



**Airport Master Plan Update**

## CHAPTER TWO AVIATION DEMAND FORECASTS

The demand for aviation services has, historically, been closely related to the socio-economic character of its area of influence. As population and relative income grow there generally is a corresponding growth in the demand for aviation services. This section of the Airport Master Plan Update presents a summary of the estimated future levels of activity at the Rapid City Regional Airport.

### 2.1 Purpose

Aviation demand forecasts serve four purposes in development of the master plan update. Specifically, they provide the basis for:

- \* Determining the necessary capacity of the airfield, passenger terminal, general aviation area, and ground access system serving the airport;
- \* Determining the airport's role, and resulting size, and type of existing facility expansion or new construction;
- \* Estimating the potential environmental effects, such as noise and air pollution, on the surrounding community from the airport's operation;
- \* Evaluating the financial feasibility of alternative airport development proposals.

### 2.2 Approach

The development of aviation demand forecasts are conducted in two distinct phases: the analytical, followed by the judgmental. In general, past aviation activity data are examined in anticipation of identifying past trends that will give an indication of future activity. Trends in the local economy are factored into future activity levels, as well.

During the analytical process, the past trends of the aviation demand elements are extended into the future using a variety of techniques and incorporating a number of assumptions. Projections are developed by combining historical trends with various analytical procedures. After preparing a number of projections, the analyst is able to identify a range of growth within which the true trend will most likely fall.

The second phase of demand forecasting requires experienced professional judgment. The analyst examines various growth projections for each demand element, studies the character of the community and how it will influence the particular demand element, and then makes a determination as to the "preferred" forecast.

#### 2.2.1 Projection Methodology

The most reliable approach to estimating aviation demand is through the use of more than one analytical technique. Methodologies

usually considered for airport master planning include regression analysis, trend line analysis, economic growth indicators, and survey analysis.

### Regression Analysis

The forecasts of aviation demand (the dependent variable) are projected on the basis of one or more external indicators, the independent variables. Historical values for both variable types are analyzed to determine the relationship between the independent and dependent variables. This relationship may then be used to project the dependent variable with a forecast or projection of the independent variables.

In aviation forecasting, elements of aviation activity, such as passengers and based aircraft, are the dependent variables. Population, per capita income, economic factors, and other socioeconomic data are frequently used independent variables.

### Trend Line Analysis

Trend analysis is probably the simplest and most familiar forecasting technique and is one of the most widely used methods. Historical data is extended into the future, providing an estimate of the aviation demand element in future years.

A basic assumption of this trend analysis technique is that the historical levels for aviation demand will continue and exert a similar influence on future demand levels. As broad as this assumption may be, such a

projection method often does serve as a reliable benchmark against which other projections may be compared.

### Survey Analysis

Surveys can be developed that will provide an indication of present and future levels of aviation demand. Numerous survey types are available to the airport planner. For this study, personal interviews, mail-back questionnaires, and structured personal observation were used.

### Forecast Development

The analytical projections serve as a basis for developing aviation demand forecasts through the application of experienced, professional judgment.

Informed judgment is perhaps the most valuable factor in forecasting any aviation demand element. Many variables can be accounted for in the analysis and assigned the proper weight, as viewed by the forecaster. Such variables include: airline service in terms of frequency and aircraft fleet, changes in a community's competitive status, long-term demographic shifts, tourism, and environmental limitations.

## **2.3 Aviation Demand Elements**

Forecasts of aviation demand can be developed for numerous elements. In the case of airports such as Rapid City Regional Airport, the key demand elements are enplaned passengers, based aircraft, aircraft

operations, aircraft stage lengths, and aircraft types. Other important elements are derived from these basic indicators. For this study, forecasts were prepared for:

- \* Commercial Airline Activity:
  - Enplaned Passengers,
  - Aircraft Operations,
  - Fleet Mix,
  - Peaking Characteristics;
- \* General Aviation Activity;
  - Based Aircraft,
  - Aircraft Operations,
  - Fleet Mix
- \* Instrument Operations; (Annual Instrument Approaches - A.I.A.'s)
- \* Air Cargo Activity; and
- \* Operational Fleet Mix.

The demand forecasts will serve as the basis for determining aviation facility requirements and staged development throughout the forecast period.

#### 2.4 Commercial Airlines Forecasting Considerations

In 1995, there were eighty major commercial airlines in the US. Fifty-six (56) were all-passenger (operating with over 60 seats) and 24 were all-cargo carriers. In 1995, passenger and air cargo sectors have shown steady growth with domestic travel up 5.1 percent

and domestic cargo revenue ton miles up 9.0 percent.<sup>1</sup>

During and shortly after deregulation in 1979, Rapid City was only served by major air carriers which included United, Delta, Continental, and Northwest. However, along with many other South Dakota cities, Rapid City has seen a reduction of service by the major carries, including a reduction in the number of departure seats and nonstop destinations.<sup>2</sup> Currently, one major air carrier, Northwest, provides nonstop service to Minneapolis.

The decision to reduce service at Rapid City by the majors opened up the market to the regional carriers. However, due to the benefits of code sharing agreements, the majors did not see a significant reduction in the amount of passengers flying their airlines. Regardless of the changes in service over the years, Rapid City has maintained very good air transit for a community less than 100,000 in population.

In the past ten years the regional airline sector has shown continued strong growth. If the FAA forecasts hold true, enplanements on regional carriers could total 115.1 million by 2007, up from approximately 58.4 million in 1995.<sup>1</sup> Regional/commuters accounted for 56 percent of departures at small commercial service airports in 1994, up from 29 percent from 1978.<sup>1</sup>

Regional air carriers are also anticipated to expand globally in the twenty years. Within twenty years Deutsche Aerospace Airbus (DASA) predicts the need for 6,000 commuter

aircraft world-wide to satisfy demand for regional air carriers. North America could account for up to 45 percent of the market for commuter aircraft.<sup>3</sup> Rapid City is served by two regional air carriers (United Express and SkyWest) with nonstop service currently to Denver, Salt Lake City, and Sioux Falls.

