Deception in Dallas
Strategic Misrepresentation in Rail Transit Promotion and Evaluation

John F. Kain

This article describes the misuse of land-use and ridership forecasts by Dallas Area Rapid Transit (DART). DART made extensive use of clearly unrealistic land use forecasts and optimistic ridership forecasts in its unsuccessful efforts to obtain voter approval for a 91-mile rail transit system. When alternative analyses indicated that the proposed $2.6-billion rail system would carry only slightly more riders than an unimproved bus system, DART tried to conceal the information. Subsequently, when a citizen’s group obtained the release of these unfavorable findings, DART attempted to mislead voters about their significance and released cost-effectiveness analyses based on earlier, and clearly incorrect, ridership forecasts.

In 1983, the Dallas Area Rapid Transit District (DART) persuaded Dallas area voters to create a permanent regional transit authority and to impose a 1-percent sales tax to build and operate a 160-mile rail rapid transit system. DART spent the next five years and more than $75 million designing a rail system (Deloitte, Haskins, and Sells 1987). As planning proceeded, the system’s planned size was steadily reduced.

In 1988, DART returned to the voters in its service area for authority to sell long-term bonds to build a 92-mile light rail transit (LRT) system. While the referendum was concerned solely with the question of whether DART would be given authority to sell long-term bonds, it was interpreted by supporters and opponents alike as a referendum on DART’s competence and as a plebiscite on its rail plan. In a single issue election held on Saturday, June 25, 1988, Dallas area voters, worried about high unemployment, falling property values, bank closures, rising taxes, and sharp cuts in local government services, dealt DART and its supporters a crushing defeat as 59 percent of those voting rejected the proposed financing plan.

In campaigns to obtain voter support for its proposed rail system, the Dallas Area Rapid Transit District (DART) overstated the benefits and understated the costs of the proposed system and attempted, first, to conceal and then to misrepresent the results of unfavorable travel forecasts.

It is difficult, if not impossible, to identify those responsible for this misrepresentation or their motivations. DART has had three executive directors in its short life; the unpaid chairman of its board and several board members, who had strong commitments to rail, were actively involved in setting policy. In addition, many professionals at both DART and the North Central Texas Council of Governments (NCTCOG) tried to assess realistically the rail option. Indeed, the analyses presented in this article were possible only because a number of DART and NCTCOG professionals freely shared their knowledge and concerns with the author. DART’s efforts to mislead the public, moreover, were abetted by a less-than-vigilant media that editorially supported the rail plan and were encouraged by community mores that discourage public debate on issues of this kind.

This article is an examination of issues related to the creation of DART, its controversial rail plan, the referendum seeking bonding authority, and in particular DART’s persistent misuse of land-use and travel forecasts. While the article deals principally with efforts by one transit authority to convince area residents to provide funding for an extensive rail rapid transit system, the practices described here occur in virtually every metropolitan area (Gomez-Ibanez 1985; Gordon and Wilson 1985; Hamer 1976; Kain 1988a; Peat, Marwick, Main & Co. 1988; Pickrell 1989).

Travel Forecasting and Alternatives Analyses

Transportation planners throughout the world rely on a travel forecasting methodology developed in the United
States shortly after World War II. The so-called land-use transportation model relies on statistical regularities that relate current travel patterns to current land use patterns and transport system characteristics, i.e., the levels and spatial distribution of employment; the numbers, location, and density of population and households; income and car ownership levels; and the capacities and performance of alternative modes (Kain 1971). Predictions of future travel are obtained using these statistical regularities and projections of future land uses for the area in question. These travel forecasts in turn are used in an evaluation procedure that is currently referred to in the United States as "alternatives analysis."

While widely used, these travel forecasting procedures and the larger alternatives analysis framework can produce seriously incorrect outcomes for at least four principal reasons:

1. Analysts may fail to include the most promising technologies and investments among the "alternatives" being considered;
2. The land use forecasts and particularly the critical CBD employment forecasts may be wrong;
3. The models (statistical regularities) developed from historical data may be wrong or the relationships may change over time; or
4. Consultants and analysts, responding to "political" and bureaucratic pressures, may use unrealistic assumptions in preparing forecasts or may misrepresent forecast results.

DART's most serious error in developing its long-term transit plan was its unwillingness to give serious consideration to anything but rail for its so-called rail corridors. In spite of the fact that the region's dispersed employment pattern, low residential densities, and high levels of auto ownership would seem to be ill-suited to an extensive rail system, DART compounded its error of ignoring alternatives to rail by using seriously flawed land-use forecasts, and particularly by using highly optimistic projections of CBD employment. DART also tried to hide unfavorable ridership forecasts from the public and seriously misrepresented these forecasts when they were finally released.

