- **Flagstaff Pennyroyal**. One population of this species was identified on airport property. The population consisted of approximately 30 plants on two natural limestone outcroppings comprising a total area of less than 50 meters square.
- **Bald Eagle**. Bald eagles are known to winter at Lake Mary and Mormon Lake, located about five miles southeast of the airport. It was determined that the forested area around the airport could be used for roosting or foraging; however, no nests were found on or within ¼-mile of the project area. There are no known nesting records of the species in this location, and no individuals were observed during the surveys.
- **Mexican Spotted Owl**. Approximately 200 of the 315 acres of property which were surveyed are considered forested. The forested areas are considered potential habitat for the owl. During the survey, no currently occupied nests were found on, or within ¼-mile of the project area. The nearest protected activity center for the owl is located approximately three miles southeast of the airport.

It is anticipated that additional coordination and surveys will be required prior to the development of airport improvements, especially in areas which are currently undeveloped.

Coastal Resources

Federal activities involving or affecting coastal resources are governed by the Coastal Barriers Resource Act (CBRA), the Coastal Zone Management Act (CZMA), and E.O. 13089, Coral Reef Protection.

The airport is not located near any coastal resources.

Wild and Scenic Rivers

The *Wild and Scenic Rivers Act*, as amended, describes those rivers or segments of rivers which are listed, or eligible for listing, in the Wild and Scenic Rivers System. These rivers are free-flowing and possess "outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values" (PL 90-542 as amended by PL 96-487).

The National Park Service (NPS) maintains a Nationwide River Inventory (NRI) of river segments which appear to qualify for inclusion in the National Wild and Scenic River System, but which have not been designated as a Wild and Scenic River or studied under a Congressionally authorized study. The President's 1979 *Environmental Message Directive on Wild and Scenic Rivers* directs federal agencies to avoid or mitigate adverse effects on rivers identified in the NRI as having potential for designation under the *Wild and Scenic Rivers Act*.

The nearest wild and scenic river is a stretch of the Verde River which is located approximately 45 miles south of Flagstaff Pulliam Airport. No NRI rivers are located within 30 miles of the airport.

Farmland

Under the *Farmland Protection Policy Act* (FPPA), federal agencies are directed to identify and take into account the adverse effects of federal programs on the preservation of farmland, to consider appropriate alternative actions which could lessen adverse effects, and to assure that such federal programs are, to the extent practicable, compatible with state or local government programs and policies to protect farmland. The FPPA guidelines apply to farmland classified as prime or unique, or of state or local importance as determined by the appropriate government agency, with concurrence by the Secretary of Agriculture.

Coordination received from the Natural Resources Conservation Service (NRCS) as part of the EA for the extension of Runway 3-21 indicated that the land surrounding the airport is already in, or committed to, urban development, currently used as water storage, or land that is not prime or unique farmland. Therefore, development at Flagstaff Pulliam Airport is exempt from the requirements of the FPPA.

Natural Resources and Energy Supply

Energy requirements associated with the proposed action alternative generally fall into two categories: (1) those which relate to changed demands for stationary facilities (i.e., airfield lighting and terminal building heating); and (2) those which involve the movement of air and ground vehicles (i.e., fuel consumption). In addition

to fuel, the use of natural resources includes construction materials, water, and manpower.

The implementation of the proposed alternative will likely not significantly increase the consumption of natural resources and energy at the airport. Any impacts would be the result of increased operations and upgraded facilities.

Light Emissions and Visual Impacts

Airport lighting is characterized as either airfield lighting (i.e., runway, taxiway, approach and landing lights) or landside lighting (i.e., security lights, building interior lighting, parking lights, and signage). Generally, airport lighting does not result in significant impacts unless a high intensity strobe light such as a Runway End Identifier Light (REIL) would produce a glare on any adjoining site, particularly residential uses.

Visual impacts relate to the extent that the proposed development contrasts with the existing environment and whether a jurisdictional agency considers this contrast objectionable.

Proposed improvements at the airport include a number of projects which would induce lighting in areas which are currently undeveloped. These projects are primarily located south of the runway system. Areas surrounding the proposed development are currently undeveloped; therefore, it is anticipated that lighting impacts will not be significant.

Hazardous Materials, Pollution Prevention, and Solid Waste

Four primary laws have been passed governing the handling and disposal of hazardous materials, chemicals, substances, and wastes. The two statutes of most importance to the FAA in proposing actions to construct and operate facilities and navigational aids are the Resource Conservation Recovery Act (RCRA) (as amended by the Federal Facilities Compliance Act of 1992) and the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA), as amended (also known as Superfund). RCRA governs the generation, treatment, storage, and disposal of hazardous wastes. CERCLA provides for cleanup of any release of a hazardous substance (excluding petroleum) into the environment.

Consideration should be given regarding the hazardous nature of any materials or wastes to be used, generated, or disturbed by the proposed action, as well as the control measures to be taken.

As mentioned previously in this section, the airport will need to continue to comply with current NPDES operations permit requirements. With regard to construction activities, the airport and all applicable contractors will need to obtain and comply with the requirements and procedures of the construction-related NPDES General Permit, including the preparation of a *Notice of Intent* and a *Stormwater Pollution Prevention Plan*, prior to the initiation of project construction activities.

Construction Impacts

Construction impacts typically relate to the effects on specific impact categories, such as air quality or noise, during construction. To minimize construction-related impacts, the use of Best Management Practices (BMPs) is recommended. All applicable permits and certifications will need to be obtained prior to any construction.

Appendix E
AIRPORT LAYOUT PLAN

AIRPORT MASTER PLAN

FLAGSTAFF

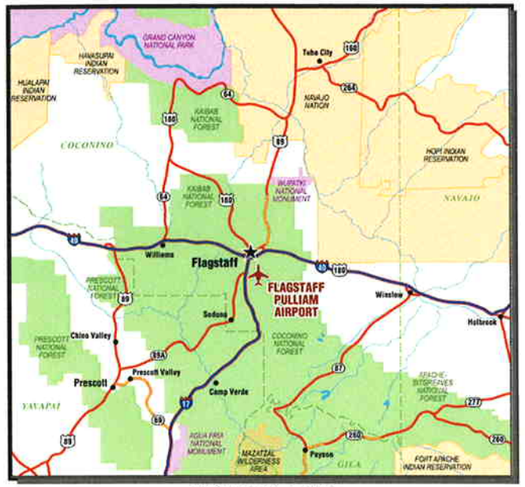
PULLIAM AIRPORT

AIRPORT LAYOUT PLAN SET

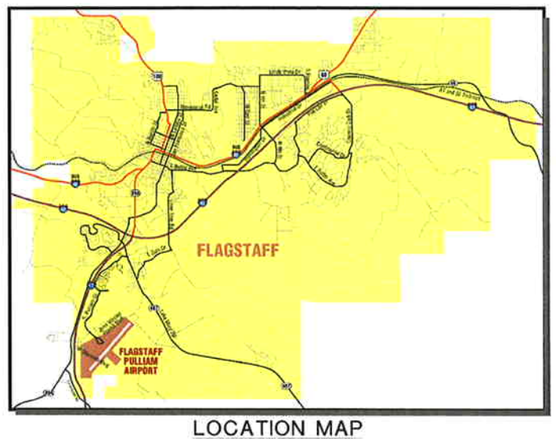
INDEX OF DRAWINGS

PREPARED FOR
CITY OF FLAGSTAFF, ARIZONA

Coffman Associates
Airport Consultants



VICINITY MAP



LOCATION MAP

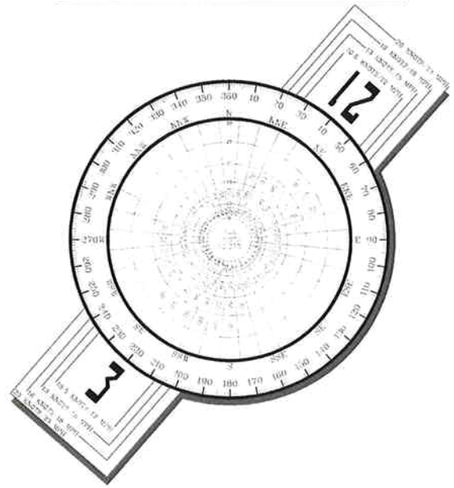
RUNWAY DATA

	RUNWAY 3(L)-21(R)		RUNWAY 3R-21L	
	EXISTING	ULTIMATE	EXISTING	ULTIMATE
RUNWAY CATEGORY AIRCRAFT DESIGN GROUP	C-III	C-III	---	C-II
CRITICAL DESIGN AIRCRAFT	DASH 8 WESTWIND	BOEING BUSINESS JET	---	CHALLENGER
WINGSPAN OF DESIGN AIRCRAFT	90.0	117.1	---	64.3'
APPROACH SPEED OF DESIGN AIRCRAFT	125KTS	140KTS	---	125KTS
UNDER CARRIAGE WIDTH	32.8	18.9'	---	26.1
MAXIMUM TAKE OFF WEIGHT	41,100	150,000	---	10,200
RUNWAY BEARING (TRUE)	N41°10' 25.00" E	SAME	---	S41°10' 25.00" E
RUNWAY AZIMUTH	221.170	SAME	---	221.170
RUNWAY DIMENSIONS	6,999' x 150'	8,800' X 150'	---	7,000' X 100'
RUNWAY END ELEVATIONS (MSL) (NAVD 88)	7,013.9' 6,997.8'	7013.9' 6,985.0'	---	7,016.0' 6,993.0'
ELEVATION OF RWY TOUCH DOWN ZONE (MSL)	7,013.9' 7,003.1'	7,013.9' 7,003.9'	---	7,016.0' 7,002.8'
ELEVATION OF RUNWAY HIGH POINT (MSL)	7,013.9'	7,013.9'	---	7,016.0'
ELEVATION OF RUNWAY LOW POINT (MSL)	6,997.8'	6,985.1'	---	6,993.0'
WIND COVERAGE IN MPH	12-98.82%, 15-99.60%	SAME	---	12-98.82%, 15-99.60%
APPROACH VISIBILITY MINIMUMS	1 MILE 1/2 MILE	1/2 MILE 1/2 MILE	---	1 MILE 1 MILE
FAR PART 77 CATEGORY	NONPREC PRECISION	PRECISION PRECISION	---	NONPREC NONPREC
RUNWAY END MARKINGS	PRECISION PRECISION	PRECISION PRECISION	---	NONPREC NONPREC
RUNWAY APPROACH SURFACES	20:1 50:1	50:1 50:1	---	34:1 34:1
RUNWAY SAFETY AREA (RSA)	8,999' X 500'	10,800' X 500'	---	9,000' X 500'
RSA DISTANCE BEYOND EACH RUNWAY END	1,000' 1,000'	1,000' 1,000'	---	1,000' 1,000'
RUNWAY OBJECT FREE AREA (OFA)	8,999' X 800'	10,800' X 800'	---	9,000' X 800'
OFA DISTANCE BEYOND EACH RUNWAY END	1,000' 1,000'	1,000' 1,000'	---	1,000' 1,000'
RUNWAY OBSTACLE FREE ZONE (OFZ)	7,399' X 1,1,1	9,200' X 400'	---	7,100' X 400'
OFZ DISTANCE BEYOND EACH RUNWAY END	200' 200'	200' 200'	---	200' 200'
RUNWAY CL TO PARALLEL TAXIWAY CL	400'	SAME	---	300'
LINE OF SITE REQUIREMENT MET	YES	YES	---	YES
RUNWAY PAVEMENT MATERIAL	ASPHALT	SAME	---	ASPHALT
RUNWAY PAVEMENT SURFACE TREATMENT	PFC	PFC	---	PFC
PAVEMENT STRENGTH (in thousand lbs.)[1]	30(S)95(D) 130(DTW)	30(S) 150(D)	---	30(S) 60(D)
RUNWAY EFFECTIVE GRADIENT (in %)	0.2%	0.33%	---	0.33%
MAXIMUM GRADIENT (in %)	0.6%	0.7%	---	0.6%
RUNWAY LIGHTING	HIRL	HIRL	---	MIRL
TAXIWAY PAVEMENT MATERIAL	ASPHALT	ASPHALT	---	ASPHALT
TAXIWAY LIGHTING	MITL	MITL	---	MITL
TAXIWAY MARKING	CENTERLINE EDGE	CENTERLINE EDGE	---	CENTERLINE EDGE
TAXIWAY OBJECT FREE AREA WIDTH	131.1	SAME	---	110.1
TAXIWAY SAFETY AREA WIDTH	117.1	SAME	---	64.3
TAXIWAY WINGTIP CLEARANCE	33.5	SAME	---	22.9
DISTANCE from RWY CL to HOLDLINE	200	250	---	250
TAXIWAY CL to FIXED or MOVEABLE OBJECT	93.0	93.0	---	65.5
NAVIGATIONAL AIDS	ILS DME NDB DME VOR DME	SAT 1 GPS	---	GPS
VISUAL AIDS	VASI - 1	VASI - 1 MALSR (21) REIL - (3)	---	VASI - 1 REIL

[1]Pavement strengths are expressed in Single(S) Dual(D), Dual Tandem(DT) and or Double Dual Tandem(DDT) wheel loading capacities.