## 2.5 Commercial Airline Forecasts

It is against this back drop and with this information that the forecasts of air carrier aviation activity for Rapid City Regional Airport were prepared. The remainder of this section will be devoted to the discussion of forecast activity through 2017.

### 2.5.1 Passenger Enplanement Forecast Models

#### Regression Analysis

A number of alternative regression analyses were performed. From past experience, population and adjusted per capita income (independent variables), have shown a strong correlation to the increases in passenger enplanements (dependant variable).

One regression analysis which was performed related population and adjusted per capita income. The regression of the independent variables takes account of historic patterns. The regression created a new level of growth with a steady trend in the future. The regression yielded an R-squared co-efficient of 71.62 meaning the regression explained 71.62 percent of the dependant variables movement. As a regression approaches 100 percent level,

the more reliable the prediction can be considered. A correlation factor of 80 percent or better is considered good.

#### Trend Line

The first trend line analysis was performed based on historic passenger enplanements and developed from 1978 to present activity. The trend line model identifies the historical growth of passenger enplanements over the selected time frame and projects this same rate of increase into the future. The trend line had a correlation factor of 95 percent. The model yielded a year 2017 enplanement level of 251,268. Since a strong trend has been established between the historic and progressing years, this projection can be considered valid. Therefore, the trend line can be applied as a reliable predictor for passenger enplanements at Rapid City Regional Airport.

#### National Growth Rate

Each year the FAA prepares forecasts of aviation activity in the United States. The FAA annual growth rates for passenger enplanements are forecast to grow annually at 3.7 percent for domestic travel on the major carriers and 5.0 percent on regional carriers.<sup>1</sup> These rates are expected to continue for the next 12 years. The rate for regional carriers was reduced when the regionals reached a load factor of 70 percent. At this level the major carriers could initiate additional service. The adjustment year is assumed to be 2002. The regionals at Rapid City are expected to grow at 5.0 percent until 2002, and then flatten out while the major carriers are expected to

remain stable prior to 2002, and then grow at 3.7 percent annually.

Survey Analysis - Rapid City Regional Airport

In the fall of 1996, 400 surveys were distributed to businesses, pilots and potential airport users in the Rapid City area to provide an indication of current airport usage and to provide input as to user satisfaction and needed improvements. The survey indicated a strong preference for jet service and the need for lower air fares. However, frequency of the arrivals/departures was also indicated as a priority among many returned surveys.

Overall, users of the airport are satisfied with the facilities and services available. Top destinations from Rapid City (other than nonstop service cities) include Chicago, Dallas, Boise, Fargo, Billings, California, and Florida locations.

"Preferred" Passenger Enplanement Forecast

Table 2-1 provides a summary of the various statistical forecast models for passenger enplanements at the Rapid City Regional Airport. The models provide a long-term range of activity levels from 251,268 to a high of 306,319 by the year 2017. Potential enplanements associated with the proposed Deadwood Resort have been added to the "preferred" and high range forecast totals.

Based on the socio-economic conditions in the Rapid City region, the "preferred" baseline forecast for enplanements is estimated to be the regression analysis of per capita income and county population growth. The steady growth patterns as exhibited in the population and per capita income data are reflective of the economy and local trends. These, in turn, can be used as a reliable predictor of future passenger enplanements. The regression analysis also is in the mid-range of the other statistical models; therefore, is justified by comparison as well.

**TABLE 2-1  
ANNUAL AIR PASSENGER ENPLANEMENT FORECAST  
Rapid City Regional Airport**

	Trend Line	FAA Trend	Regression	Deadwood Passenger Impacts	Range High	"Preferred" Forecast Regression + Deadwood
2002	202,770	194,591	212,025	25,000	227,025	227,025
2007	218,936	220,053	229,845	33,000	262,845	262,845
2012	235,102	257,956	245,150	41,000	298,956	286,150
2017	251,268	306,319	261,948	50,000	356,319	311,948

Source: Bucher, Willis & Ratliff Corporation, 1997

### Tourism Market Analysis

Rapid City competes with every major destination in the country for both leisure and convention business. The advantages of the region are significant, including excellent facilities, low cost, and an internationally recognized attraction in Mt. Rushmore. However, competition is increasing as new facilities are constructed throughout the region and alternatives present themselves for consumer leisure time activity. Travel time, convenience, and travel expense must also be factored into any market analysis.

These last factors appear to the consulting team to be the major constrictors of growth in both the leisure and meetings markets. Rapid City's distance from major population centers makes a significant increase in the leisure "drive" market unlikely, given the change in travel patterns for most leisure trips. Whereas even 10 years ago the family vacation consisted on one, big annual trip lasting nearly 10 days, today's vacationers tend to take three or four shorter "getaways." These normally consist of excursions to nearby regional destinations. Also, due to the airlines' desire to increase business during off-peak periods, attractive fares over weekends make almost any destination a viable consideration. Rapid City's air service structure prevents it from sharing in many of these "discount wars," thereby eliminating it from consideration as a "getaway" site.

For group leisure business, Mt. Rushmore continues to be one of the nation's top motor coach destinations. Nearly 3,000 buses - each

with a capacity of 47 people - arrive annually at the site. Those arrivals have held steady over the past few years, and interviews with tourism officials see little, if any, growth in this segment over the next five years. In fact, motorcoach tours hosting domestic customers appear to have declined, whereas the international market has increased in importance.

Travel time and costs affect the impact this segment has on the region as well. Due to the limited number of the total airline seats available into Rapid City being provided by commuter carriers, groups cannot realistically book group air service, meaning they must spend less time in the region in order to travel to another city with more jet service. Domestic and international tour operators interviewed for this study also cite "exorbitant" fares as a limiting factor for fly/drive programs to Rapid City.

As noted earlier, cost is now the number one factor in the selection of a destination by corporate and association meeting planners. When coupled with the limited number of airline seats available into the market, the relatively high cost of air fares during business travel times almost insures the number of national meetings and conventions will not increase and may, indeed, decline. In fact, American Express Travel Services expect air fares nationally to increase an additional 9-11% over the next 12 months, further eroding Rapid City's other competitive advantages.

