CHAPTER VIII
Capital Needs

Before transit services can be provided, a number of capital items are required, including vehicles, office and facilities, passenger amenities, administrative computer programs, bicycle/pedestrian facilities, and advanced public transportation system technologies.

VEHICLES

While the Transportation District currently does not own any of the transit vehicles being used by Snow Express, the current service provider has a need for replacement vehicles prior to the start of the next ski season.

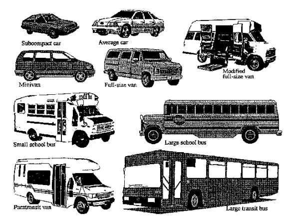
Currently, the fleet of vehicles contracted for the Snow Express are 1993 International standard school buses. The buses have an average vehicle-life of approximately five to seven years or 150,000 to 200,000 miles (according to the Federal Transit Administration Guidelines). The expected replacement date, as stated by the current service provider, is during the next bid process. Unfortunately, the school buses do not convey the message of a transit system in a resort community. Most resort areas across the western United States are not using school buses in their fleets. The Big Sky Transportation District should specify in their future bids the type of vehicles that are acceptable for use in the area. However, this can likely increase the annual contract costs significantly. The school buses are relatively the least costly option available at this time.

It is not likely that school buses will be used in future years if and when additional funding becomes available. However, it must be restated that newer, more attractive vehicles will likely require additional capital funding.

The current vehicles used by the current service provider will require replacement in the upcoming years. In addition, depending upon the service alternatives chosen, additional vehicles may be required. A vehicle used by the current service provider from the airport to Big Sky, which would be appropriate for use in Big Sky, can range from $150,000 to $175,000 per unit.

The following text presents information regarding alternative fuel vehicles which are used across the United States. The information can apply to the Big Sky area even though they are not currently considered to be a non-attainment area.

Alternative Fuels



To reduce pollution from mobile sources, the national Clean Air Act Amendments of 1990 encouraged the use of clean fuels such as methanol, ethanol, bio-diesel, and natural gas derivatives including compressed natural gas, liquefied natural gas, and liquefied petroleum gas. In order to develop a working concept of the different alternative fuels, their advantages and disadvantages, and their potential application for Snow Express and the Big Sky area, the following review of the relatively common alternative fuels has been prepared.

<u>Methanol</u>

Most of the methanol used commercially within the United States is manufactured from natural gas, making it economical to utilize. The tailpipe emissions of methanol are generally considered to be about half as reactive as an equal mass of emissions from gasoline or diesel fuel, promoting its use to reduce ozone in urban areas (such as Los Angeles). By volume, methanol has slightly more than half the energy content of diesel fuel and slightly more than half the energy content of gasoline. Due to the above characteristics, a methanol engine will consume slightly over twice the volume of fuel per mile of service, as compared to a diesel engine.

In the past few years, the transit authorities in Los Angeles and Seattle have retired their methanol programs due to the fuel's highly corrosive properties. After spending $102 million on methanol buses since the year 1989, the Los Angeles County transit officials declared their methanol anti-pollution program a failure because the buses are prone to costly mechanical repairs. Officials of the Seattle Metro transit agency eliminated their methanol demonstration program after a trial period of five years. Test results of the program indicated that severe engine malfunctions were experienced on the buses at 60,000 and 70,000 miles, largely attributed to the corrosive nature of the fuel.

Ethanol

While not being as corrosive as methanol, the major use of ethanol is currently limited as an octane additive and oxygenate for gasoline. The cost for ethanol is quite comparable to that of gasoline; however, ethanol has many more benefits. Ethanol produces lower carbon monoxide emission rates than gasoline, has a higher energy density than methanol, and has a lower toxicity than either methanol or gasoline. Ethanol in the Rocky Mountain Region costs approximately $2.23 per gallon compared to gasoline at $2.073 per gallon as of March 2005.