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots 12 MPH	13 Knots 15 MPH	16 Knots 18 MPH	20 Knots 23 MPH
Runway 3-21	98.82%	99.60%	99.91%	99.99%

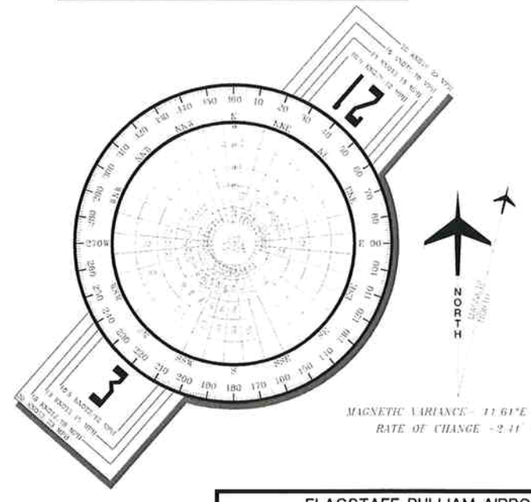


SOURCE:
NOAA National Climatic Center
Asheville North Carolina
Flagstaff Pulliam Airport
Flagstaff Arizona

OBSERVATIONS:
36,803 Hr Hourly Observations
3,072 Hr Observations
1993 - 2002

IFR WIND COVERAGE

Runways	10.5 Knots 12 MPH	13 Knots 15 MPH	16 Knots 18 MPH	20 Knots 23 MPH
Runway 3-21	99.04%	99.55%	99.88%	99.98%



MAGNETIC VARIANCE 11.61°E (2006)
RATE OF CHANGE -2.41' W

RUNWAY END COORDINATES NAD (83)

		EXISTING	ULTIMATE
RUNWAY 3L	Latitude	35°07' 52.190" N	SAME
	Longitude	111°40' 14.120" W	SAME
RUNWAY 21R	Latitude	35°08' 11.183" N	35°08' 57.891" N
	Longitude	111°39' 18.671" W	111°39' 33.894" W
RUNWAY 21R DISPLACEMENT	Latitude	---	35°08' 11.183" N
	Longitude	---	111°39' 18.671" W
RUNWAY 3R	Latitude	---	35°07' 17.809" N
	Longitude	---	111°40' 47.735" W
RUNWAY 21L	Latitude	---	35°08' 49.921" N
	Longitude	---	111°39' 42.410" W

AIRPORT DATA

FLAGSTAFF PULLIAM AIRPORT (FLG)

CITY FLAGSTAFF ARIZONA — COUNTY COCONINO
RANGE 7E — TOWNSHIP 20N — CIVIL TOWNSHIP Not Applicable

		EXISTING	ULTIMATE
AIRPORT CATEGORY		COMMERCIAL SERVICE	COMMERCIAL SERVICE
DESIGN AIRCRAFT		DASH 8 WESTWIND	BOEING BUS JET
AIRPORT REFERENCE CODE		C-III	C-III
AIRPORT ELEVATION (MSL)		7013.9'	SAME
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		86.1° F (JULY)	SAME
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	Latitude	35°08' 18.412" N	35°08' 20.140" N
	Longitude	111°40' 16.386" W	111°40' 09.619" W
AIRPORT and TERMINAL NAVIGATIONAL AIDS		ILS DME, VOR NDB GPS ROTATING BEACON LSOS	GPS ROTATING BEACON LSOS --- --- ---
GPS AT AIRPORT		YES	SAME

MAGNETIC VARIANCE 11.61°E (2006)
RATE OF CHANGE -2.41' W

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

AIRPORT DATA SHEET

FLAGSTAFF, ARIZONA

PLANNED BY Steven S. Benson P.E.
DETAILED BY Maggie Bowers
APPROVED BY James M. Harris P.E.
April 20, 2007 SHEET 1 OF 18

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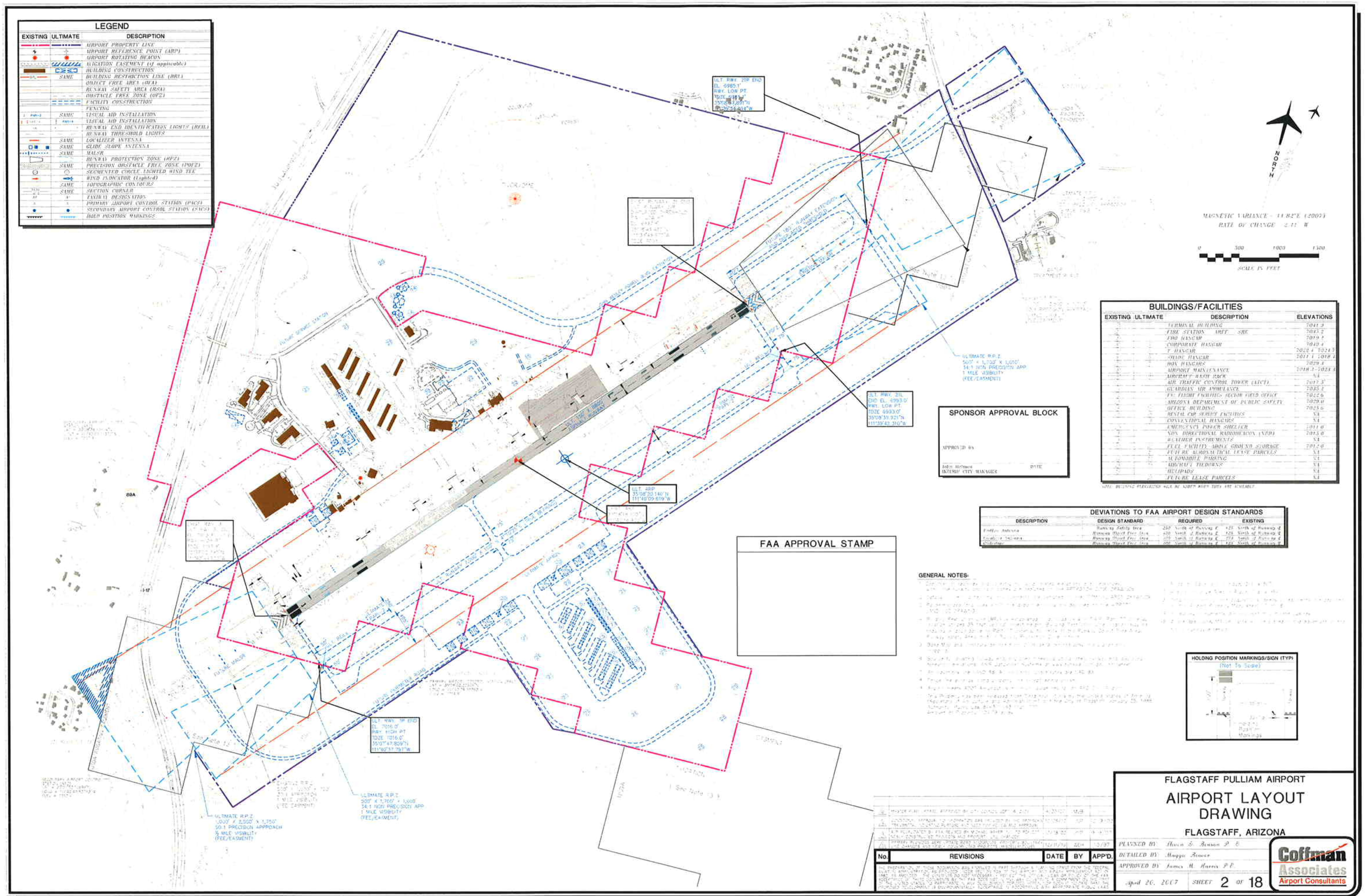
LEGEND
EXISTING
ULTIMATE
DESCRIPTION
BUILDINGS/FACILITIES
EXISTING
ULTIMATE
DESCRIPTION
ELEVATIONS
SPONSOR APPROVAL BLOCK
DEVIATIONS TO FAA AIRPORT DESIGN STANDARDS
DESCRIPTION
DESIGN STANDARD
REQUIRED
EXISTING
FAA APPROVAL STAMP
GENERAL NOTES:
HOLDING POSITION MARKINGS/SIGN (TYP)
(Not To Scale)
MAGNETIC VARIANCE
SCALE IN FEET
NORTH
ULT. RWY. 21R END
ULT. RWY. 21L
ULT. ARP
ULT. RWY. 3R END
ULTIMATE R.P.Z.
ULTIMATE R.P.Z.
REVISIONS
DATE
BY
APP'D.
FLAGSTAFF PULLIAM AIRPORT
AIRPORT LAYOUT
DRAWING
FLAGSTAFF, ARIZONA
PLANNED BY
DETAILED BY
APPROVED BY
April 26, 2007
SHEET 2 OF 18
Coffman
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Airport Consultants

NORTH

0 200 400
SCALE IN FEET

JOHN WESLEY POWELL BLVD. EXTENSION

FUTURE SERVICE STATION

BUILDINGS/FACILITIES

EXISTING	ULTIMATE	DESCRIPTION	ELEVATIONS
		TERMINAL BUILDING	7041.9'
		FIRE STATION ARFF SRE	7035.2'
		FBO HANGAR	7019.2'
		CORPORATE HANGAR	7010.4'
		T-HANGAR	7022.2 - 7024.2
		SHADE HANGAR	7011.4 - 7018.1
		BOX HANGARS	7029.3'
		AIRPORT MAINTENANCE	7018.3 - 7023.3
		AIRCRAFT WASH RACK	NA
		AIR TRAFFIC CONTROL TOWER (ATCT)	7017.5'
		GUARDIAN AIR AMBULANCE	7035.2'
		FAA FLIGHT FACILITIES SECTOR FIELD OFFICE	7022.6'
		ARIZONA DEPARTMENT OF PUBLIC SAFETY	7029.0'
		OFFICE BUILDING	7025.6
		RENTAL CAR SERVICE FACILITIES	NA
		CONVENTIONAL HANGARS	NA
		EMERGENCY POWER SHELTER	7011.0
		NON-DIRECTIONAL RADIOBEACON (NDB)	7015.0'
		WEATHER INSTRUMENTS	NA
		FUEL FACILITY-ABOVE GROUND STORAGE	7012.0
		FUTURE AERONAUTICAL LEASE PARCELS	NA
		AUTOMOBILE PARKING	NA
		AIRCRAFT TIEDOWNS	NA
		HELIPADS	NA
		FUTURE LEASE PARCELS	NA

NOTE: BUILDING ELEVATIONS WILL BE ADDED WHEN THEY ARE AVAILABLE

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING CONSTRUCTION
	SAME	BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		OBSTACLE FREE ZONE (OFZ)
		FACILITY CONSTRUCTION
		FENCING
PAPI-2	SAME	VISUAL AID INSTALLATION
PAPI-4	PAPI-4	VISUAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
	SAME	LOCALIZER ANTENNA
	SAME	GLIDE SLOPE ANTENNA
	SAME	MALSR
		RUNWAY PROTECTION ZONE (RPZ)
	SAME	PRECISION OBSTACLE FREE ZONE (POFZ)
		SEGMENTED CIRCLE LIGHTED WIND TEE
		WIND INDICATOR (Lighted)
	SAME	TOPOGRAPHIC CONTOURS
	SAME	SECTION CORNER
		TAXIWAY DESIGNATION
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)
		HOLD POSITION MARKINGS

No.	REVISIONS	DATE	BY	APP'D.

THE INFORMATION ON THIS DRAWING WAS PLANNED IN PART THROUGH A GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AND THE ARIZONA DEPARTMENT OF TRANSPORTATION, AERONAUTICS GROUP UNDER THE AIRPORT IMPROVEMENT PROGRAM. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA OR ADOT AND DO NOT CONSTITUTE A STANDARD, SPECIFICATION OR REGULATION. ACCEPTANCE OF THIS REPORT BY THE FAA OR ADOT DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES OR THE STATE OF ARIZONA TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED IN THE REPORT NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ELIGIBLE FOR FEDERAL OR STATE FUNDING.

FLAGSTAFF PULLIAM AIRPORT

NORTH/EAST TERMINAL AREA DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Kevin G. Benson P. E.
DETAILED BY: Maggie Benner
APPROVED BY: James M. Harris P.E.

April 20, 2007 SHEET 3 OF 18

Coffman Associates
Airport Consultants
www.coffmanassociates.com

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING CONSTRUCTION
	SAME	BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		OBSTACLE FREE ZONE (OFZ)
		FACILITY CONSTRUCTION
		FENCING
	SAME	VISUAL AID INSTALLATION
		VISUAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
	SAME	LOCALIZER ANTENNA
	SAME	GLIDE SLOPE ANTENNA
	SAME	MALSR
		RUNWAY PROTECTION ZONE (RPZ)
	SAME	PRECISION OBSTACLE FREE ZONE (POFZ)
		SEGMENTED CIRCLE LIGHTED WIND TEE
		WIND INDICATOR (Lighted)
	SAME	TOPOGRAPHIC CONTOURS
	SAME	SECTION CORNER
		FAIRWAY DESIGNATION
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)
		HOLD POSITION MARKINGS

NORTH

0 200 400
SCALE IN FEET

BUILDINGS/FACILITIES

EXISTING	ULTIMATE	DESCRIPTION	ELEVATIONS
		TERMINAL BUILDING	7041.9'
		FIRE STATION ARFF SRE	7035.2'
		FBO HANGAR	7019.2'
		CORPORATE HANGAR	7010.4'
		T-HANGAR	7022.1-7023.5'
		SHADE HANGAR	7011.4-7018.4'
		BOX HANGARS	7029.3'
		AIRPORT MAINTENANCE	7018.3-7023.3'
		AIRCRAFT WASH RACK	NA
		AIR TRAFFIC CONTROL TOWER (ATCT)	7017.8'
		GUARDIAN AIR AMBULANCE	7035.2'
		FAA FLIGHT FACILITIES SECTOR FIELD OFFICE	7022.0'
		ARIZONA DEPARTMENT OF PUBLIC SAFETY	7029.0'
		OFFICE BUILDING	7025.6'
		RENTAL CAR SERVICE FACILITIES	NA
		CONVENTIONAL HANGARS	NA
		EMERGENCY POWER SHELTER	7011.0'
		VOR-DIRECTIONAL RADIOBEACON (VDB)	7015.0'
		WEATHER INSTRUMENTS	NA
		FUEL FACILITY-ABOVE GROUND STORAGE	7012.0'
		FUTURE AERONAUTICAL LEASE PARCELS	NA
		AUTOMOBILE PARKING	NA
		AIRCRAFT TIEDOWNS	NA
		HELIPADS	NA
		FUTURE LEASE PARCELS	NA

NOTE: BUILDING ELEVATIONS WILL BE SHOWN WHEN THEY ARE AVAILABLE

No.	REVISIONS	DATE	BY	APP'D.

THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF TITLE 49 U.S.C. AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS DOES NOT IN ANY WAY OBLIGATE THE FAA TO FUND ANY PROJECTS OR TO APPROVE THEIR APPLICATION FOR AIRPORT DEVELOPMENT. IT IS ALSO UNDERSTOOD AND AGREED THAT THE PROVISIONS OF THIS GRANT AGREEMENT WILL REMAIN IN FORCE AND EFFECT FOR THE USEFUL LIFE OF ANY DEVELOPMENT PROJECT FUNDED HEREUNDER, AS DETERMINED BY THE SECRETARY OF TRANSPORTATION, BUT IN NO EVENT SHALL THE USEFUL LIFE BE LESS THAN TWENTY YEARS FROM THE DATE OF THIS GRANT AGREEMENT. THE FAA RESERVES THE RIGHT TO AMEND OR WITHDRAW THIS GRANT AGREEMENT AT ANY TIME PRIOR TO ITS ACCEPTANCE BY THE SPONSOR WHOSE ACTION SHALL BE TAKEN WITH APPROPRIATE PUBLIC NOTICE.

FLAGSTAFF PULLIAM AIRPORT

SOUTH/WEST TERMINAL AREA DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven S. Benson P.E.
DETAILED BY: Maggie Brewer
APPROVED BY: James M. Harris P.E.

April 20, 2007 SHEET 4 OF 18

Coffman Associates
Airport Consultants
www.coffmanassociates.com

OBSTRUCTION TABLE

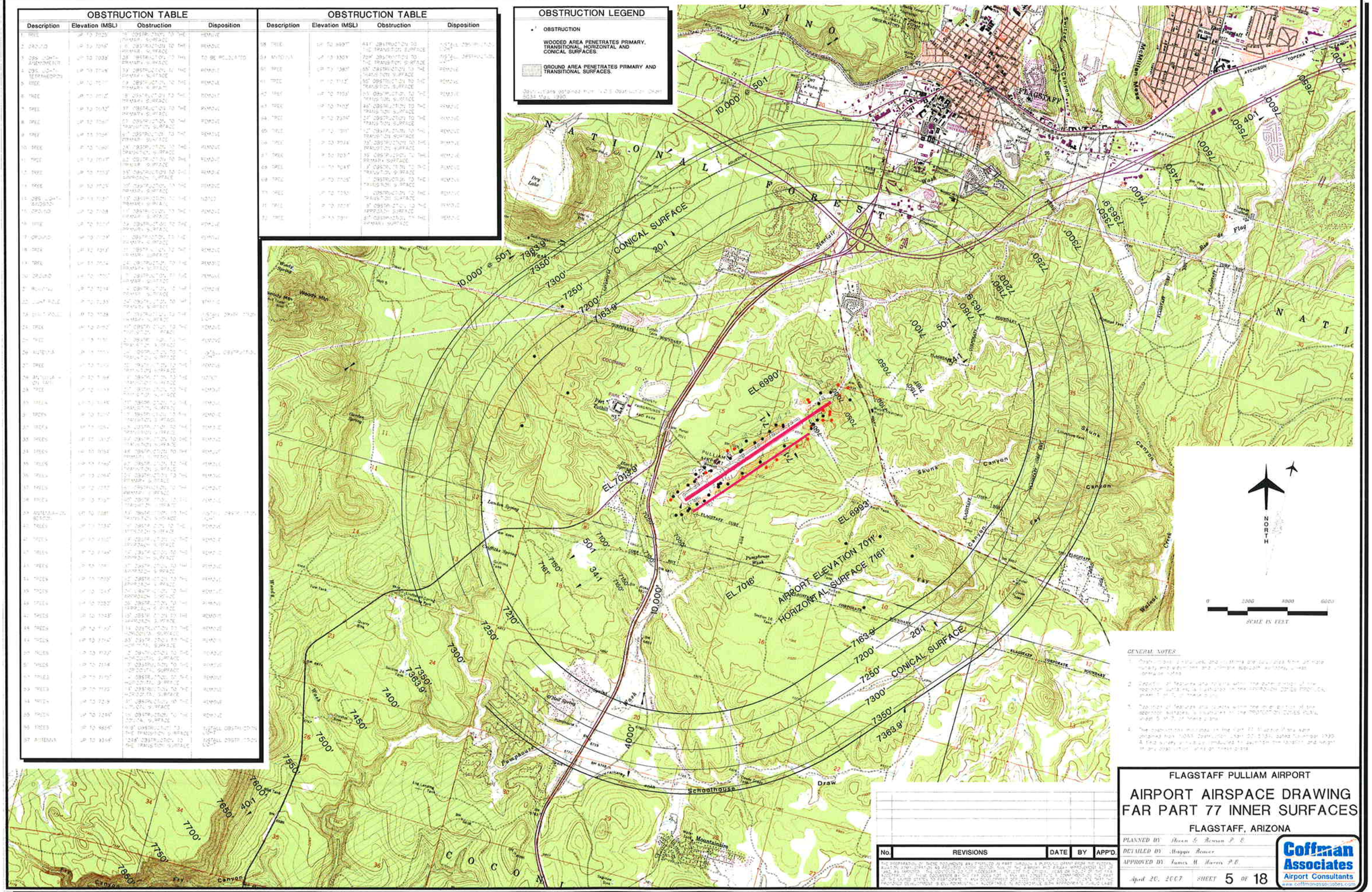
Description	Elevation (MSL)	Obstruction	Disposition
1 TREE	UP TO 7000'	0' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
2 GROUND	UP TO 7016'	0' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
3 OBS - NORTH ANEMOMETER	UP TO 7038'	38' OBSTRUCTION TO THE PRIMARY SURFACE	TO BE RELOCATED
4 OBS - NORTH TETRAHEDRON	UP TO 7016'	0' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
5 TREE	UP TO 7017'	1' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
6 TREE	UP TO 7019'	3' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
7 TREE	UP TO 7032'	16' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
8 TREE	UP TO 7034'	18' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
9 TREE	UP TO 7034'	18' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
10 TREE	UP TO 7035'	19' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
11 TREE	UP TO 7037'	21' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
12 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
13 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
14 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
15 OBS - LIGHT ANTENNA	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
16 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
17 GROUND	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
18 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
19 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
20 BUILDING	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
21 LIGHT POLE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
22 GROUND	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
23 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
24 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
25 BUILDING	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
26 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
27 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
28 ANTENNA	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
29 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
30 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
31 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
32 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
33 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
34 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
35 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
36 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
37 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
38 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
39 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
40 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
41 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
42 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
43 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
44 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
45 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
46 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
47 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
48 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
49 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
50 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
51 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
52 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
53 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
54 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
55 TREE	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
56 TREES	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
57 ANTENNA	UP TO 7038'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE

OBSTRUCTION TABLE

Description	Elevation (MSL)	Obstruction	Disposition
58 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	INSTALL OBSTRUCTION LIGHT
59 ANTENNA	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	INSTALL OBSTRUCTION LIGHT
60 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
61 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
62 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
63 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
64 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
65 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
66 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
67 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
68 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
69 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
70 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
71 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE
72 TREE	UP TO 7038'	22' OBSTRUCTION TO THE TRANSITIONAL SURFACE	REMOVE

OBSTRUCTION LEGEND

- OBSTRUCTION
- WOODED AREA PENETRATES PRIMARY, TRANSITIONAL, HORIZONTAL AND CONICAL SURFACES.
- GROUND AREA PENETRATES PRIMARY AND TRANSITIONAL SURFACES.



GENERAL NOTES

1. Contours, spot elevations, and culture are compiled from photogrammetric methods and field surveys and are shown in feet above mean sea level.
2. Obstructions are identified on aeronautical surveys to the accuracy specified in FAA Advisory Circular 150/5300-16, paragraph 5.a.(1).
3. Obstructions are identified on aeronautical surveys within the limits of the runway obstruction identification surface (OIS) as specified in FAA Advisory Circular 150/5300-16, paragraph 5.a.(2).
4. The coordinates and elevations shown on this drawing are based on the North American Datum of 1983 (NAD83) for horizontal values and the North American Vertical Datum of 1988 (NAVD88) for vertical values.

FLAGSTAFF PULLIAM AIRPORT

AIRPORT AIRSPACE DRAWING FAR PART 77 INNER SURFACES

FLAGSTAFF, ARIZONA

No.	REVISIONS	DATE	BY	APP'D

PLANNED BY: Steven G. Benson P.E.
DETAILED BY: Maggie Benner
APPROVED BY: James H. Harris P.E.
April 20, 2007
SHEET 5 OF 18

Coffman Associates
Airport Consultants
www.coffmanassociates.com

OBSTRUCTION TABLE

Description	Elevation (MSL)	Obstruction	Disposition
1 TREE	UP TO 7025'	15' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
2 GROUND	UP TO 7016'	6' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
3 OBS. LIGHT-ANEMOMETER	UP TO 7035'	25' OBSTRUCTION TO THE PRIMARY SURFACE	TO BE RELOCATED
4 OBS. LIGHT-TETRAHEDRON	UP TO 7040'	30' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
5 TREE	UP TO 7071'	61' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
6 TREE	UP TO 7012'	16' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
7 TREE	UP TO [illegible]	23' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
8 TREE	UP TO [illegible]	47' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
9 TREE	UP TO [illegible]	41' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
10 TREE	UP TO 7100'	78' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
11 TREE	UP TO 7041'	22' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
12 TREE	UP TO 7050'	19' OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
13 TREE	[illegible]	23' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
14 OBS. LIGHT-WINDSOCK	UP TO 7043'	33' OBSTRUCTION TO THE PRIMARY SURFACE	[illegible]
15 GROUND	UP TO 7000'	11' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
16 TREE	UP TO 7027'	20' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
17 GROUND	UP TO 7059'	11' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
18 TREE	UP TO 7048'	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
19 TREE	[illegible]	24' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
20 GROUND	UP TO 7002'	5' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
21 BUILDING	UP TO 7003'	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
22 LIGHT POLE	UP TO 7025'	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
23 LIGHT POLE	UP TO 7035'	17' OBSTRUCTION TO THE PRIMARY SURFACE	INSTALL OBSTRUCTION LIGHT
24 TREE	[illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
25 TREE	[illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
26 [illegible]	UP TO 7090'	50' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
27 TREE	[illegible]	58' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
28 ANTENNA - ON TANK	UP TO [illegible]	44' OBSTRUCTION TO THE TRANSITION SURFACE	[illegible]
29 TREE	[illegible]	15' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
30 TREES	[illegible]	27' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
31 TREES	UP TO 7055'	19' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
32 TREES	[illegible]	55' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
33 TREES	[illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
34 TREES	[illegible]	42' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
35 TREES	[illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
36 TREES	[illegible]	26' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
37 TREES	[illegible]	61' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
38 TREES	[illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
39 ANTENNA-ON BEACON	[illegible]	30' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
40 TREES	[illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
41 TREES	UP TO 7015'	23' OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
42 TREES	[illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
43 TREES	[illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
44 TREES	[illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
45 TREES	[illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
46 TREES	[illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
47 TREES	[illegible]	15' OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
48 TREES	UP TO 7192'	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
49 TREES	[illegible]	37' OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
50 TREES	[illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
51 TREES	[illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
52 TREES	[illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
53 TREES	[illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
54 TREES	UP TO 7218'	41' OBSTRUCTION TO THE CONICAL SURFACE	REMOVE
55 TREES	UP TO 7246'	[illegible] OBSTRUCTION TO THE CONICAL SURFACE	REMOVE
56 TREE	UP TO 8850'	915' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
57 ANTENNA	UP TO 9388'	1248' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT

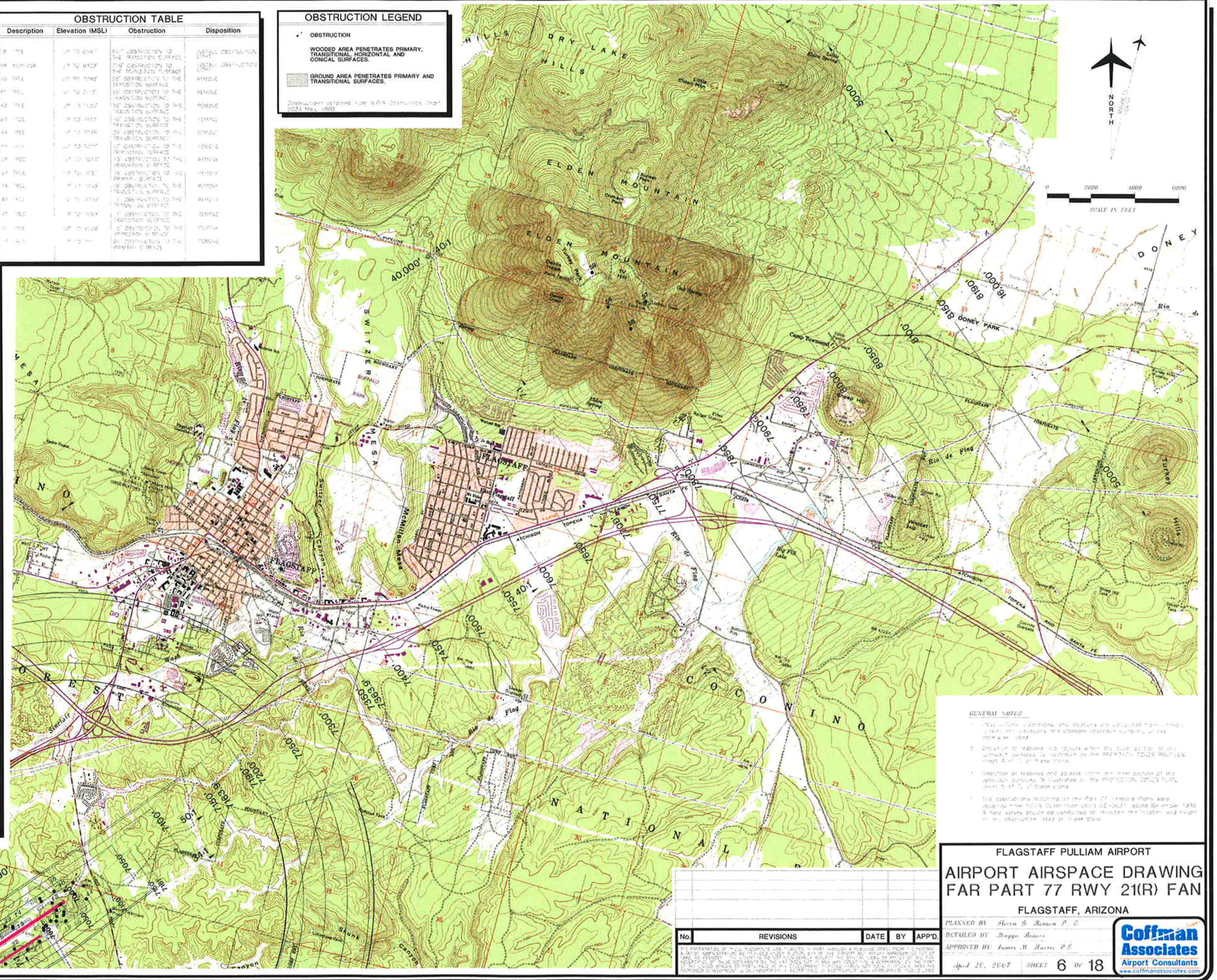
OBSTRUCTION TABLE

Description	Elevation (MSL)	Obstruction	Disposition
58 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
59 ANTENNA	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
60 TREE	UP TO [illegible]	56' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
61 TREE	UP TO [illegible]	55' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
62 TREE	UP TO [illegible]	56' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
63 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
64 TREE	UP TO [illegible]	24' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
65 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
66 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
67 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
68 TREE	UP TO [illegible]	19' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
69 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
70 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
71 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
[illegible] TREE	UP TO [illegible]	81' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE

OBSTRUCTION LEGEND

- OBSTRUCTION
- WOODED AREA PENETRATES PRIMARY, TRANSITIONAL, HORIZONTAL AND CONICAL SURFACES.
- GROUND AREA PENETRATES PRIMARY AND TRANSITIONAL SURFACES.

Obstructions compiled from N.O.S. Obstruction Chart 5034 May, 1990.



GENERAL NOTES

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]

No.	REVISIONS	DATE	BY	APP'D.

[illegible]

FLAGSTAFF PULLIAM AIRPORT

AIRPORT AIRSPACE DRAWING FAR PART 77 RWY 21(R) FAN

FLAGSTAFF, ARIZONA

PLANNED BY Steven G. Benson P.E.
DETAILED BY Maggie Beaver
APPROVED BY James M. Harris P.E.

April 20, 2007 — SHEET 6 OF 18

Coffman Associates
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www.coffmanassociates.com

OBSTRUCTION TABLE

Description	Elevation (MSL)	Obstruction	Disposition
1 TREE	UP TO 7015'	15' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
2 GROUND	UP TO 7016'	9' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
3 OBS LIGHT-ANEMOMETER	UP TO 7038'	15' OBSTRUCTION TO THE PRIMARY SURFACE	TO BE RELOCATED
4 OBS LIGHT-TETRAHEDRON	UP TO [illegible]	38' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
5 TREE	UP TO [illegible]	80' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
6 TREE	UP TO 7012'	16' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
7 TREE	UP TO [illegible]	27' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
8 TREE	UP TO [illegible]	17' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
9 TREE	UP TO 7056'	51' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
10 TREE	UP TO [illegible]	28' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
11 TREE	UP TO [illegible]	32' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
12 TREE	UP TO 7057'	55' OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
13 TREE	UP TO [illegible]	50' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
14 OBS LIGHT-WINDSOCK	UP TO [illegible]	32' OBSTRUCTION TO THE PRIMARY SURFACE	NOTED
15 GROUND	UP TO 7008'	10' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
16 TREE	UP TO [illegible]	29' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
17 GROUND	UP TO 7008'	11' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
18 TREE	UP TO [illegible]	21' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
19 TREE	UP TO [illegible]	24' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
20 GROUND	UP TO [illegible]	10' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
21 [illegible]	UP TO [illegible]	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
22 LIGHT POLE	UP TO [illegible]	24' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
23 LIGHT POLE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	INSTALL OBSTRUCTION LIGHT
24 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
25 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
26 ANTENNA	UP TO [illegible]	30' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
27 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
28 ANTENNA - [illegible]	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	NOTED
29 TREE	UP TO [illegible]	22' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
30 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
31 TREES	UP TO [illegible]	10' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
32 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
33 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
34 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
35 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
36 TREES	UP TO [illegible]	34' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
37 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
38 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
39 ANTENNA ON BEACON	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
40 TREES	UP TO [illegible]	26' OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
41 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
42 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
43 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
44 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
45 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
46 TREES	UP TO [illegible]	26' OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
47 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
48 TREES	UP TO [illegible]	34' OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
49 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
50 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
51 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
52 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
53 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE HORIZONTAL SURFACE	REMOVE
54 TREES	UP TO [illegible]	41' OBSTRUCTION TO THE CONICAL SURFACE	REMOVE
55 TREES	UP TO [illegible]	[illegible] OBSTRUCTION TO THE CONICAL SURFACE	REMOVE
56 TREES	UP TO 8956'	414' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
57 ANTENNA	UP TO 9188'	1246' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT

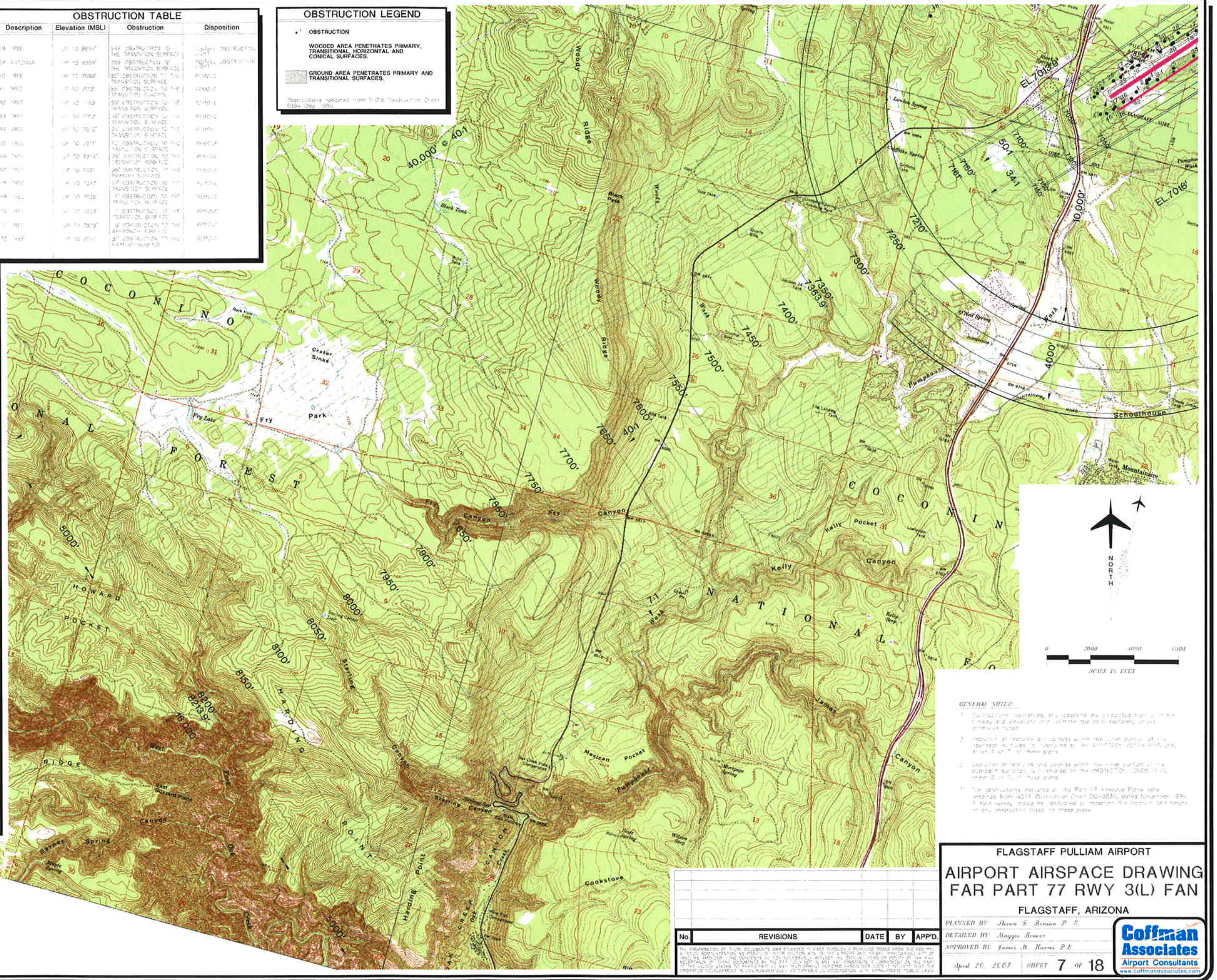
OBSTRUCTION TABLE

Description	Elevation (MSL)	Obstruction	Disposition
58 TREE	UP TO 8697'	547' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
59 ANTENNA	UP TO 9359'	759' OBSTRUCTION TO THE TRANSITION SURFACE	INSTALL OBSTRUCTION LIGHT
60 TREE	UP TO 7050'	50' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
61 TREE	UP TO 7112'	65' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
62 TREE	UP TO [illegible]	55' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
63 TREE	UP TO [illegible]	48' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
64 TREE	UP TO 7076'	24' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
65 TREE	UP TO [illegible]	12' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
66 TREE	UP TO [illegible]	75' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
67 TREE	UP TO [illegible]	38' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE
68 TREE	UP TO [illegible]	17' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
69 TREE	UP TO 7020'	1' OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
70 TREE	UP TO [illegible]	[illegible] OBSTRUCTION TO THE TRANSITION SURFACE	REMOVE
71 TREE	UP TO 7029'	0' OBSTRUCTION TO THE APPROACH SURFACE	REMOVE
72 TREE	UP TO [illegible]	31' OBSTRUCTION TO THE PRIMARY SURFACE	REMOVE

OBSTRUCTION LEGEND

- OBSTRUCTION
- WOODED AREA PENETRATES PRIMARY, TRANSITIONAL, HORIZONTAL AND CONICAL SURFACES.
- GROUND AREA PENETRATES PRIMARY AND TRANSITIONAL SURFACES.

Obstructions obtained from NOS Obstruction Chart 5034 [illegible] 1990.



GENERAL NOTES:

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

AIRPORT AIRSPACE DRAWING FAR PART 77 RWY 3(L) FAN

FLAGSTAFF, ARIZONA

PLANNED BY: Steven G. Benson P.E.
DETAILED BY: Maggie Bower
APPROVED BY: James M. Harris P.E.