Increased demand for the destination could certainly contribute to an airline's decision to

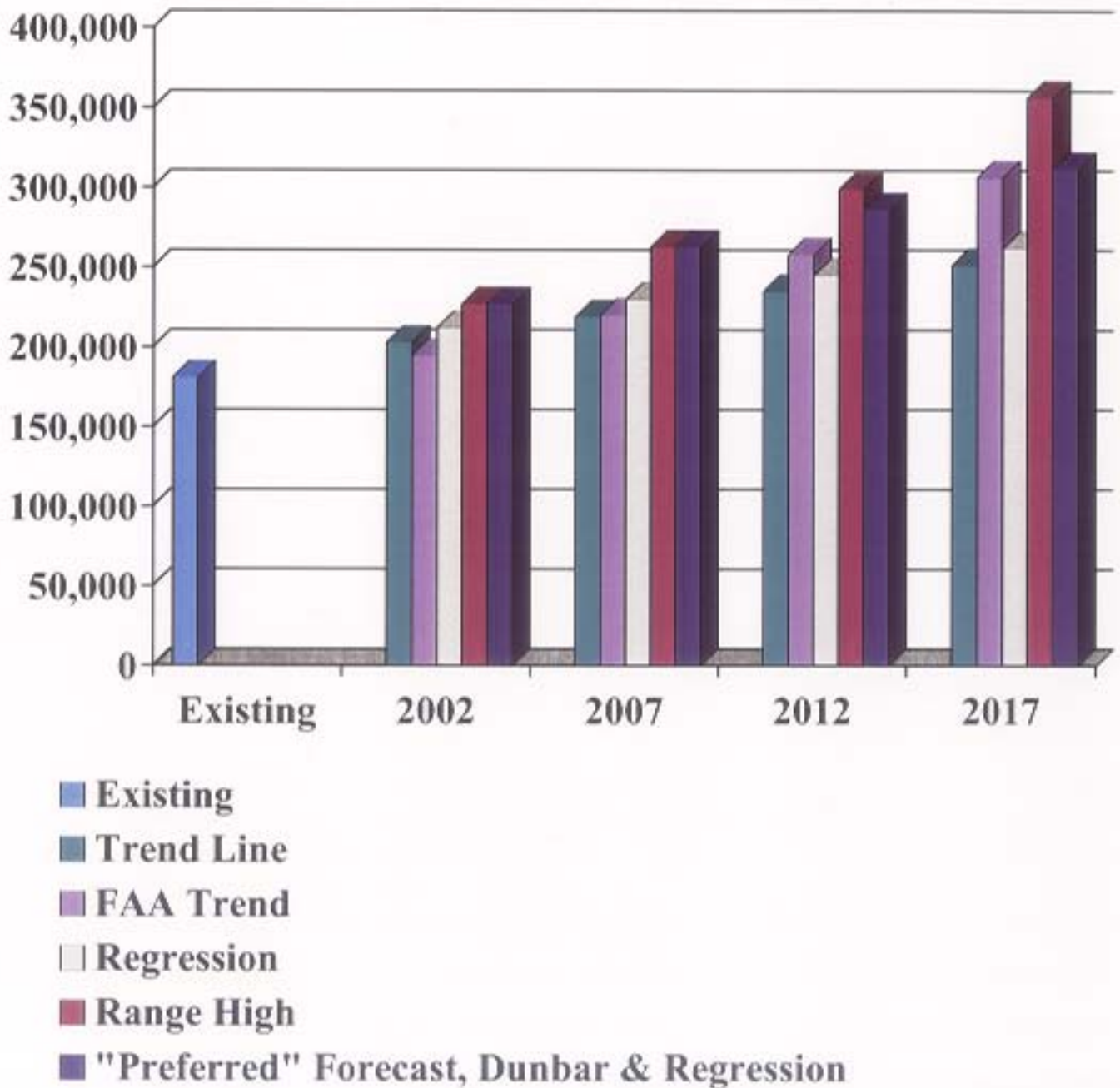


Figure 2.1



provide more seats into the market. As noted, representatives of development projects in Deadwood expect its unique appeal to bring an additional 100,000 convention delegates via air to Rapid City annually. Due to a variety of factors, the consultants believe this projection to be extremely optimistic.

Whereas these development projects may indeed host 100,000 convention guests annually, we believe that initially many of these meetings will be booked at the expense of convention hotels in Rapid City or Sioux Falls. Interviews with Deadwood developer representatives indicate that there are 30,000 room requests currently, primarily from regional groups.

These groups have made several assumptions on the future development of the marketplace which have yet to manifest themselves. In order to generate 100,000 passenger enplanements, they anticipate the construction of an additional 1,200-1,300 first-class rooms in the Deadwood area. Currently, only the 150 rooms slated for Phase I of The Gold Mine have been announced.

The developers' own projections of 60% annual occupancy, average length of stay of 2.2 days, and an average number of people per room at 1.7 persons for conventions, presents a somewhat different picture of the resort's impact on passenger levels.

Taken together, The Dunbar Resort and Phase I of The Gold Mine will provide a total of 471 rooms suitable for meetings and conventions. Given an average occupancy rate of 60%, and

a total of 1.7 persons per room, on any given day there will be 480 guests at the two facilities. With an average length of stay of 2.2 days, the total number of guests in any given year would be approximately 79,600. Based on the projection of 55% of their guests arriving by air, both properties would generate less than 44,000 passengers per year.

This projection is based on the assumption of new business, rather than a relocation of existing Rapid City meetings, which we have already indicated is to be the more likely case. Both The Dunbar and The Gold Mine have indicated that - based on season - occupancy will range between 30% and 70% attributable to leisure generated business. Since the current leisure consumer market is primarily a drive market, its impact on air passenger counts will be negligible without significant changes in the air service package available.