### Forecasting CBD Employment

CBD employment levels, while hard to predict, are especially critical to transit forecasts, particularly rail transit ridership (Hendrickson 1986). The difficult task of predicting CBD employment levels 20 or 30 years into the future is exacerbated by the tendency of city officials and others to equate what they would like to see happen with what is likely to happen.

Table 1 contains 19 estimates of "actual" Dallas CBD employment prepared during the 33-year period 1956-1990.

### Table 1: Estimates and Forecasts of Dallas CBD Employment

<table>
<thead>
<tr>
<th>Year</th>
<th>Date released</th>
<th>Total employment</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>1956</td>
<td>58</td>
<td>115,000</td>
<td>BERC</td>
</tr>
<tr>
<td>1957</td>
<td>Jul 58</td>
<td>130,000</td>
<td>TEC</td>
</tr>
<tr>
<td>1964</td>
<td>72</td>
<td>87,620</td>
<td>Barton-Aschman</td>
</tr>
<tr>
<td>1964</td>
<td>77</td>
<td>92,656</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>1970</td>
<td>72</td>
<td>99,000</td>
<td>Barton-Aschman</td>
</tr>
<tr>
<td>1970</td>
<td>Mar 75</td>
<td>116,271</td>
<td>Barton-Aschman</td>
</tr>
<tr>
<td>1970</td>
<td>Aug 87</td>
<td>90,034</td>
<td>Barton-Aschman</td>
</tr>
<tr>
<td>1977</td>
<td>Nov 80</td>
<td>109,684</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>1980</td>
<td>82</td>
<td>127,000</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>1980</td>
<td>87</td>
<td>102,386</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>1984</td>
<td>Oct 84</td>
<td>108,000</td>
<td>CDA</td>
</tr>
<tr>
<td>1985</td>
<td>85</td>
<td>110,000</td>
<td>CDA</td>
</tr>
<tr>
<td>1986</td>
<td>Jan 86</td>
<td>113,000</td>
<td>CDA</td>
</tr>
<tr>
<td>1986</td>
<td>Nov 86</td>
<td>97,000</td>
<td>CDA</td>
</tr>
<tr>
<td>1986</td>
<td>1987</td>
<td>116,725</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>1986</td>
<td>Nov 86</td>
<td>97,000</td>
<td>CDA</td>
</tr>
<tr>
<td>1987</td>
<td>Aug 88</td>
<td>93,000</td>
<td>CDA</td>
</tr>
<tr>
<td>1988</td>
<td>Jul 88</td>
<td>90,000</td>
<td>CDA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Date released</th>
<th>Total employment</th>
<th>Author/Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>Mar 75</td>
<td>164,700</td>
<td>Barton-Aschman</td>
</tr>
<tr>
<td>1990</td>
<td>May 76</td>
<td>187,756</td>
<td>All-highway</td>
</tr>
<tr>
<td>1990</td>
<td>May 76</td>
<td>275,119</td>
<td>All transit</td>
</tr>
<tr>
<td>1990</td>
<td>May 76</td>
<td>212,362</td>
<td>Primarily highway</td>
</tr>
<tr>
<td>1990</td>
<td>May 76</td>
<td>253,225</td>
<td>Primarily transit</td>
</tr>
<tr>
<td>1990</td>
<td>May 76</td>
<td>127,283</td>
<td>Do-nothing</td>
</tr>
<tr>
<td>1990</td>
<td>Nov 80</td>
<td>176,761</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>1990</td>
<td>Aug 87</td>
<td>209,370</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>1990</td>
<td>Nov 80</td>
<td>120,206</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>2000</td>
<td>Nov 80</td>
<td>198,074</td>
<td>NCTCOG</td>
</tr>
<tr>
<td>2000</td>
<td>82</td>
<td>288,000</td>
<td>NCTCOG-DART</td>
</tr>
<tr>
<td>2000</td>
<td>Dec 83</td>
<td>180,173</td>
<td>NCTCOG-RL</td>
</tr>
<tr>
<td>2000</td>
<td>Jan 84</td>
<td>226,513</td>
<td>NCTCOG-ALR (medium)</td>
</tr>
<tr>
<td>2000</td>
<td>84</td>
<td>288,000</td>
<td>NCTCOG-DART (high)</td>
</tr>
<tr>
<td>2000</td>
<td>Feb 84</td>
<td>134,453</td>
<td>JFK</td>
</tr>
<tr>
<td>2000</td>
<td>Aug 87</td>
<td>137,176</td>
<td>NCTCOG*</td>
</tr>
<tr>
<td>2010</td>
<td>Aug 87</td>
<td>153,019</td>
<td>NCTCOG*</td>
</tr>
</tbody>
</table>