Compressed Natural Gas

The strength of compressed natural gas (CNG) as an alternative fuel for transit buses is that it is generally less expensive per unit of energy than gasoline or diesel fuels. CNG fuel also has the potential to reduce the oxides of nitrogen emissions, reactive organic hydrocarbons, particulate matter concentrations, and carbon monoxide concentrations by as much as 90 percent (per the Transportation Research Board, Transit Cooperative Research Program, 1993). The advantages of a CNG bus include no visible pollution and a quieter operation. Over the last several years, CNG has become the alternative fuel of choice in US transit systems.

Historically, the weakness of CNG fuel is its difficult storage requirements. CNG is typically stored in high pressure cylinders under maximum pressures. The high weight, volume, and cost of the storage tanks have been a barrier to its commercialization as an alternative fuel. The recent development of lighter aluminum tanks, however, has reduced this disadvantage to some degree.

The main problem with CNG is primarily associated with the moisture in the compressed fuel freezing during the fueling process, since the approximate time to fill a bus may be three hours. Other problems that have been encountered nationally include the quality of local CNG supplies, limited testing of altitude effects on CNG, low power for climbing steep grades, and limited CNG testing in extreme temperatures.

Liquefied Natural Gas

Liquefied natural gas (LNG) has only recently received attention as an alternative fuel. The potential advantages of the fuel lie in its economic considerations since the fuel processing costs are much less than that of the other gaseous fuels. LNG also has a greater potential to reduce the oxides of nitrogen emissions and the hydrocarbon emissions when compared to diesel and gasoline fuels. Currently, the biggest obstacles facing LNG are the lack of availability and its storage and handling facility requirements.

LNG Storage Tank

Liquefied Petroleum Gas

The advantages and disadvantages of liquefied petroleum gas (LPG) are similar to those of natural gas. The advantage of LPG is that gasoline engines can be easily converted due to its high heating and high octane characteristics. LPG is also well established in its transit fleet applications. According to the *Alternative Transportation Fuel in the United States* (R.F. Webb Corporation, June 1989), approximately 350,000 LPG transit vehicles were in operation in the United States. In 1995, the Department of Transportation estimated over 750,000 LPG transit vehicles would be in operation by the year 2000.

The main disadvantage of LPG is the lower engine performance of transit vehicles using the fuel. According to the above citation, the conversion of an engine from gasoline to LPG will usually cause a 10 to 15 percent power loss.

Diesel Fuel

Diesel fueled engines have traditionally dominated the transit vehicle marketplace due to diesel's fuel efficiency and durability. From an air quality perspective, diesel engines have very low tailpipe emissions of carbon monoxide and other organic gases. The concern from an air quality perspective, however, has been the diesel emission rates of the oxides of nitrogen emissions (Nox) and particulate matter. Due to increasing environmental pressure to reduce the above emissions, the Environmental Protection Agency and American Public Transit Association have developed stringent Nox and particulate matter regulations. The Clean Air Act Amendments (CAAA) permit the use of clean diesel in urban buses provided that the clean diesel engines meet the particulate matter standards imposed by the CAAA.

In partial response to the 1990 CAAA's recommendations for cleaner burning fuels and the continued development of the previously mentioned alternative fuels, the traditional diesel fuel engine has made great strides toward developing cleaner burning particulate traps and improved catalytic converter technology. Diesel engine manufacturers have been successful in lowering the Nox and particulate tailpipe emissions by employing the above-mentioned techniques while still maintaining diesel fuel's economy.

Barring conversion to alternative fuels, a number of steps can be taken to substantially reduce the air quality impacts of diesel-fueled transit buses. Various transit systems have been successful in reducing the particulate emissions through the application of "clean-diesel" technology. The utilization of a low sulphur fuel has proven to reduce the average annual particulate emissions of a transit coach from 935 pounds to 260-300 pounds, roughly a 70 percent reduction. In addition, installation of an electronically-controlled fuel injection system and specially-designed transmission has dropped emission levels by 120 pounds of particulate matter annually, for a total emissions reduction of 87 percent.