Taking the leisure component out of the air service projections, initial passenger impacts could range from a low of 13,000 to a high of 30,600. Factors which until recently would have given Deadwood a competitive advantage, such as casino gambling, have been largely offset by the proliferation of destinations offering a similar product. For example, over two-thirds of the states now have some sort of legalized casino gambling. As noted earlier, geographic location and the resultant weather conditions create significant competitive disadvantages.

These factors may be overcome by the history of the Black Hills, the trend to adventure tourism and ecotourism, the proximity to an

tourism and ecotourism, the proximity to an international attraction, and the unique appeal of Deadwood. These attributes taken together, and coupled with an intensive marketing effort, may allow The Dunbar/The Gold Mine duo to generate an additional 25,000 to 35,000 passengers by the year 2002 and possibly 50,000 passengers long-term. We believe only the addition of significant new jet service and drastically lower airfares would create new demand beyond that level.

### 2.5.2 Airline Operational Fleet

The Rapid City Regional Airport currently has a wide range in the types of commercial aircraft operating to and from the airport. The following text is a summary of the expected changes in the mix of commercial aircraft over the next ten years as these changes may relate to needs at Rapid City.

#### Air Carriers

Air carriers are purchasing new aircraft in increasing numbers according to U.S. and foreign manufacturers. Of these new purchases, 69 percent were for two-engine narrow body aircraft.<sup>1</sup> The new purchases can be attributed to the following reasons: the airlines are retiring many older planes (25 year life cycle is typical), profits have been steady, and stage 2 noise-rated aircraft need to be replaced prior to the year 2000 (34 percent of the current fleet are stage 2). The following information from the Air Transport Association (Table 2-2) shows the major carriers narrow body fleet that operate at or

have code sharing agreements at Rapid City Regional Airport.

#### Regional Carriers

In 1995, the "15 to 19 seats" category accounted for the largest portion of the regional airline fleet at 35 percent. However, the 15 to 19 seat group is expected to decline steadily through 2003. It is projected regional carriers will retire many aircraft in the "15 to 19 seats" in the next ten years which will reduce the overall fleet percent to 20.4 percent by 2007.

The increase in the regional airline fleet will be in the "20 to 40 seats" and "greater than 40 seats" categories because of the escalation of service and new route opportunities created by other uses of larger, longer range aircraft. In 1995, the "20 to 40 seats" category accounted for 29.4 percent of the fleet, while the "greater than 40 seats" accounted for 9.9 percent. By the year 2007, these two categories are expected to account for 68.1 percent of the total fleet (42.2% "20 to 40"), (25.9% greater than 40).<sup>1</sup> The regional carriers that are currently operating at Rapid City all operate aircraft in the these designated groups.

Table 2-3 shows the potential passenger seats available on aircraft that are or could be the airline's choice to operate at Rapid City Regional Airport during the planning period



Table 2-2 NARROW BODY AIRCRAFT						
Airline	Current Operating Fleet		Firm Orders		Options	
	Type	Number	Type	Number	Type	Number
Northwest	MD-80	8	MD-80	0	MD-80	0
	MD-90	0	MD-90	0	MD-90	0
	DC-9	172	DC-9	0	DC-9	0
	B-727	47	B-727	0	B-727	0
	B-737	0	B-737	0	B-737	0
	B-757	44	B-757	29	B-757	0
	A-320	50	A-320	20	A-320	0
Delta	MD-80	120	MD-80	0	MD-80	25
	MD-90	12	MD-90	19	MD-90	50
	DC-9	0	DC-9	0	DC-9	0
	B-727	129	B-727	0	B-727	0
	B-737	67	B-737	0	B-737	58
	B-757	86	B-757	4	B-757	35
	A-320	0	A-320	0	A-320	0
United	MD-80	0	MD-80	0	MD-80	0
	MD-90	0	MD-90	0	MD-90	0
	DC-9	0	DC-9	0	DC-9	0
	B-727	75	B-727	0	B-727	0
	B-737	226	B-737	0	B-737	123
	B-757	89	B-757	3	B-757	15
	A-320	34	A-320	16	A-320	40

Source: Air Transport Association (ATA) - June 30, 1996

TABLE 2-3 EXISTING PASSENGER AIRCRAFT			
	Accommodation	Engine Type	Wing Span
Douglas DC-9-30	110 passengers	- Turbo fan	93'
Beech 1900D	19 passengers	- Turbo prop	81'
EMB 120 -Brasilia	30 Passengers	- Turbo prop	65'
Canadair Regional Jet	50 passengers	- Turbo fan	70'
deHavilland Dash 8-200	37 passengers	- Turbo prop	90'

Source: Bucher, Willis & Ratliff Corporation

### 2.5.3 Annual Airline Operations

Annual airline operations have been forecast and are shown in Table 2-4. The basic computation to forecast operations is straightforward, however judgement is required to predict the boarding load factors. Historic boarding load factors have been used to begin the forecast period and the future projections have been developed utilizing FAA forecasts for load factors and seats per aircraft. The Rapid City current load factor is 64.5 percent. This load factor will approach national forecasts by the FAA which is 66 percent.

From the airline operational levels shown in Table 2-4 a breakdown of operations per each category of air carrier aircraft can be computed and are shown in Table 2-5. The operations are associated with a forecast "critical" aircraft for each category. The "critical" aircraft for the other operational categories are the Beech 1900D for the "10 to 19 seat", the deHavilland Dash-8 for the "20 to 40 seat" and the Canadair RJ for the "over 40 seat" category. The major air carriers will use primarily the DC-9-30 type aircraft with 110 passenger seats. Other similar aircraft in this group include the MD-80-90 and B-737.