April 20, 2007 — SHEET 7 OF 18

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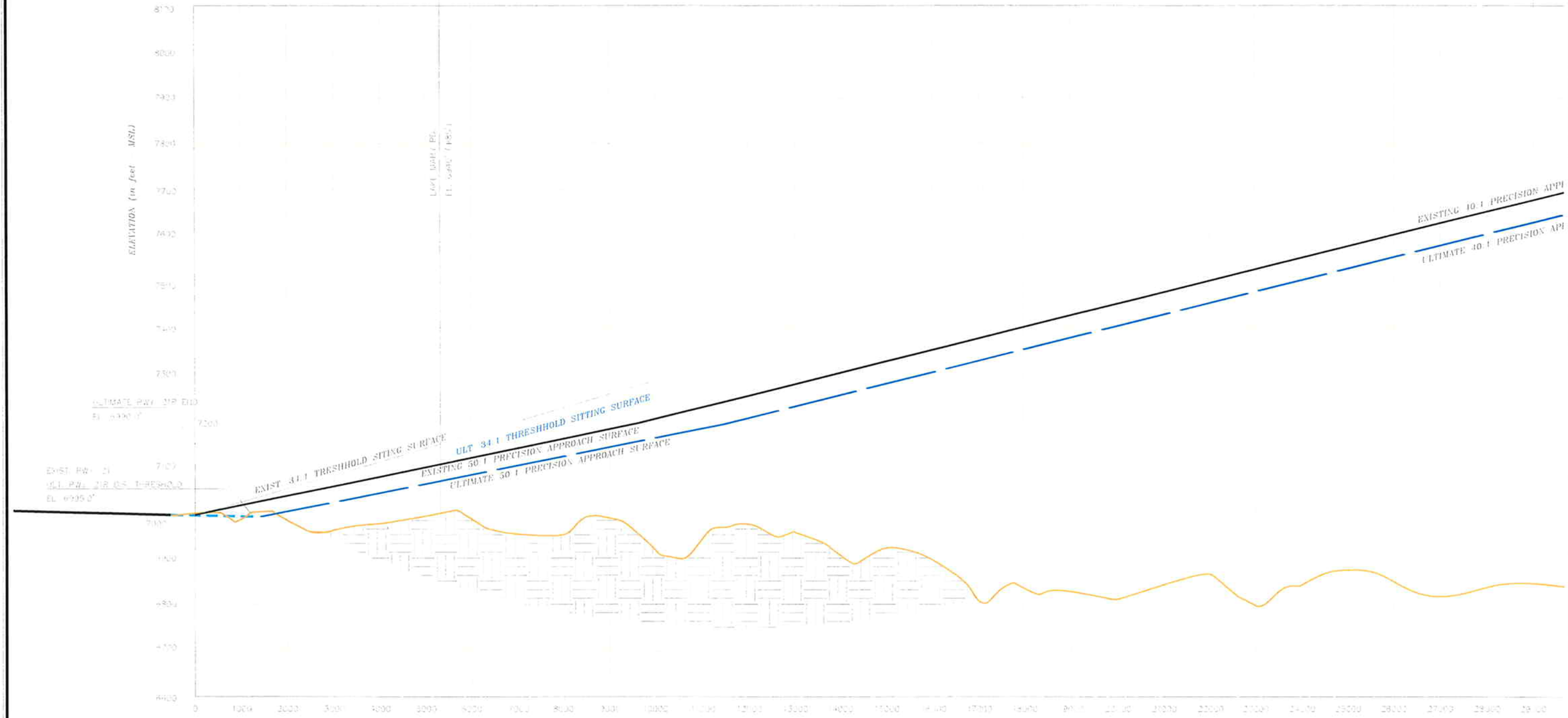
RUNWAY 21R OUTER APPROACH ZONE PROFILE



0 100 200 300

VERTICAL SCALE IN FEET

0 1000 2000 3000

HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

THE DRAWING OF THESE RUNWAYS WAS EVALUATED IN PART THROUGH A FAA AIRSPACE DRIVEN FROM THE FEDERAL AVIATION REGULATIONS PART 77 OBJECTS AFFECTING NAVIGABLE AIRSPACE. THE DRAWING ALSO SHOWS PROPERTY BOUNDARIES AND ALL OBSTRUCTIONS WITHIN THE AIRPORT AND WITHIN THE AREAS DEFINED BY THE FAR PART 77 CRITERIA. THE FAA DOES NOT REVIEW OR APPROVE THE PART OF THE DRAWING THAT DEPICTS THE PROPERTY BOUNDARIES AND NONAERONAUTICAL USES. THE LOCATION OF THE AIRPORT PROPERTY BOUNDARIES AND THE NONAERONAUTICAL USES ON THE PROPERTIES SHOWN ON THIS DRAWING IS UNDERSTOOD TO BE ACCEPTABLE TO AND COORDINATED WITH APPROPRIATE PUBLIC OFFICIALS.

FLAGSTAFF PULLIAM AIRPORT

RUNWAY 21(R) PRECISION (50:1) APPROACH SURFACE PROFILE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven S. Benson P. E.
DETAILED BY: Maggie Brewer
APPROVED BY: James H. Harper P.E.

April 20, 2007 SHEET 8 OF 18

Coffman Associates
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RUNWAY 21R OUTER APPROACH ZONE PROFILE

EXISTING 40:1 PRECISION APPROACH

ULTIMATE 40:1 PRECISION APPROACH SURFACE

EL. 8195'

EL. 8190'

ELEVATION (in Feet MSL)

DISTANCE (in feet)

NORTH

0 100 200 300

SCALE IN FEET

VERTICAL SCALE IN FEET

0 1000 2000 3000

SCALE IN FEET

HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

RUNWAY 21(R) PRECISION (40:1) APPROACH SURFACE PROFILE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven G. Benson P. E.

DETAILED BY: Maggie Bravee

APPROVED BY: James M. Harris P.E.

April 20, 2007 SHEET 9 OF 18

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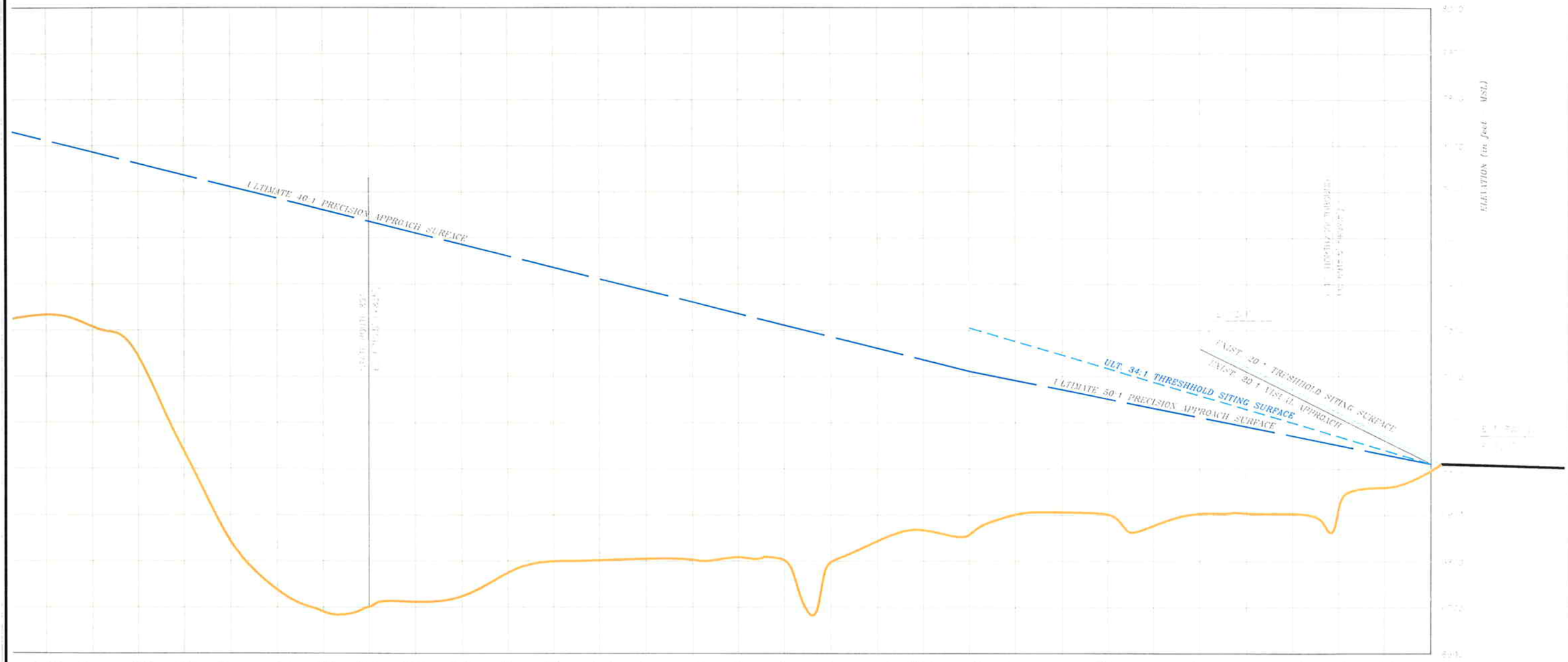
RUNWAY 3L OUTER APPROACH SURFACE PROFILE



NORTH

0 100 200 300
SCALE IN FEET
VERTICAL SCALE IN FEET

0 1000 2000 3000
SCALE IN FEET
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

RUNWAY 3(L) PRECISION (50:1) APPROACH SURFACE PROFILE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Heven G. Benson P.E.
DETAILED BY: Maggie Benson
APPROVED BY: James M. Havens, P.E.
April 26, 2007 SHEET 10 OF 18

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RUNWAY 3L OUTER APPROACH SURFACE PROFILE

ELEVATION (in feet - MSL)

ULTIMATE 40:1 PRECISION APPROACH SURFACE

NORTH

0 100 200 300
SCALE IN FEET
VERTICAL SCALE IN FEET

0 1000 2000 3000
SCALE IN FEET
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

RUNWAY 3(L) PRECISION (40:1) APPROACH SURFACE PROFILE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven S. Benson P.E.
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
April 20, 2007 SHEET 11 OF 18

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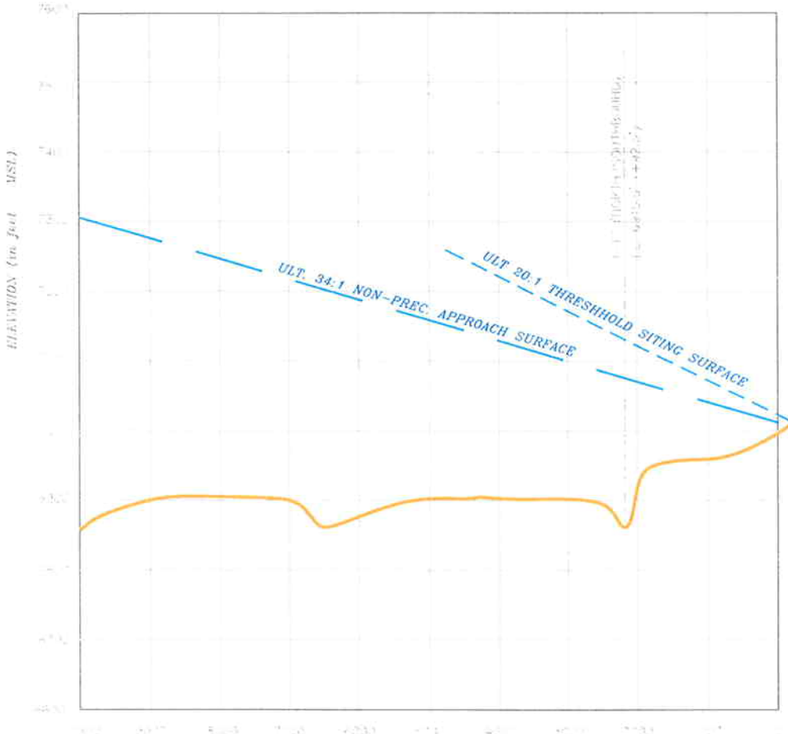
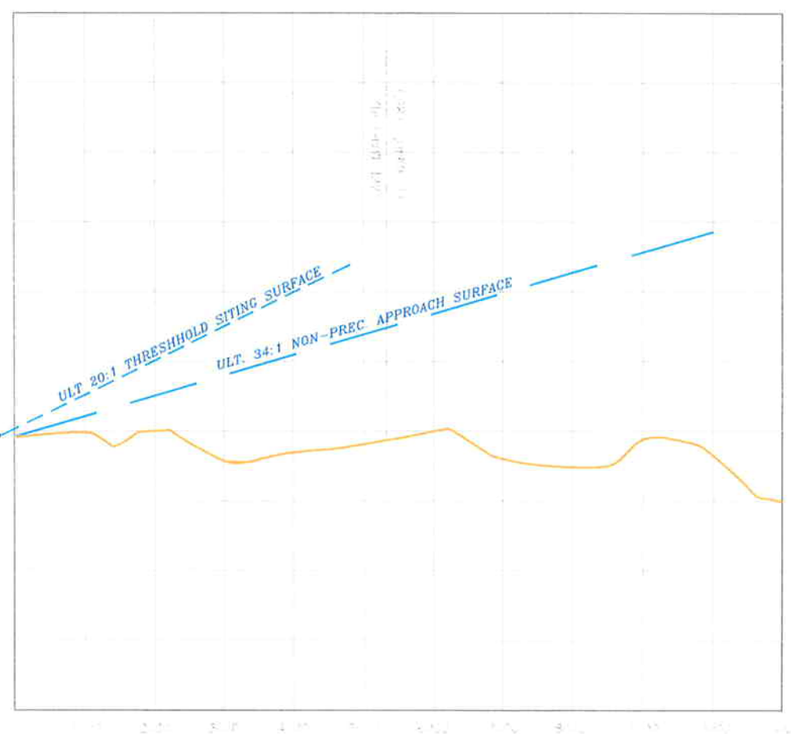
RUNWAY 3R OUTER APPROACH SURFACE PROFILE



RUNWAY 21L OUTER APPROACH ZONE PROFILE



DISTANCE (in feet)

NORTH

0 100 200 300

VERTICAL SCALE IN FEET

0 1000 2000 3000

HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

RUNWAY 3R-21L OUTER APPROACH SURFACE PROFILE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven G. Benson P.E.
DETAILED BY: Maggie Benner
APPROVED BY: James M. Hanes P.E.