Bio-Diesel

Bio-diesel is a clean burning alternative fuel make from domestic, renewable resources. The fuel is made from vegetable oil and animal fat. It is made from mono-alkyl esters of long chain of fatty acids that are derived from vegetable oils or animal fats which conform to ASTM D 6751 specifications for use in diesel engines. This fuel is then mixed with diesel to reduce the amount of pollution that the vehicle normally produces. The amount of pollution reduce depends on the amount of bio-fuel that is mixed in with the diesel. The amount of carbon monoxide (CO) is reduced by 12 percent when the mixture is 20 percent bio-fuel and 80 percent diesel. The maximum amount of CO reduction is 48 percent at 100 percent bio-fuel. The disadvantage of this fuel is that it increases the production of Nox by 2 to 10 percent, depending on the mix of bio to diesel. At this time, there are several companies (14) that are producing bio-diesel. Another advantage of this alternative fuel is that the fuel can be used in the existing Snow Express bus fleet with a small amount of engine adjustment at a low cost. There are several grant sources that are available to aid in the funding to convert to bio-diesel. These grants are by the FTA and the Department of Agriculture. Under the FTA there is the clean fuel program and the Congestion Mitigation Air Quality Program which have funding for the development of a transit agency to convert to bio-diesel in order to reduce the level of air pollution

Montana currently offers a tax credit available for 50 percent of the conversion cost associated with converting a vehicle to run on an alternative fuel. The credit is worth up to $500 or $1,000, depending on the weight of the vehicle.

Montana Laws and Regulations

The State of Montana encourages the use of alternative fuels and fuel blends to the extent that doing so produces environmental and economic benefits to the citizens of Montana. According to the US Department of Energy, the Montana Hydrogen Energy Plan aims to develop the hydrogen economy in Montana and establish Montana as a key state in the hydrogen economy. The Montana Hydrogen Futures Project shall be established as the key economic development focus of the state, “such that by the year 2020, 50 percent of all vehicles and equipment in Montana…will be powered by alternative fuels; all intercity bus systems will use hydrogen…a school bus retrofit and hydrogen power program will be established; and incentives will be provided for conversion of internal combustion engines to hydrogen." These and other incentives continue to make conversion to alternative fuels feasible in many areas.

Ski Racks on Buses

Ski racks on Snow Express buses are a must in the future. The service is designed with the skier in mind. However, the current ski racks on the school buses are located in such a manner that you must be somewhat tall to get skis properly stored into the racks. This is a function of the design of the racks as well as the overall height of the vehicles. In any case, whether new vehicles are sought in the future, or the same vehicles are used over the next few seasons, ski racks should:

- Be easy to use for all patrons
- Be located close to exit doors
- Be on the sides of the buses
- Be in clear view of the driver through the use of mirrors
- Be constructed of rust proof material
- Not exceed further in width than the side mirrors of the bus

Bicycle Racks on Buses

The concept of bicycle racks on public buses has gained widespread acceptance and popularity over recent years, particularly in smaller transit systems. Bicycle racks are utilized as an inducement to increase transit ridership as well as to encourage non-motorized forms of transportation. A reasonable cost for a two-position, front-mounted bicycle rack is approximately $300 to $1,200 per vehicle. This cost could be reduced if a local bicycling store could be recruited to provide the rack at a reduced cost.

The Los Angeles County Metropolitan Transportation Authority and the City of Colorado Springs Transit, for example, use stainless steel racks that hold two bicycles each. The Central Contra Costa Transit Authority of Concord, California and the City of Colorado Springs Transit are currently providing front-mounted bicycle racks on their entire fleet. MET Transit in Billings, Montana has installed bicycle racks with a very positive response from the community.

The most common type of bicycle rack is placed on the front of the vehicle (so the driver can watch the loading and unloading) and has space for two or four bikes. These racks are available on a "first-come/first-served" basis and are provided with a notice indicating that the passenger is liable for all damages. Passengers must be able to load and unload their bicycles on their own. Bicycles fitted with child seats are typically prohibited from utilizing the racks as the seat could block the bus's turn signals.