Year	Passenger Enplanements	Boarding Load Factor	Departure Seats	Avg. Seats Per Departure	Annual Departures	Annual Airline Operations
Existing	180,784	64.5%	280,048	51.16	5,473	10,946
2002	227,025	65.0%	349,269	59	5,948	11,896
2007	262,845	65.5%	401,290	61	6,555	13,110
2012	286,150	66.0%	433,560	60	7,236	14,472
2017	311,948	66.0%	472,648	59	8,003	16,005

Source: Bucher, Willis & Ratliff Corporation

**TABLE 2-5  
COMMERCIAL OPERATIONS FORECAST BY AIRCRAFT CATEGORY  
Rapid City Regional Airport**

Year	Aircraft Categories				Total Airline Operations
	10 to 19 Seats	20 to 40 Seats	40-60 Seats	Over 60 Seats	
Existing *	1,460	4,702	2,190	2,594	10,946
2002	1,460	5,346	2,490	2,600	11,896
2007	1,460	6,090	2,830	2,730	13,110
2012	1,460	6,924	3,218	2,870	14,472
2017	1,460	7,870	3,659	3,016	16,005

Note (\*) - 1995 used as base year due to primary runway reconstruction for 2 months in 1996  
Source: Bucher Willis & Ratliff Corporation

### 2.5.4 Peak Hour Passengers

The analysis of the commercial service airline flight schedules indicates that there are three peaks that occur during the day. The first occurs between 6:15 a.m. and 8:15 a.m., the second between 11:05 a.m. and 1:05 p.m., and finally between 4:00 p.m. and 6:30 p.m.

The demand during the peak hours is used to determine facility size. The FAA has design parameters to determine Typical Peak Hour Passengers (TPHP). From reviewing monthly enplaned passenger data at Rapid City, July and August have had the highest percentages of annual passengers, at 12.5 percent over the years.

The annual peak hour is assumed to be 20 percent, based upon the number of peaks during the day and the number of arrivals and departures during each peak. Each peak has approximately 20 percent of total activity, the remaining 40 percent of activity is spread out through the day.

Studies have shown that as passenger volume increases, peak hour percentages generally decrease as the volume of passengers is spread throughout the day. At Rapid City, the peak hour was adjusted downward because of the increase in the potential departures of air carrier aircraft. Table 2-6 shows the forecasted peak hour passengers at Rapid City through the planning period.

**TABLE 2-6  
PEAK HOUR PASSENGERS  
Rapid City Regional Airport**

	Passengers	Peak Month (12.5%)	Peak Day (Month ÷ 30.4)	Peak Hour Percent	Peak Hour Passengers
Existing	361,588	45,199	1,487	20%	297
2002	454,050	56,756	1,867	18%	336
2007	525,690	65,711	2,162	16%	346
2012	572,300	71,536	2,353	16%	376
2017	623,896	77,987	2,565	16%	410

Source: Bucher, Willis & Ratliff Corporation, 1997

### 2.5.5 Air Cargo Forecast

Air cargo revenue ton miles (RTM's) flown by US air carriers totaled 23.2 billion in 1995, up 11.5 percent from 1994. In 1995 air freight RTM's have increased 12.5 percent, and, mail RTM's have increased 4.4 percent. The trend line of historic cargo activity reflects these national trends in air cargo activity and freight

freight totals at Rapid City Regional Airport through the planning period would be expected to continue to increase. For forecasting purposes, mail is expected to increase at about 3.3 percent annually and freight is expected to increase at 2.5 percent annually. Table 2-7 shows the air cargo forecast.

**TABLE 2-7  
AIR CARGO FORECASTS (in pounds)  
Rapid City Regional Airport**

	Mail	Freight
Existing	1,141,030 lbs.	1,115,054 lbs.
2002	1,483,748 lbs.	1,606,113 lbs.
2007	1,719,594 lbs.	1,678,400 lbs.
2012	1,955,440 lbs.	1,750,687 lbs.
2017	2,191,286 lbs.	1,822,974 lbs.

Source: Bucher, Willis & Ratliff Corporation, 1997

## 2.6 General Aviation Forecasts

The general aviation fleet is becoming more sophisticated, with more frequent activity of business aircraft, and a simultaneous decline in recreational flying. Because business aircraft users typically operate larger and more demanding aircraft than recreational users, the need to accommodate business aircraft is critical to the future development of an airport. Since the early 1980's, several trends have contributed to the sluggish growth of the general aviation industry. These include a less active general aviation fleet (aircraft operations and total utilization hours), fewer trained student and private pilots, and a decline in manufacturing and shipping of single and small twin-engine aircraft. The recent cost escalation associated with recreational flying, coupled with higher liability and taxes for those who own, rent, and operate general aviation airplanes has contributed to an increase in business and itinerant aircraft operations relative to pilot training and recreational activity.

There is recent optimism in the general aviation industry. More sophisticated and higher-value single and twin-engine aircraft are being manufactured, along with an increase in the number of instrument-rated pilots. The used aircraft market has remained strong, more affordable design and navigational technologies are available, experimental aircraft building has proliferated under new FAA certification, and globalization of general aviation activities is more cooperative. In addition, federal legislation passed in 1994 established a 18-

year statute-of-repose for litigation on the design or manufacturing of general aviation aircraft and components. Combined, these events are anticipated to stimulate general aviation activity nationally during the 20-year planning period.

The purpose of this section is to quantify general aviation demand for the Rapid City area during the short, medium, and long-range planning periods (Phases I thru III). National trends and forecasts, including the *National Plan of Integrated Airport Systems (NPIAS)* and previous Rapid City Regional Airport planning documents were analyzed to compare forecast data for the airport.

The forecasts, combined with the demand/capacity analysis, will be used to determine long-range general aviation facility requirements to be scheduled during the appropriate planning period. General aviation demand forecasts have been prepared for:

- \* Based Aircraft
- \* Aircraft Operations
- \* Aircraft Mix
- \* Annual Instrument Approaches (AIAs)

### 2.6.1 Based Aircraft Forecasts

The most important factor in the development of aviation activity forecasts at an airport serving general aviation is the number of based aircraft. At Rapid City, to determine future levels of based aircraft, regression analysis techniques and market projections were performed analyzing the social and economic characteristics for Rapid City and

Pennington County. The results are indicated in Table 2-8. These were then compared with previous forecasts, assessed for accuracy, and utilized where appropriate.