April 26, 2007

SHEET 12 OF 18

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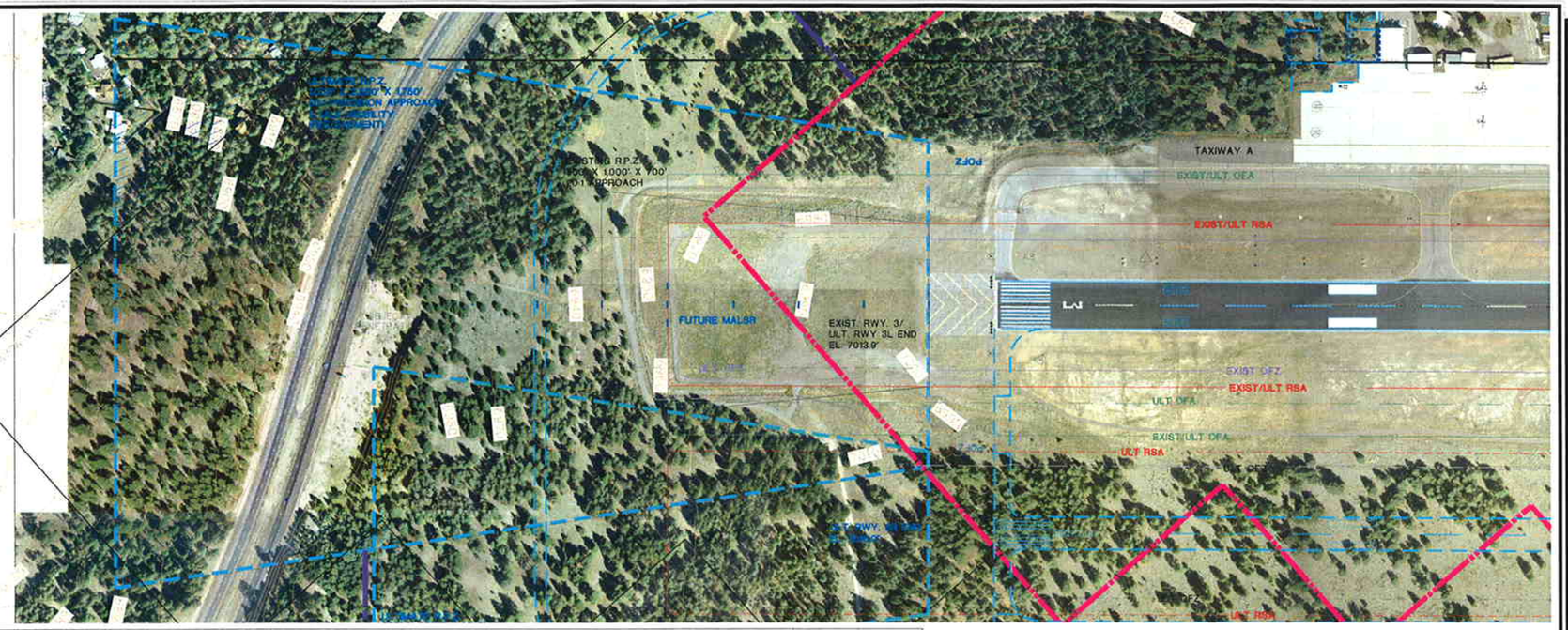
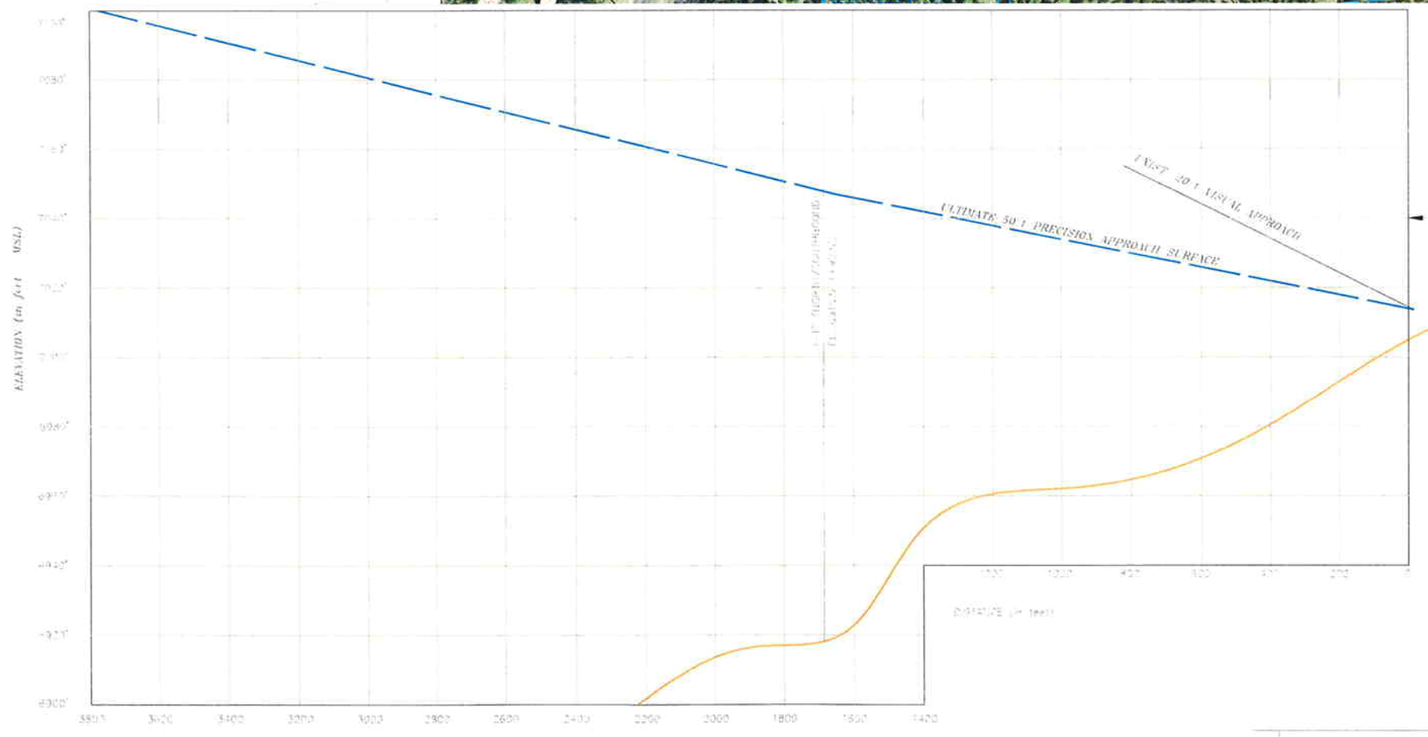


RUNWAY 3L



GENERAL NOTES:

1. Obstructions, clearances, and inclusions are calculated from Ultimate runway end elevations and ultimate precision surfaces, unless otherwise noted.
2. Distance for nose applications and surfaces subject to safety clearance of 50' for airport air carrier roads, 15' for nonrevenue roads, 15' for interstate roads, 21.5' for railroads.

OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
1. NONE	--	--	--	--	--

0 20 40
VERTICAL SCALE IN FEET

0 200 400
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

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FLAGSTAFF PULLIUM AIRPORT

INNER PORTION OF THE RUNWAY 3L APPROACH SURFACE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven Benson P.E.
DETAILED BY: Maggie Brauer
APPROVED BY: James M. Harris P.E.

April 20, 2007 SHEET 13 OF 18

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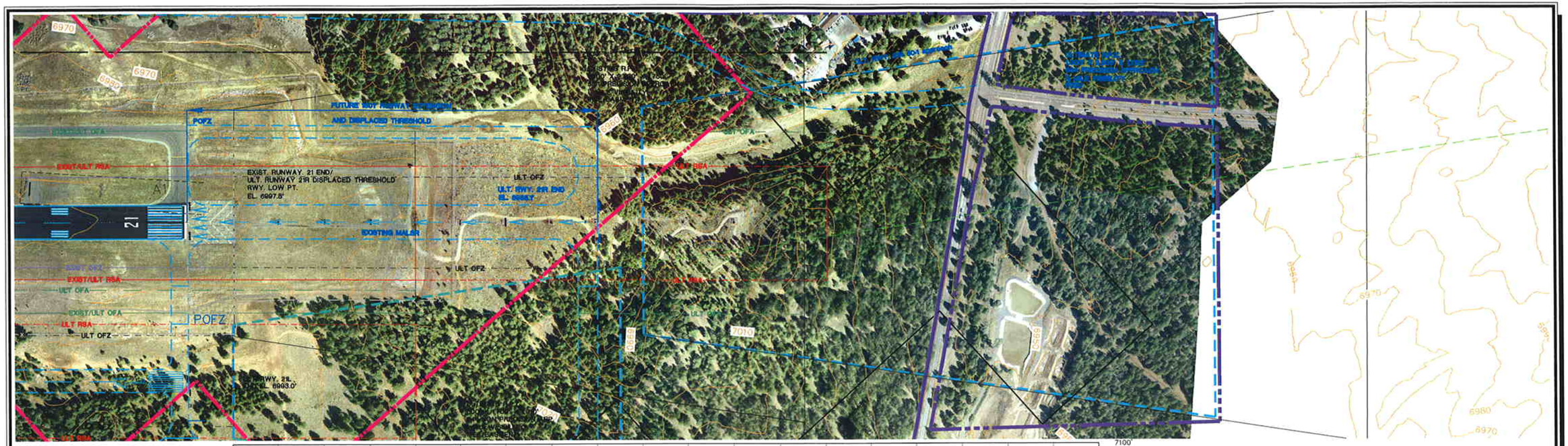

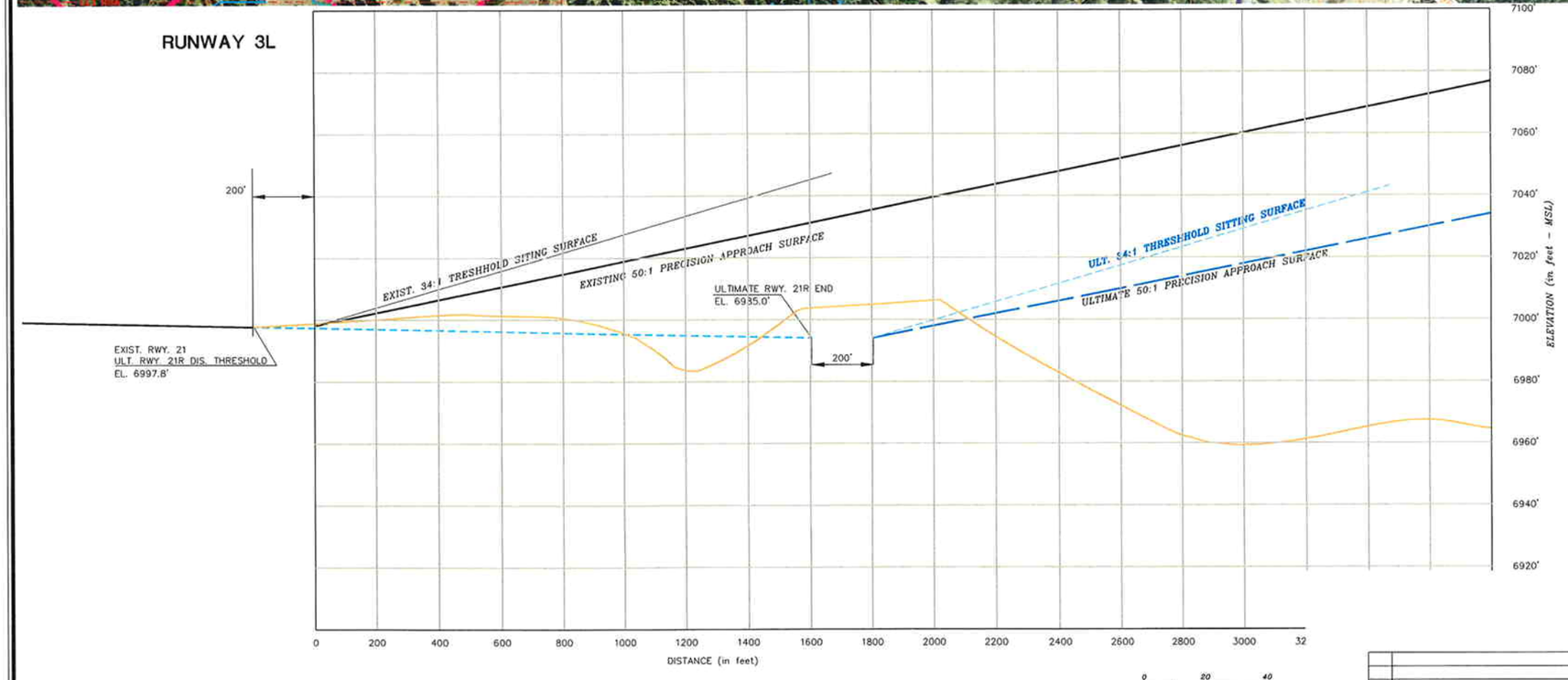

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway and elevations and ultimate approach surfaces, unless otherwise noted.
2. Distance for road obstructions and clearances reflect a safety clearance of 10' for airport service roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroads.

OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
1. NONE	--	--	--	--	-

0 20 40
VERTICAL SCALE IN FEET

0 200 400
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

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FLAGSTAFF PULLIUM AIRPORT

INNER PORTION OF THE RUNWAY 21R APPROACH SURFACE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven Benson P.E.
DETAILED BY: Maggie Brewer
APPROVED BY: James M. Harris P.E.
April 20, 2007
SHEET 14 OF 18

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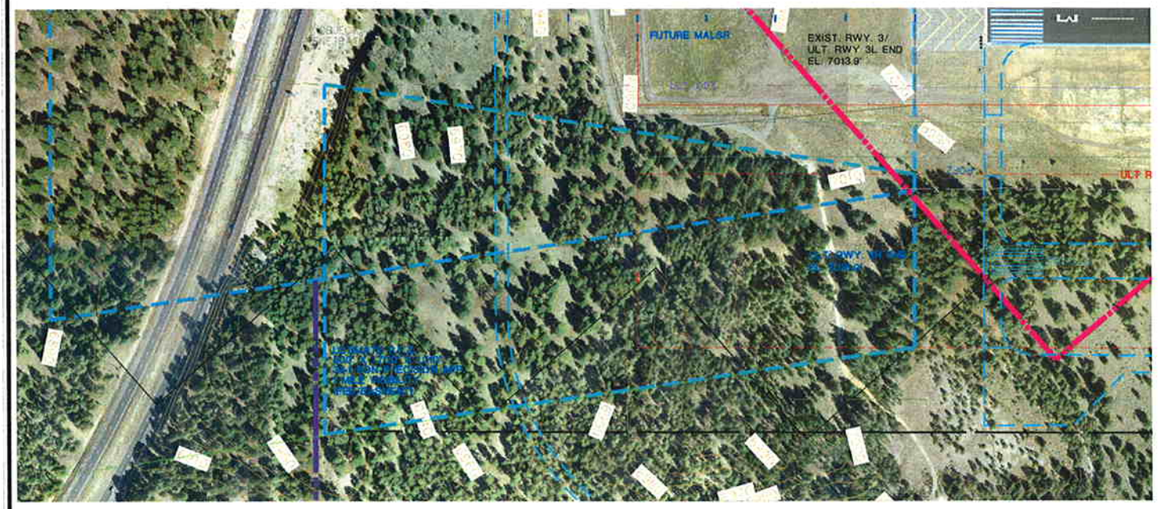
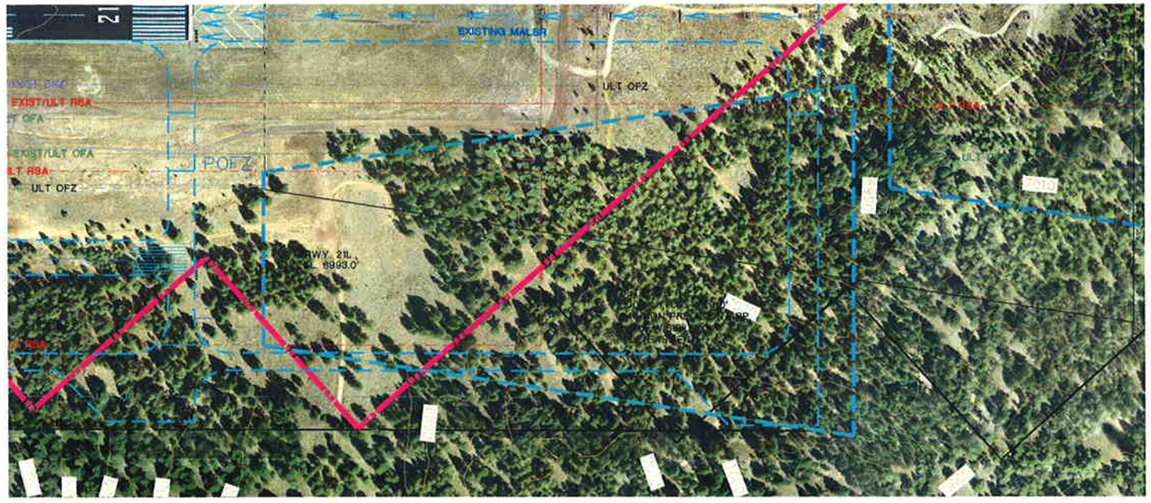
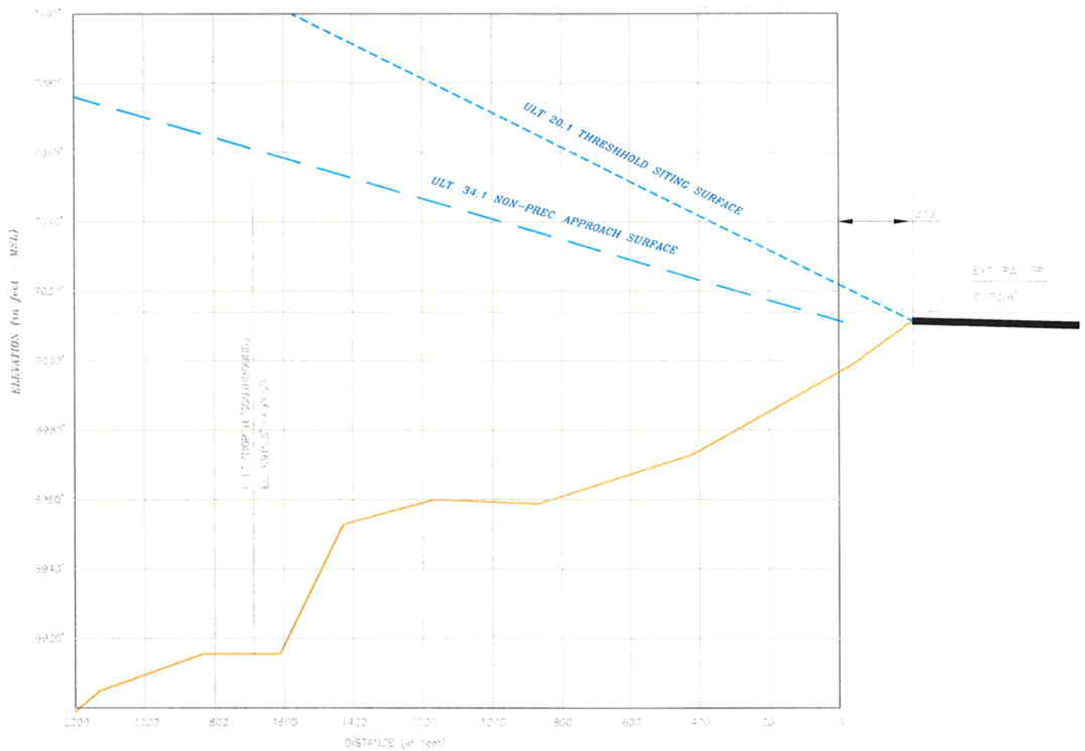
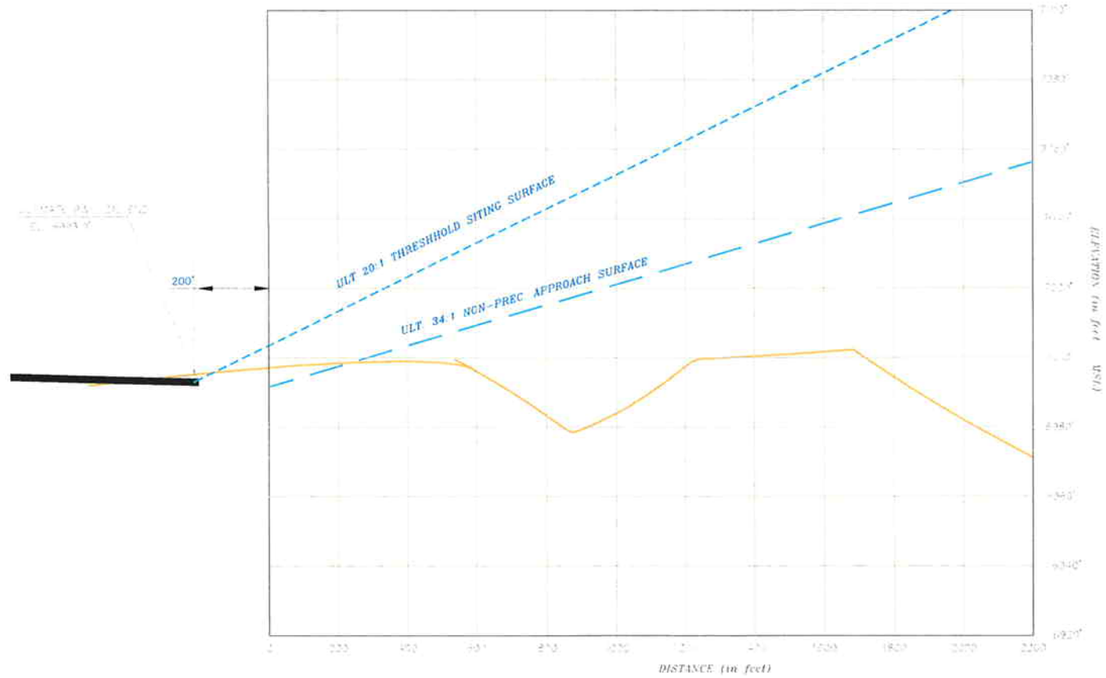


RUNWAY 3R



RUNWAY 21L





GENERAL NOTES:

1. [illegible]
2. [illegible]

OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
NONE					

0 20 40
VERTICAL SCALE IN FEET

0 200 400
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIUM AIRPORT

INNER PORTION OF THE RUNWAY 3R-21L APPROACH SURFACE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven Benson P.E.
DETAILED BY: Maggie Bonner
APPROVED BY: James M. Harris P.E.

April 26, 2007 SHEET 15 OF 18

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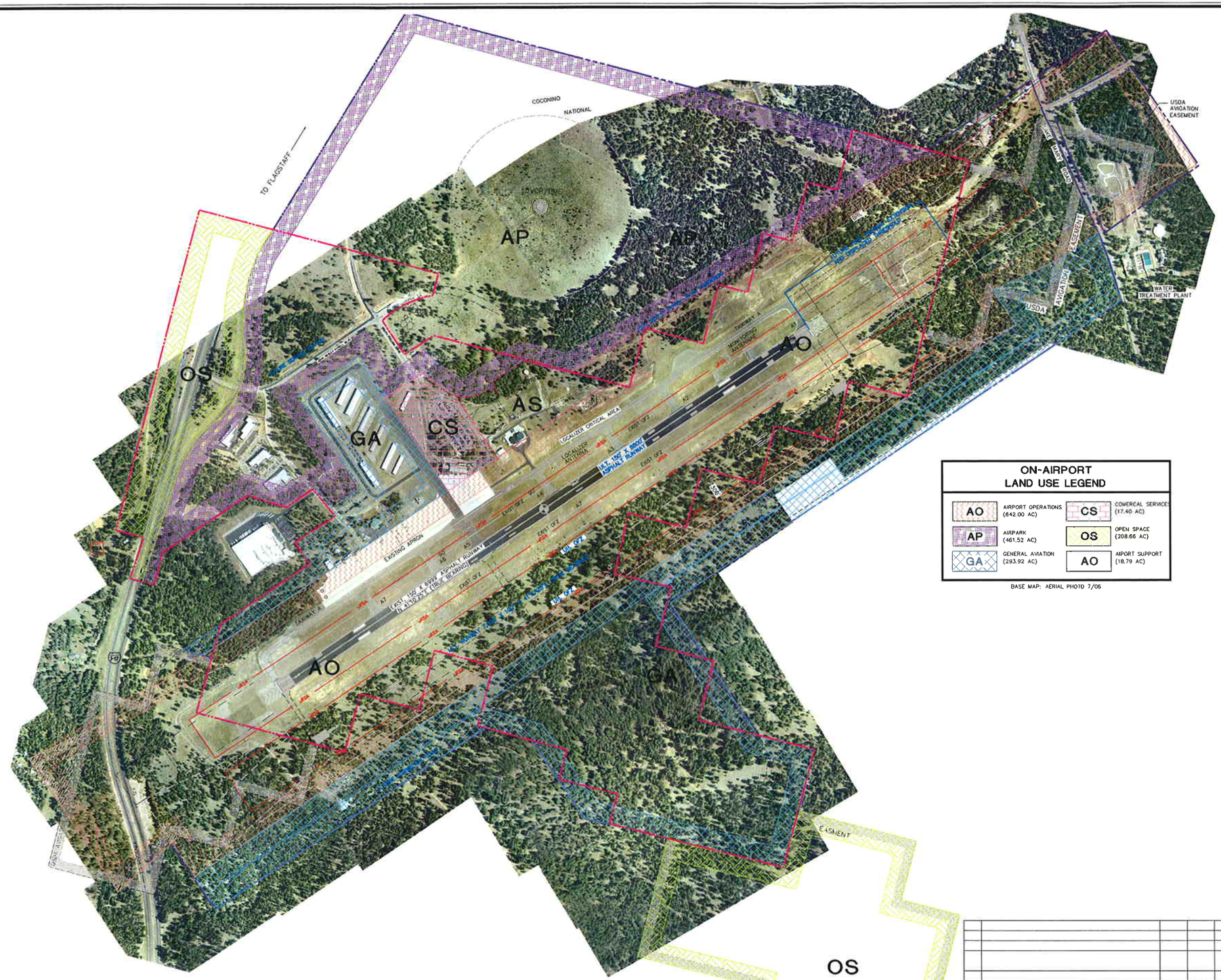

MAGNETIC VARIANCE– 11.82°E (2007)
RATE OF CHANGE –2.41' W

ON-AIRPORT LAND USE LEGEND

AO	AIRPORT OPERATIONS (642.00 AC)	CS	COMERCIAL SERVICES (17.40 AC)
AP	AIRPARK (461.52 AC)	OS	OPEN SPACE (208.66 AC)
GA	GENERAL AVIATION (293.92 AC)	AO	AIPORT SUPPORT (18.79 AC)

BASE MAP: AERIAL PHOTO 7/06

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING CONSTRUCTION
BRL		BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		OBSTACLE FREE ZONE (OFZ)
		FACILITY CONSTRUCTION
		FENCING
	PAPI-2	VISUAL AID INSTALLATION
	PAPI-4	VISUAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		LOCALIZER ANTENNA
		GLIDE SLOPE ANTENNA
		MALSR
		RUNWAY PROTECTION ZONE (RPZ)
		PRECISION OBSTACLE FREE ZONE (POFZ)
		SEGMENTED CIRCLE/LIGHTED WIND TEE
		WIND INDICATOR (Lighted)
	SAME	TOPOGRAPHIC CONTOURS
	SAME	SECTION CORNER
A7	A1	TAXIWAY DESIGNATION
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)
		HOLD POSITION MARKINGS

No.	REVISIONS	DATE	BY	APP'D.

THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

FLAGSTAFF PULLIAM AIRPORT

ON-AIRPORT LAND USE DRAWING

FLAGSTAFF, ARIZONA

PLANNED BY: Steven G. Benson P. E.
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.

April 20, 2007 SHEET 16 OF 18

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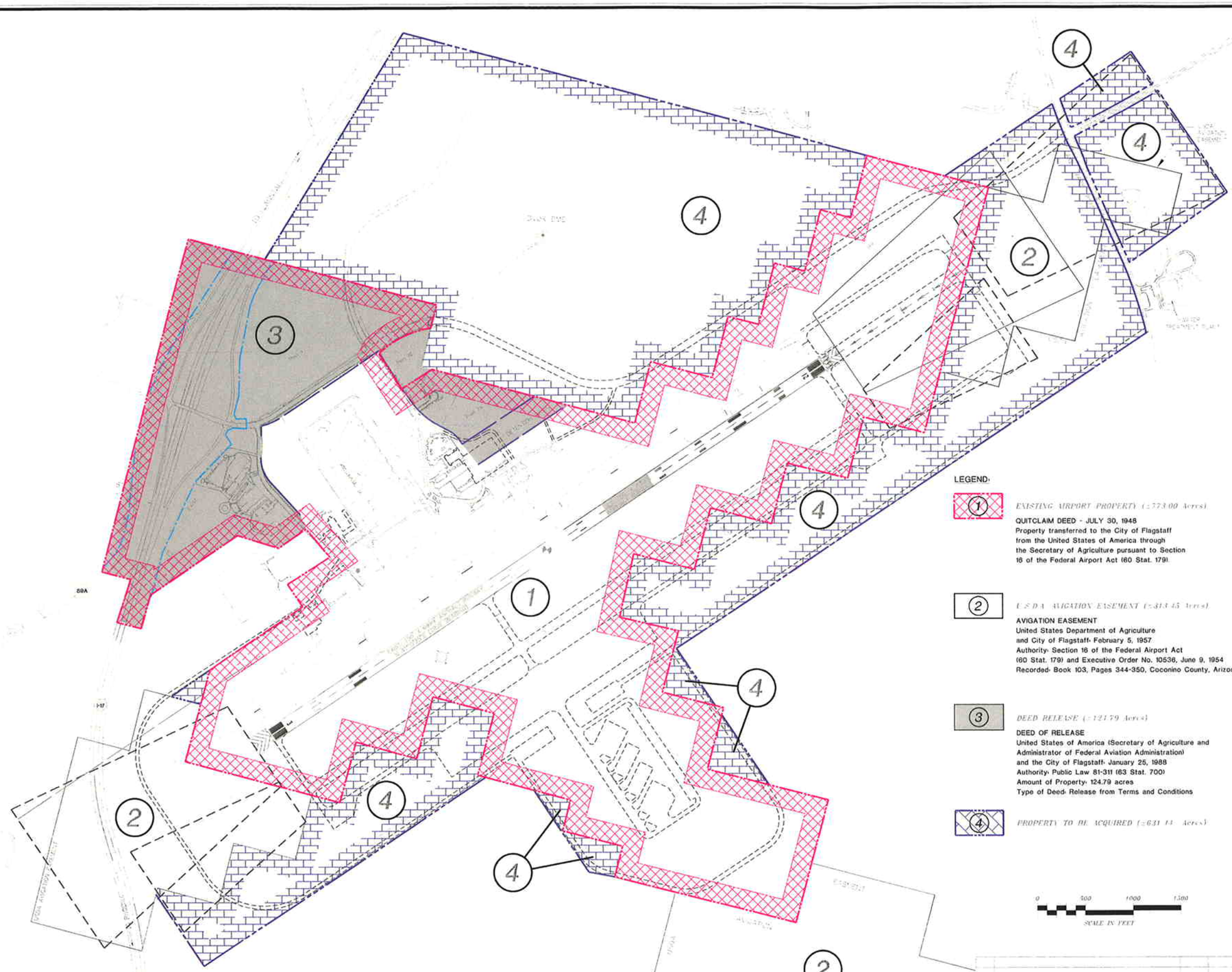

MAGNETIC VARIANCE 13.82°E (2007)
RATE OF CHANGE 0.11° W

LEGEND:

(1) *EXISTING AIRPORT PROPERTY (±773.00 Acres)*

QUITCLAIM DEED - JULY 30, 1948
Property transferred to the City of Flagstaff from the United States of America through the Secretary of Agriculture pursuant to Section 16 of the Federal Airport Act (60 Stat. 179).

(2) *U.S.D.A. AVIGATION EASEMENT (±313.45 Acres)*

AVIGATION EASEMENT
United States Department of Agriculture and City of Flagstaff- February 5, 1957
Authority- Section 16 of the Federal Airport Act (60 Stat. 179) and Executive Order No. 10536, June 9, 1954
Recorded- Book 103, Pages 344-350, Coconino County, Arizona

(3) *DEED RELEASE (±124.79 Acres)*

DEED OF RELEASE
United States of America (Secretary of Agriculture and Administrator of Federal Aviation Administration) and the City of Flagstaff- January 25, 1988
Authority- Public Law 81-311 (63 Stat. 700)
Amount of Property- 124.79 acres
Type of Deed- Release from Terms and Conditions

(4) *PROPERTY TO BE ACQUIRED (±631.11 Acres)*

LEGEND		
EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING CONSTRUCTION
	SAME	BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		OBSTACLE FREE ZONE (OFZ)
		FACILITY CONSTRUCTION
		FENCING
	SAME	VISUAL AID INSTALLATION
		VISUAL AID INSTALLATION
	SAME	RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
	SAME	LOCALIZER ANTENNA
	SAME	GLIDE SLOPE ANTENNA
	SAME	MALSR
		RUNWAY PROTECTION ZONE (RPZ)
	SAME	PRECISION OBSTACLE FREE ZONE (POFZ)
		SEGMENTED CIRCLE LIGHTED WIND TEE
		WIND INDICATOR (Lighted)
	SAME	TOPOGRAPHIC CONTOURS
	SAME	SECTION CORNER
		TAXIWAY DESIGNATION
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)
		HOLD POSITION MARKINGS

0 500 1000 1500
SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

"EXHIBIT A"
PROPERTY MAP

FLAGSTAFF, ARIZONA

PLANNED BY: Steven G. Benson P.E.
DETAILED BY: Maggie Reaves
APPROVED BY: James M. Harris P.E.

April 26, 2007 SHEET 17 OF 18

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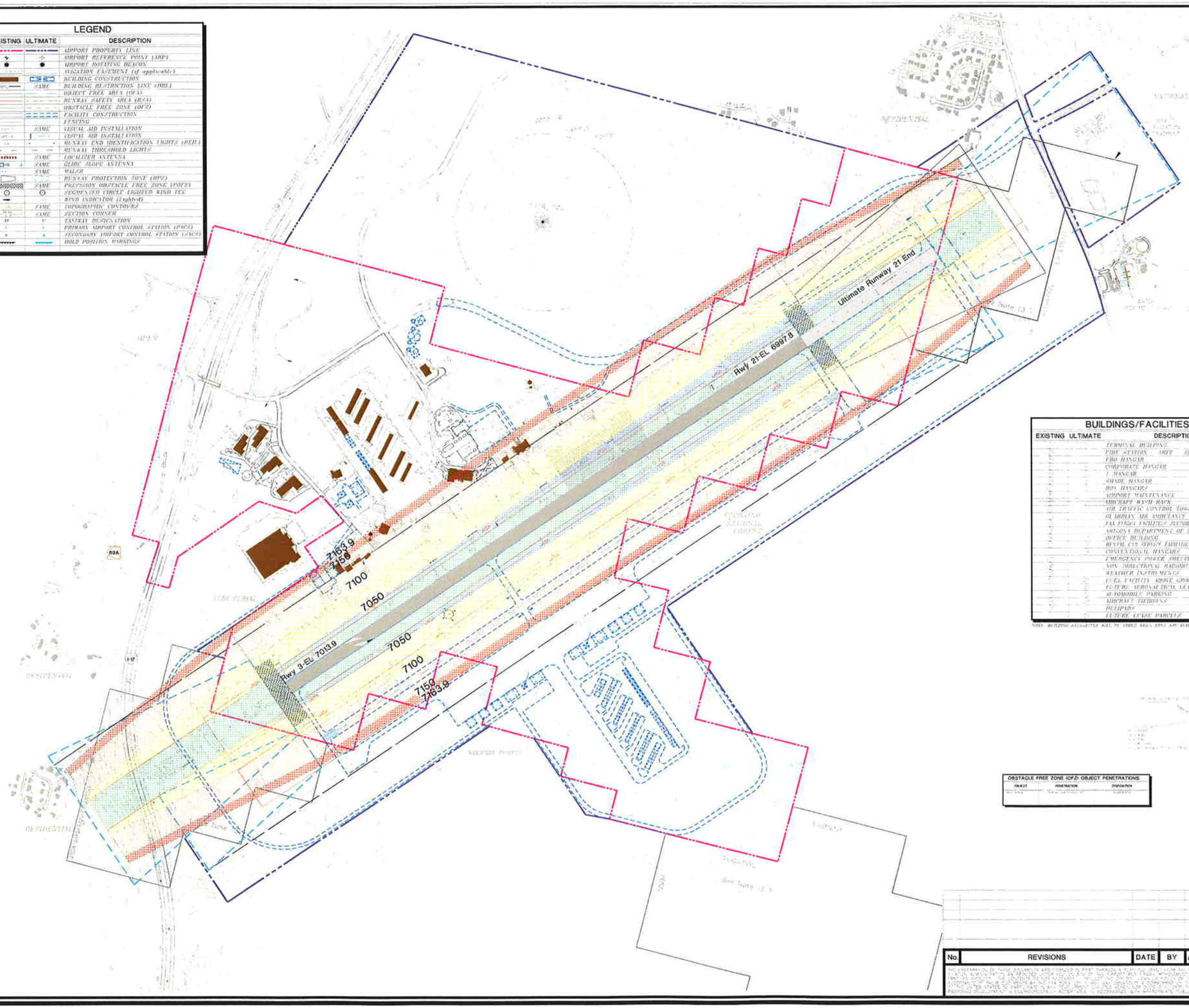
LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (of applicable)
		BUILDING CONSTRUCTION
BRL	SAME	BUILDING RESTRICTION LINE (BRL)
		OBJECT FREE AREA (OFA)
		RUNWAY SAFETY AREA (RSA)
		OBSTACLE FREE ZONE (OFZ)
		FACILITY CONSTRUCTION
		FENCING
	SAME	VISUAL AID INSTALLATION
		VISUAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
	SAME	LOCALIZER ANTENNA
	SAME	GLIDE SLOPE ANTENNA
	SAME	MALSR
		RUNWAY PROTECTION ZONE (RPZ)
	SAME	PRECISION OBSTACLE FREE ZONE (POFZ)
		SEGMENTED CIRCLE LIGHTED WIND TEE
		WIND INDICATOR (Lighted)
	SAME	TOPOGRAPHIC CONTOURS
	SAME	SECTION CORNER
		TAXIWAY DESIGNATION
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)
		HOLD POSITION MARKINGS



NORTH

MAGNETIC VARIANCE 11.82°E (2007)
RATE OF CHANGE 0.11° W

0 500 1000 1500
SCALE IN FEET

BUILDINGS/FACILITIES

EXISTING	ULTIMATE	DESCRIPTION	ELEVATIONS
		TERMINAL BUILDING	7041.9
		FIRE STATION MRT SRE	7045.2
		FBO HANGAR	7039.2
		CORPORATE HANGAR	7040.4
		T HANGER	7024.4 - 7024.7
		SHADE HANGAR	7011.4 - 7016.4
		BOX HANGARS	7029.3
		AIRPORT MAINTENANCE	7018.3 - 7024.3
		AIRCRAFT WASH RACK	NA
		AIR TRAFFIC CONTROL TOWER (ATCT)	7071.5
		GUARDIAN MR AMBULANCE	7045.2
		FAA FLIGHT FACILITIES JUSTOR FIELD OFFICE	7022.6
		ARIZONA DEPARTMENT OF PUBLIC SAFETY	7039.0
		OFFICE BUILDING	7025.6
		RENTAL CAR SERVICE FACILITIES	NA
		CONVENTIONAL HANGARS	NA
		EMERGENCY POWER SHELTER	7041.0
		NON DIRECTIONAL RADIOBEACON (NDB)	7013.0
		WEATHER INSTRUMENTS	NA
		FUEL FACILITY ABOVE GROUND STORAGE	7052.0
		FUTURE AERONAUTICAL LEASE PARCELS	NA
		AUTOMOBILE PARKING	NA
		AIRCRAFT TIEDOWNS	NA
		HELIPADS	NA
		FUTURE LEASE PARCELS	NA

ONLY BUILDING ELEVATIONS NEEDED WERE THOSE OF HOLDERS

OBSTACLE FREE ZONE (OFZ) OBJECT PENETRATIONS

OBJECT	PENETRATION	DISPOSITION

No.	REVISIONS	DATE	BY	APP'D.

FLAGSTAFF PULLIAM AIRPORT

INNER-APPROACH OFZ DRAWING
RUNWAY 3(L)-21(R)
Obstacle Free Zone

FLAGSTAFF, ARIZONA

PLANNED BY Steven S. Benson P.E.
DETAILED BY Maggie Reaver
APPROVED BY James M. Harris P.E.

April 26, 2007 SHEET 18 OF 18

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