The initiation of bicycle racks on transit buses could be a good opportunity for a promotional campaign for the environmentally-friendly citizens of Big Sky. The only drawback of bicycle racks is the additional time necessary for loading and unloading the bikes. Operational problems associated with use of the bicycle racks can be minimized through the development and distribution of a pamphlet regarding the correct use of the rack.

A benefit of adding bike racks to the transit fleet is that the system is able to expand the service range of the transit system without increasing operational cost of the service.

PASSENGER AMENITIES

The "street furniture" (shelters, benches, lighting, etc.) provided by the transit system is a key determinant of the system's attractiveness to both passengers and community residents. In addition, the "street furniture" increases the physical presence of the transit system within the community. Bus benches and shelters can play a large role in improving the overall image of a transit system and in improving the convenience of transit as a travel mode. More importantly, shelters are vital to those waiting for buses in harsh weather conditions.

Adequate shelters and benches are particularly important in attracting ridership among the non-transit-dependent population—those that have cars available as an alternative to the bus for their trips. Preference should be given to locations with a high proportion of elderly or disabled passengers and areas with a high number of daily boardings. Lighting and safety issues are equally important along major highways. This could range from overhead street lighting to a low-power light to illuminate the passenger waiting area.

The cost of modern glass and steel shelters averages approximately $3,000 to $5,000 for most areas; however, some can be acquired for as little as $1,000. The maintenance and repair of vandalism to bus benches and shelters is a very minor cost. Modern benches and shelters are very durable and resistant to vandalism. Many transit agencies have even had benches provided by advertising firms at no cost to the transit agency.

Within Big Sky, there are no passenger shelters. There are several waiting areas; however, no bus benches or shelters exist. Shelters and benches may be needed in order to improve the transit service within Big Sky, particularly if you are waiting for a bus during the winter months during harsh weather.

ADMINISTRATIVE CAPITAL NEEDS

Only a limited amount of administration is handled by the Big Sky Transportation District. However, if the current contract service were to end and Snow Express is then operated by the District, a number of administrative capital needs would be warranted. However, at this time, it is not foreseeable that any major administrative capital needs be sought. However, if the Transportation District elects to make major organizational changes to the system, this would create dramatic needs in terms of computer hardware/software, dedicated telephone lines, office space, and other needs.

BICYCLE / PEDESTRIAN FACILITIES

At one end or both ends of their transit trips, virtually all transit passengers also travel on foot or on bicycle. A key element of a successful transit system, therefore, is a convenient system of sidewalks and bikeways accessing the transit stops. Big Sky should work with the local jurisdictions to review the construction plans and scheduling priorities for pedestrian and bicycle improvements so that these plans coordinate with the transit passengers' needs.

BUS STORAGE FACILITY

Whether the Transportation District continues to operate under the current service provider contract or becomes the independent operator of Snow Express, a bus storage facility is needed in the next few years. Currently, buses are stored outside on a gravel parking lot. They get washed infrequently, compared to major transit systems across the United States, due to the fact that there is not a dedicated wash area for the buses. Buses are fueled off State Highway 191 at a local gas station. While an indoor bus storage facility is not critically needed, it is envisioned that a future facility with wash bays, limited maintenance bays, administration offices, driver training space, break rooms, and general storage space is likely to be identified and constructed. If the District were to apply for FTA funding for new transit vehicles, it would be beneficial to show that the vehicles would be stored in an indoor facility and well cared for. However, this is not a prerequisite for a future grant application.

A bus facility would be eligible under either FTA 5309 or 5311 capital funding requiring a local 20 percent match. Several steps are needed to comply with FTA capital funding for facilities. Several requirements, such as a site-selection study and possibly Environmental Impact Assessments/Statements which must be prepared when applicable, may be a requirement to be eligible for funding. At this point, a prudent approach is to identify, in the fiscally-constrained short-range plan, a placeholder for a transit maintenance facility for Big Sky. This placeholder allows the Transportation District to make a facility decision in the next 3 to 5 years.