#### Previous Forecasts

Previous forecasting for Rapid City Regional Airport was completed in the initial Airport Master Plan in 1985, and as part of the *National Plan of Integrated Airport Systems (NPIAS)*. The *Rapid City Regional Airport Master Plan, 1991* contains the most recent specific forecast of based aircraft. Since then, changes in economic and population growth rates have influenced the original projections used to estimate the future airport activity levels. The (NPIAS) completed in 1990 has a flat projection for Rapid City Regional Airport. The NPIAS shows 99 based aircraft at Rapid City from 1993-1997.

Due to changes occurring in Rapid City and at Rapid City Regional Airport, the previous forecasts will be used for comparison purposes only.

#### Trend Line Projections

The Trend Line analysis indicates how the airport has performed with regard to based aircraft increases. From 1984 to 1995 based aircraft at the airport has changed very little. However, from 1980 to 1983 based aircraft increased by 18. Therefore, the trend line based upon past figures was initiated in 1980 and computes to an annual growth rate of 0.8 percent. This rate of growth is low but not far

from the national growth rate forecasted by FAA.

#### Market Share Regression Analysis

As previously shown in Table 1-12, aircraft levels in Pennington County have been consistently increasing. Regression analyses techniques were performed to project based aircraft in Pennington County through the planning period. The regression yielded an R squared of 98 percent which is very acceptable. Adjusted per capita income and Pennington County population projections were used as the independent variables.

Since 1980, based aircraft at Rapid City Regional Airport have averaged 61 percent of total Pennington County aircraft. The regression was calculated and the average percent (61%) of Rapid City Regional Airport aircraft was applied to forecast totals for total Pennington County aircraft. This method of forecasting regresses what the market (Pennington County) can expect in the future and uses the average percent (share) of Pennington County that can be expected at Rapid City Regional Airport.

#### National Growth Rate

According to the latest FAA general aviation forecast figures<sup>1</sup> it is estimated that the national active general aviation fleet has generally declined since 1993. However, national aviation trends (flight hours, fleet composition, etc.) indicate a growing transition to larger, faster, and more sophisticated general aircraft, coupled with a



leveling-off of single-engine and smaller multi-engine piston aircraft activity during the next three to five years.

Because of many single-engine and multi-engine piston aircraft being retired in the next 3-5 years, the fleet will continue to drop slightly, but during the overall 20-year forecast period, there will be growth in the general aviation fleet through the year 2007. This increase will be driven primarily by greater business use of turbine-powered aircraft, increasing use of experimental aircraft, and the production of new single-engine piston aircraft resulting from the passage of the General Aviation Revitalization Act.

"Preferred" Based Aircraft Forecast

Based on a review of the various statistical methodologies, the "preferred" growth forecast for general aviation based aircraft is expected to be in-line with the FAA national trend analysis. The historic trend line is not considered valid because the trends in general aviation are up and also because Rapid City is the urban population center of the region and growth should be slightly stronger. The market share regression analysis works well (R-squared over 80%) but is overly optimistic when compared to the relatively low change in based aircraft in the past 10 years. Therefore, the FAA trend forecast is believed to be the best model to use when predicating based aircraft. It takes into account fleet mix, and trends in the different sectors of the general aviation market.

Year	1991 Airport Master Plan	NPIAS	Historic Trend	Market Share Regression	"Preferred" FAA Trend
2002	95	99	106	120	101
2007	103	--	109	131	106
2012	112	--	111	140	114
2017	--	--	114	150	124

Source: Bucher, Willis & Ratliff Corporation, 1997

### 2.6.2 General Aviation Operations Forecast

The aircraft operations forecast is developed by using the based aircraft figures and then by applying percentage-usage rates which most realistically reflect trends at Rapid City Regional Airport. To arrive at general aviation operations per based aircraft, the airline operations and military operations are subtracted from total operations. The general aviation operations are then divided by the current level of based aircraft (100). For Rapid City Regional Airport, 504 operations will be used as the baseline for operations per based aircraft.

Aircraft operations are identified as local and itinerant operations. Local operations are performed by those aircraft which take off and

land at the same airport and operate within the local vicinity of the airport. Itinerant aircraft operations are those in which the aircraft land or take off at one airport and have a terminus of flight at another airport. It is important to note that local and itinerant operations can be performed by a based aircraft or a foreign aircraft based at another airport.

The historic local/itinerant split of total operations for the past six years was computed as 40% local and 60% itinerant. Based upon past performance, this percentage split is expected to remain the same through the planning period.

A summary of the general aviation aircraft operations forecast is given in Table 2-9.

**TABLE 2-9  
GENERAL AVIATION AIRCRAFT OPERATIONS FORECAST  
Rapid City Regional Airport**

Year	Based Aircraft	General Aviation Operations Per Base Aircraft	Local Operations	Itinerant Operations		Total General Aviation Operations
				General Aviation	Air Taxi	
Existing	100	503.73	19,246	23,503	7,624	50,373
2002	101	504	20,362	22,907	7,635	50,904
2007	106	504	21,370	24,041	8,013	53,424
2012	114	504	22,982	25,855	8,619	57,456
2017	124	504	24,998	28,123	9,375	62,496

Note (\*) - 1995 used as base year due to primary runway reconstruction for 2 months in 1996

