Comprehensive Analysis for Service Efficiencies (CASE)
Executive Summary
November 2007

Introduction

In meeting the diverse travel requirements of the citizens of the District and maintaining a high-performance, sustainable transit system, RTD has developed a family (or classes) of services. Each class serves specific transit markets and has different expectations for performance. RTD classes of bus services for this analysis are: CBD (downtown Denver) Local, Urban Local, Suburban Local, Express, Regional and skyRide.

RTD's annual performance analysis is done at the service class and route level. This report, conducted by TMD, Inc., consists of two additional levels of analysis which were geared to looking for service efficiencies. The first, documented here, is an overview of performance by bus service class at the *time period and weekday/Saturday/Sunday* levels. Figures illustrate the tables at the end of the report that summarize the data for the calendar year 2006.

Figure 1 In-Service Bus Hours by Class & Day of Week

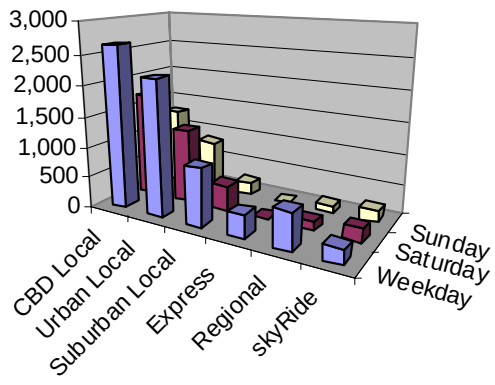
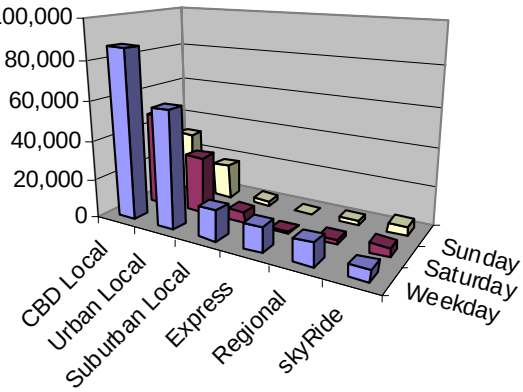


Figure 2 Boardings by Class & Day of Week



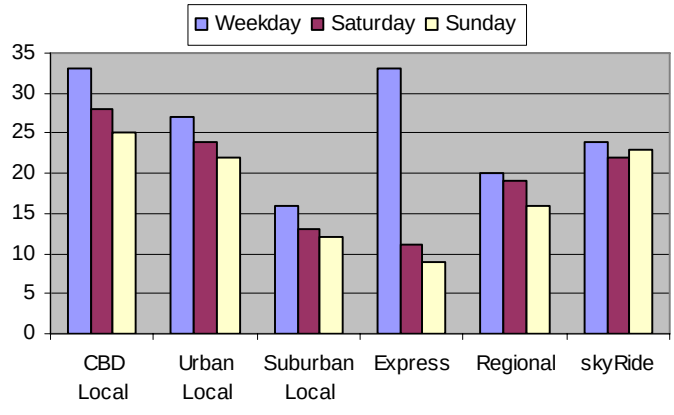
Overall Findings and Conclusions

1. *Figures 1 and 2 show broadly how well the amount of bus service RTD provides mirrors our ridership.* The bulk of the service is on local CBD routes, followed by Urban and Suburban routes, all focused on the strongest transit travel markets. Regional and Express services are more narrowly focused on suburban commuters. Also reflecting travel patterns, there is less service on weekends, especially much less for Express and Regional services.

2. *The productivity on weekends is comparable to weekday productivity.* We expect diminished ridership on weekends, but Figure 3 suggests we generally make an appropriate adjustment of service levels on weekends to reflect the corresponding level of travel. For all classes of service (except Express – see Item 4 below) Figure 3 shows productivity declines somewhat on weekends, but not dramatically.