ADVANCED PUBLIC TRANSPORTATION SYSTEM TECHNOLOGIES

A key consideration in long-term planning is the impact of improvements in technology that can benefit transit services. In recent years, technological research and development programs have been incorporated into the Intelligent Transportation System (ITS) concept. The application elements of ITS for public transportation are known as Advanced Public Transportation Systems (APTS). Snow Express should look for future technologies beyond the time frame of this study.

APTS basically have to do with the application of many high-tech developments to the transportation realm. Most of the APTS developments have come from the military and financial arenas. One such military development is the use of Global Positioning Satellites (GPS) to determine the exact location of an object through triangulation, radio frequencies, and computers. The same concepts used to track nuclear warheads, submarines, and spy on other countries can be employed for other purposes, notably to improve our transportation systems. Likewise, from the financial arena, the same principles used in credit/debit cards and building security systems can be applied to the transportation field. These technologies can be utilized to monitor the people using the transit service by noting where they board, noting where they alight, debiting their fares from bank accounts, or charging their fares to the appropriate human service agency.

Several key conditions have evolved to make APTS applications more attractive. Technology has progressed to the point that the applications are finding their way into the general market. The cutting edge applications of yesterday are now relatively commonplace. Currently, APTS applications are being used in many western states and are realistic options for Big Sky.

Advanced traveler information systems are intended to forewarn the public of delays on the transportation network. These may take the form of sign boards on the highway which advise travelers of congestion ahead, or they may be in the form of a traffic report accessed on television or over the phone.

Automated vehicle location (AVL) systems employ one of several means of determining the location of a vehicle. By monitoring the historical locations and demands of the vehicles, transit planners can better refine schedules and networks to optimize the workload of vehicles. Logical links to the AVL systems are real-time ride-matching and on-demand dispatching through sophisticated matching and scheduling programs. These systems function by examining where vehicles are, where the vehicles are heading, and how full the vehicles are at the time a ride request call is received. Through a series of decision trees, the computer matches the ride request to a vehicle and dispatches the ride order to the driver or, if no capacity exists on the vehicle, schedules the ride request to be filled by the first available vehicle. Providing transportation services in this flexible format may have significant and fundamental impacts on how demand-response and fixed-route services are provided.

The Regional Transportation District in Denver has implemented an AVL system for 833 fixed-route buses and 66 supervisor vehicles at an estimated cost of $10,400,000. The Dallas Area Rapid Transit system is installing an AVL system for a total of 844 buses, 216 commuter coaches, 245 demand-response vans, and 300 supervisor vehicles. Similar systems are being developed in Milwaukee and Baltimore. The Baltimore system will include signal preemption for buses running behind schedule. The City of Colorado Springs is in the process of implementation of an ITS/AVL. The estimated cost over the next five years is $1.2 million in total dollars. FTA's share is estimated at $960,000 (80 percent).

The existence of real-time dispatching and ride-matching systems creates the need for linking the public to the service. The smart traveler system concept provides a quick link by phone, kiosk, or computer to the service dispatching system. A caller would request a ride, the system would examine vehicle availability in response to the ride request, and inform the caller where and when the rider would be met. The system may also suggest other mode choices available to the caller. The entire transaction need take only a few minutes. If an acceptable match cannot be made, the system may offer to fill the request with a taxi ride.

These new technologies may seem quite advanced for Big Sky. However, these developments are realistically the wave of the future for transportation systems. Such technological advancements improve transit efficiency, quality of service, and service for all types of public transportation in urban and rural areas. However, realistically, these innovations may be cost-prohibitive for the current system. One enhancement should be the use of new passenger count boards to more accurately track passenger boarding and alightings at specific stop locations.

SUMMARY

This chapter has identified various capital needs that should be taken into consideration when providing transit service. The capital items required for transit service include vehicles, passenger amenities (such as shelters and benches), administrative computer programs, bicycle/pedestrian facilities, and advanced public transportation system technologies. The capital needs identified above should be considered when developing a more efficient transit system within Big Sky.