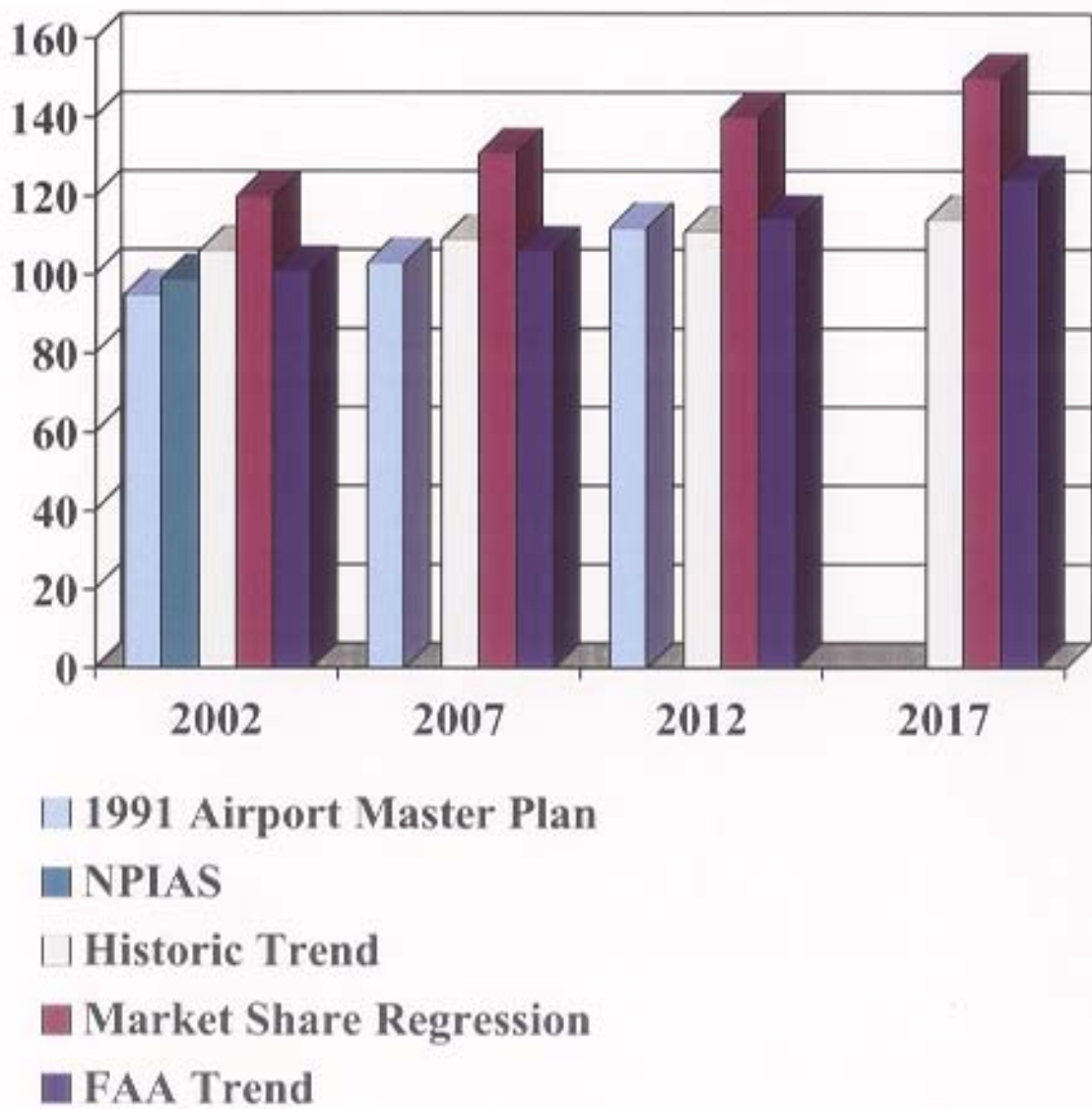


Figure 2.2

### 2.6.3 Aircraft Mix Forecast

The number of operations performed by the various types of aircraft at Rapid City Regional Airport is required to determine the present and ultimate design requirements, weight limitations, and environmental effects associated with future airport activity. The aircraft "mix" of aircraft is a design feature using aircraft characteristics (wingspan, approach airspeed, and weight) for determining airfield criteria. The mix of these different "categories" of aircraft is an important feature to determine anticipated design, structural and material needs.

There are two basic functional means to classify aircraft for design purposes; (1) by the Aircraft Approach Category, which is based on the aircraft's final approach speed; and (2) by the Airplane Design Group, which is based on the aircraft's wingspan. The Aircraft Approach Category is classified from A to E, and the Airplane Design Group is classified from Group I to IV. Combined, the two classifications produce an Airport Reference Code (ARC) which yields specific information about the type of aircraft around which the airport is ultimately designed. These classifications are indicated in Table 2-10.

The aircraft mix forecast was developed on the basis of information assembled in the inventory analysis element and on national trends, aircraft inventories, and anticipated future requirements of the Rapid City area. Although the majority of aircraft activity will continue to be single and twin-engine aircraft, the forecasts reflect the increasing trend toward use by turbine and larger air carrier aircraft.

The ultimate aircraft fleet mix which is also shown in Table 2-10 has been determined using the percentages inherent at Rapid City and in conjunction with national aviation trends.

### 2.7 Military Activity

Military operations are any operation made by any branch of the United States Armed Forces. Military operations at Rapid City Regional Airport make up about 8 percent of air traffic activity. The military activity is a direct result of congressional funding and is not dependant on local or regional economic influences. Therefore, military operations are expected to remain constant at about 1,800 annual itinerant operations and 3,600 local operations throughout the planning period.

**TABLE 2-10  
ULTIMATE AIRCRAFT MIX BY CLASSIFICATION\*  
(OPERATIONS)**

a. **Aircraft Approach Category.** An aircraft approach is a grouping of aircraft based on an approach speed. The aircraft approach categories percentage is of based aircraft at the Rapid City Regional Airport.

**Utility Aircraft:**

- |  |       |
|--|-------|
| 1. Category A: Speed less than 91 knots .....                        | 74.5% |
| 2. Category B: Speed 91 knots or more, but less than 121 knots ..... | 16.0% |

**Transport Aircraft:**

- |   |      |
|---|------|
| 3. Category C: Speed 121 knots or more, but less than 141 knots ..... | 9.0% |
| 4. Category D: Speed 141 knots or more, but less than 166 knots ..... | 0.5% |
| 5. Category E: Speed 166 knots or more .....                          | 0%   |

b. **Airplane Design Group (Physical Characteristics).** The airplane design group subdivides airplanes by wingspan. The airplane design group concept links an airport's dimensional standards to aircraft approach categories or to airplane design groups or to runway instrumentation configurations.