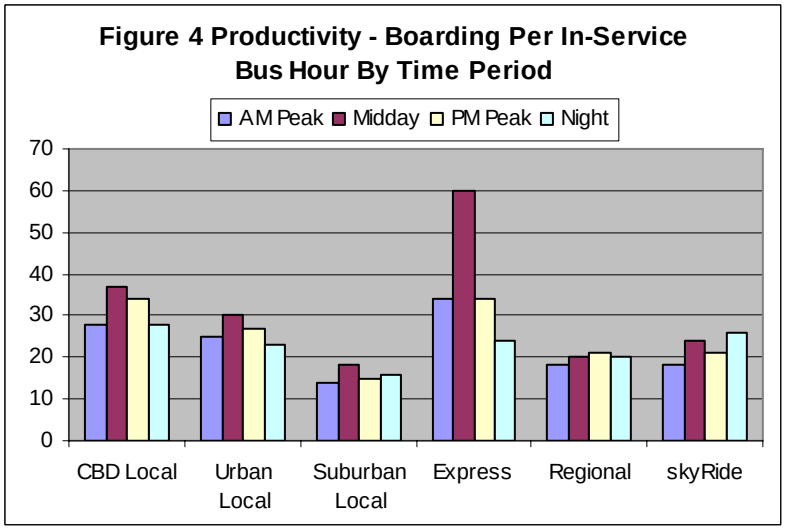
3. *Weekday off-peak productivity on nearly all services exceeds the peak period productivity!* This seems counterintuitive; however, Figure 4

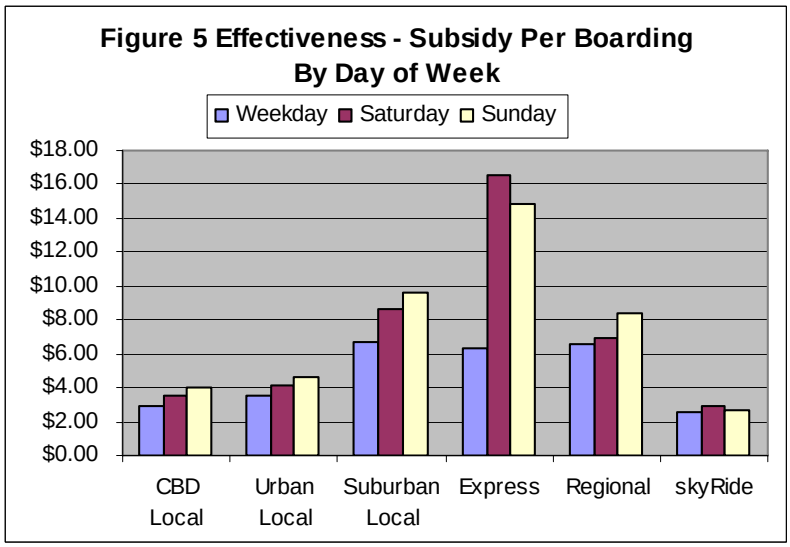
Figure 3 Productivity - Boardings Per In-Service Bus Hour By Day of Week



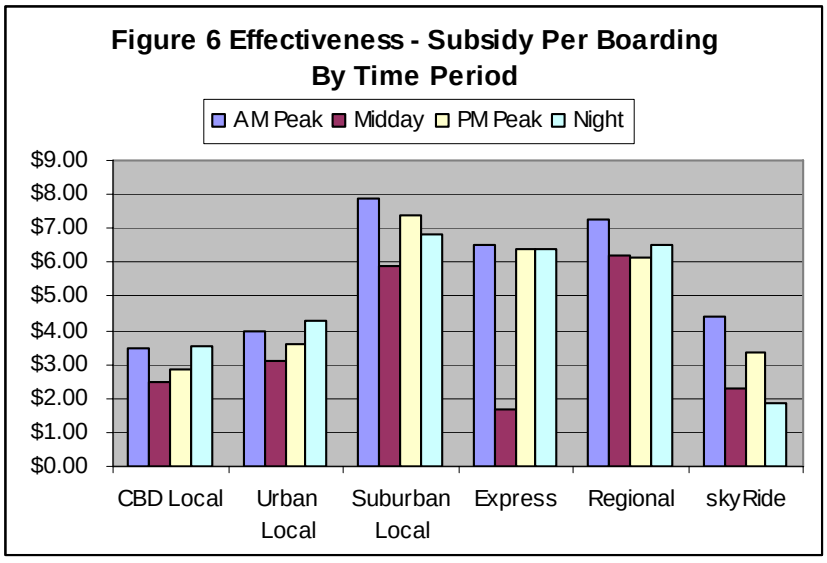
reflects the following:

- Service jobs, a major transit market, are now spread throughout the day ("24/7").
- RTD supplements peak period service to increase capacity and passenger comfort and to reduce customer wait time. The additional ridership does not completely offset the additional service, thus overall productivity is diminished. The imbalance in direction of customer travel in the peak periods contributes significantly to this.
- Midday productivity on CBD local routes is remarkably high. This reflects a strong demand from customers living in high density, more transit-dependent areas, and reduced off-peak service level.





4. The average, system-wide, weekday productivity is 27 boardings per in-service hour (Table 3), but this varies widely by service class (Figure 3), reflecting the different travel markets. *Express routes appear to exhibit high productivity, but this is a false reading relative to other service classes.* This is because many Express buses have single productive trips and the deadhead time (traveling to and from the garage) is not counted as in-service hours. Despite their seemingly high productivity, their effectiveness (Figure 5) is comparable to the more highly subsidized Suburban and Regional classes. On Local routes, time spent traveling in the non-peak direction of travel is usually operated in revenue service.



5. The average system-wide weekday effectiveness is $3.74 per boarding (Table 4). Figures 5 & 6 show that these measures vary widely by service class, reflecting the different expectations for the services. Several observations are worthwhile:

   - While these measures are quite extreme for some classes for specific periods and days, such as weekend Express, the corresponding levels of service and ridership (Figures 1 & 2) are quite small, so there is very little impact on the overall performance.

- As expected, due to operation in low density areas, the Suburban Local and Regional services exhibit higher than average subsidy per boarding.
- There is a marked difference between midday and peak hour effectiveness on suburban routes. The market for suburban crosstown services is not as heavily skewed to the commuter market, but rather one serving general mobility requirements of the areas they service. In order to attract the discretionary commuter market, increased frequency is provided on these routes during peak hours, which leads to higher subsidy per customer.
- The skyRide service has a relatively low subsidy per boarding despite moderate productivity. This illustrates the value of market based pricing for this set of routes in which the walk-up fare for occasional customers is substantially higher than the monthly pass prices for commuters.

Segment and Time Period Analysis

The second part of the CASE analysis is documented in detailed, route by route narratives, maps and tables that are too voluminous to present here, but are available for review. The following summarizes this documentation.

- **Route Tabular Reports** - These present the two performance measures – boarding per revenue hour and subsidy per boarding - for each route by segment and time period. These tables are constructed with the directions combined to give a truer picture of the route performance, by taking into account the imbalance of both passenger and vehicle flows throughout the day.
- **Route Passenger Activity Maps** - A visual representation of the spatial distribution of boardings and alightings was prepared. A map for each route by direction shows the route alignment and a pie chart at each stop representing the number of boardings and alightings at the stop.
- **Network Maps** – It was felt that two base maps – one for the Community routes (CBD Local, Urban Local and Suburban Local classes) and one for the Metro routes (Express, Regional and skyRide classes) would better represent each of the two performance measures as discussed and depicted by the figures above. There is also a map depicting system wide boardings by stop for all routes all day and for the AM peak period. The AM Peak more distinctly captures residential, commuter origins.
- **Service Recommendations** - In consultation with the RTD staff, our consultant (TMD, Inc.) made a number of observations and characterizations about the performance of each route, especially where the performance of individual route segments during certain time periods did not meet the RTD Service Standards. Based on these observations and characterizations, a range of recommendations were made, including: no change, route termination, reduced frequency, route segment alterations/terminations, span of service modifications, service expansion, merged routes, and other changes and combinations of changes. Table 5 Service Recommendations is a comprehensive summary of specific, recommended changes and their potential impacts.