- |   |       |
|---|-------|
| 1. Airplane Design Group I: Wingspan up to but not including 49 feet (15m) .....                  | 76.0% |
| 2. Airplane Design Group II: Wingspan 49 feet (15m) up to but not including 79 feet (24m) .....   | 20.5% |
| 3. Airplane Design Group III: Wingspan 79 feet (24m) up to but not including 118 feet (36m) ..... | 3.5%  |
| 4. Airplane Design Group IV: Wingspan 118 feet (36m) up to but not including 171 feet (52m) ..... | 0%    |
| 5. Airplane Design Group V: Wingspan 171 feet (52m) up to but not including 214 feet (60m) .....  | 0%    |
| 6. Airplane Design Group VI: Wingspan 214 feet (60m) up to but not including .....                | 0%    |

\* Per A/C 150/5300-13. Does not include military operations.

## 2.8 Annual Instrument Approach (AIA)

### Forecast

The forecast of Annual Instrument Approaches (AIAs) provides further guidance in determining the Airport's requirements for additional facilities, and is especially important for type and extent of navigational guidance equipment. An instrument approach is defined as "an approach to an airport, with intent to land, by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when the visibility is less than three miles and/or the ceiling is at or below the minimum initial approach altitude."

The forecasts for AIAs assumes the amount of annual instrument approaches as a percentage of total operations. Operations data from the Rapid City Air Traffic Control Tower reveal that currently and on the average about 18 percent of all itinerant operations are conducted under instrument flight rules. Table 2-11 provides an overview of the expected levels of total itinerant airport operations and expected annual instrument approaches (AIAs) at Rapid City through the planning period.

TABLE 2-11  
ANNUAL INSTRUMENT APPROACH FORECAST  
Rapid City Regional Airport

Year	Total Itinerant Operations *	Percent IFR Operations	Total* Annual Instrument Operations	Annual IFR Approaches (AIAs)
Existing	36,986 †	18%	6,655	3,328
2002	44,238	18%	7,968	3,982
2007	46,964	18%	8,454	4,226
2012	50,746	18%	9,134	4,567
2017	55,303	18%	9,954	4,977

† Primary Runway closed for two months during reconstruction.

\* Includes instrument operations conducted for airlines, military, and flight training.

## 2.9 Forecast Summary

The purpose of this element has been to present forecasts of future aviation activity which will be used to guide in the continued development of the Rapid City Regional Airport. These forecast figures are summarized in Tables 2-12 and 2-13.

There are many indications of steady economic growth in the Rapid City area which will provide the basis for increases in the levels of general aviation based aircraft at Rapid City Regional Airport. General aviation based aircraft at Rapid City are expected to increase at a similar pace as the national fleet growth indicators.

Air carrier activity makes up the remaining civilian portion of activity at Rapid City Regional Airport.

There is little doubt about the importance of regularly scheduled departures and arrivals provided by certificated air carriers to a community. Numerous studies have shown the benefit to a community with air carrier service.<sup>4</sup> The availability of air carrier service is certainly an important ingredient to a community's ability to promote and expand its economic base.

Air carrier enplanements are on the verge of another growth period. This fact, coupled with the potential impacts of the Deadwood development, and the realization by visitors from overseas and domestically that Rapid City is becoming a destination resort, could provide the momentum for increased airport use into the next century.



**TABLE 2-12  
SUMMARY - GENERAL AVIATION FORECASTS  
Rapid City Regional Airport**

<b>Airport Activity</b>	<b>Existing</b>	<b>2002 (5-yr)</b>	<b>2007 (10-yr)</b>	<b>2012 (15-yr)</b>	<b>2017 (20-yr)</b>
<b>BASED AIRCRAFT</b>	<b>100</b>	<b>101</b>	<b>106</b>	<b>114</b>	<b>124</b>
Single Engine (A-I)	76	75	78	84	90
Multi-Engine (B-II)	23	25	27	29	32
Business Jet (B-II, C-II)	1	1	1	1	2
<b>AIRCRAFT OPERATIONS</b>	<b>50,373</b>	<b>50,904</b>	<b>53,424</b>	<b>57,456</b>	<b>62,496</b>
Local Operations (Total)	19,246	20,362	21,370	22,982	24,998
Itinerant Operations (Total)	31,127	30,542	32,054	34,474	37,498
<b>ANNUAL INSTRUMENT APPROACHES (AIA's)</b>	<b>3,328</b>	<b>3,982</b>	<b>4,226</b>	<b>4,567</b>	<b>4,977</b>

Ultimately, these forecast figures will be used to develop facility recommendations which will identify the future facility requirements at the Airport.

**TABLE 2-13  
SUMMARY OF THE "PREFERRED" FORECASTS  
Rapid City Regional Airport**

Activity Indicator	Existing	2002	2007	2017
<b>TOTAL PASSENGERS</b>				
• Total	361,588	454,050	525,690	623,896
<b>ENPLANED PASSENGERS</b>				
• Total	180,794	227,025	262,845	311,948
<b>PEAK HOUR PASSENGERS</b>				
• Total	297	336	346	410
<b>ANNUAL OPERATIONS</b>				
• Total	55,928	68,200	71,933	83,901
• Air Carrier	2,047	2,600	2,730	3,016
• Air Taxi*	11,371	16,931	18,392	22,364
• General Aviation (No air taxi)	38,177	43,269	45,411	53,121
• Military	4,333	5,400	5,400	5,400
<b>AIR CARGO (lbs)</b>				
• Mail	1,141,030	1,483,748	1,719,594	2,191,286
• Freight	1,115,054	1,606,113	1,678,400	1,822,974
<b>GENERAL AVIATION</b>				
• Based Aircraft	100	101	106	124

\* Air carrier flights with aircraft with 59 passenger seats or less are counted as air taxi.

**REFERENCES:**

- 1 FAA Aviation Forecasts - March, 1996
- 2 General Accounting Office, Airline Deregulation - April, 1996
- 3 Interavia/Aerospace World, April-1993, page 52.
- 4 U.S. Department of Commerce, "Estimating the Regional Economic Significance of Airports", September 1992