Table 1 Average Daily Service Hours by Service Class, Time Period & Day of Week

Scheduled Bus	Weekday Period						
Route Class	AM Peak	Midday	PM Peak	Night	Weekday	Saturday	Sunday
	Start – 9:00 A	9:01A – 2:59P	3:00P - 5:59P	6:00P - End			
CBD Local	550	1,049	407	650	2,656	1,710	1,284
Urban Local	469	903	349	488	2,209	1,232	816
Suburban Local	226	379	163	175	943	407	214
Express	173	24	162	20	379	21	4
Regional	183	134	149	127	593	132	104
skyRide	40	81	25	82	228	206	208
Total Bus	**1,641**	**2,570**	**1,255**	**1,542**	**7,008**	**3,708**	**2,630**

Table 2 Average Daily Boardings by Service Class, Time Period & Day of Week

Scheduled Bus	Weekday Period						
Route Class	AM Peak	Midday	PM Peak	Night	Weekday	Saturday	Sunday
	Start – 9:00 A	9:01A – 2:59P	3:00P - 5:59P	6:00P - End			
CBD Local	15,633	39,276	13,656	18,068	86,633	48,346	31,973
Urban Local	11,538	27,390	9,275	11,157	59,360	29,404	17,694
Suburban Local	3,202	6,966	2,431	2,808	15,407	5,295	2,506
Express	5,720	1,450	5,418	473	13,061	219	33
Regional	3,327	2,732	3,077	2,510	11,646	2,481	1,696
skyRide	705	1,975	517	2,149	5,346	4,564	4,716
Total Bus	**40,125**	**79,789**	**34,374**	**37,165**	**191,453**	**90,309**	**58,618**

Table 3 Productivity - Boardings Per In-Service (Revenue) Hour by Service Class, Time Period & Day of Week

Scheduled Bus	Weekday Period						
Route Class	AM Peak	Midday	PM Peak	Night	Weekday	Saturday	Sunday
	Start – 9:00 A	9:01A – 2:59P	3:00P - 5:59P	6:00P - End			
CBD Local	28	37	34	28	33	28	25
Urban Local	25	30	27	23	27	24	22
Suburban Local	14	18	15	16	16	13	12
Express	34	60	34	24	33	11	9
Regional	18	20	21	20	20	19	16
skyRide	18	24	21	26	24	22	23
Total Bus	**25**	**30**	**28**	**24**	**27**	**24**	**22**

Table 4 Effectiveness - Subsidy Per Boarding by Service Class, Time Period & Day of Week

Scheduled Bus	Weekday Period						
Route Class	AM Peak	Midday	PM Peak	Night	Weekday	Saturday	Sunday
	Start – 9:00 A	9:01A – 2:59P	3:00P - 5:59P	6:00P - End			
CBD Local	$3.45	$2.48	$2.83	$3.55	$2.93	$3.48	$4.03
Urban Local	$3.95	$3.09	$3.61	$4.31	$3.57	$4.09	$4.57
Suburban Local	$7.87	$5.92	$7.41	$6.85	$6.73	$8.61	$9.62
Express	$6.49	$1.66	$6.38	$6.40	$6.28	$16.57	$14.82
Regional	$7.26	$6.19	$6.12	$6.53	$6.55	$6.93	$8.44
skyRide	$4.43	$2.28	$3.34	$1.85	$2.50	$2.86	$2.70
Total Bus	**$4.23**	**$3.25**	**$3.64**	**$4.37**	**$3.74**	**$4.28**	**$4.76**