*These forecasts are for total employment, while most, if not all, of the earlier forecasts are wage and salary employment.*
The quality of these estimates varies widely, but for the most part, the newer estimates are much more reliable than the older ones. The highest estimate of actual CBD employment—130,000 in 1957—was developed by the Texas Employment Commission (TEC) for a study published in July 1959. Almost no information is available on the procedures used in developing either the TEC estimate or the 1957 estimate of 115,000 prepared by the Business Executive Research Committee (BERC); hence both of these estimates should probably be viewed with suspicion.3

The 1964 and 1977 CBD employment estimates were prepared by NCTCOG and its consultants and they seem to have been done with some care. The figures for 1980 and subsequent years are all careful estimates prepared by the U.S. Bureau of the Census, NCTCOG, or the Dallas Central District Association (CDA). Since 1984, the CDA has made strenuous efforts to count downtown employment each year using two different methodologies.

Careful examination of Table 1, taking into account the preceding discussion of data problems, provides little or no evidence that “actual” CBD employment grew over the 53-year period 1956–88. Yet, the forecasts of CBD employment all imply rapid growth. Recent CBD forecasts for the year 2000, which are considerably lower than those prepared during 1980–82, imply a less abrupt departure from the historical trend, but even they seem high by historical standards. The most recent forecasts, released by NCTCOG in 1987, reflect the slowdown in regional growth; NCTCOG’s increased success in resisting pressures to inflate its forecasts; and the sobering effects of lower oil prices, high vacancy rates, and slow growth on expectations. A brief discussion of the year-2000 forecasts illustrates these propositions.

The earliest NCTCOG 2000 forecast, prepared in 1980, indicated that Dallas CBD employment would grow by nearly 100 percent between 1980 and 2000. In 1982, NCTCOG prepared revised land-use forecasts for developing DART’s rail plan. NCTCOG’s revised forecast of CBD employment, i.e., 288,000 in 2000, was 44 percent larger than the already optimistic forecast prepared by the agency two years earlier.

NCTCOG forecasters were more than a little uneasy about the year-2000 forecast they provided IRTA-DART (DART’s predecessor) in 1982, and in the following year the agency prepared new forecasts based on a trend analysis of recent development. In December 1983, NCTCOG distributed a “preliminary” set of “updated” population and employment forecasts. Even though these preliminary forecasts were released at the peak of the region’s oil boom, they indicated that Dallas 2000 CBD employment would be only 63 percent as large (i.e., 180,000) as the forecast prepared for DART two years earlier. Representatives from DART and the city of Dallas took strong exception to these lower employment and population forecasts and were able to “persuade” NCTCOG to increase them. This local review process increased NCTCOG’s year-2000 forecast of Dallas CBD employment by 26 percent to 226,513.

DART, recognizing the implications of lower CBD employment forecasts for its ridership projections, refused to accept the 226,513 figure. After intense negotiations, NCTCOG released an “alternative” forecast for the DART service area. NCTCOG labeled this 1984 forecast, which was identical to NCTCOG’s 1982 forecast for the same area, “2000-high” and DART continued to use a year-2000 CBD employment level of 288,000 for its system planning.

During 1984–87 NCTCOG worked to improve its data and forecasting methods by implementing new models and developing more accurate small-area, base-year estimates of employment and population. As part of that program, I (1985a) prepared crude, trend projections of Dallas CBD employment. My 2000 CBD projection of 134,000 jobs, completed in January 1985, was less than half as large as the 288,000 figure DART was using at the time for rail system planning.

In August 1987, NCTCOG released revised projections based on better historical data and improved forecasting methods. NCTCOG’s “improved” land-use forecasts indicated that Dallas CBD employment in 2000 would be 137,000, or only 48 percent of the level used by DART in planning its rail system. NCTCOG analysts, moreover, had reason to suspect that even these much lower forecasts of CBD employment might still be too high, since preliminary runs of NCTCOG’s new land-use forecasting model produced no CBD employment growth whatsoever.

Even DART was forced to acknowledge the new realities. Sometime during 1986, it shifted the year-2000 CBD employment forecast it had been using for its planning, i.e., 288,000, forward by ten years to 2010. In May 1987, moreover, DART had NCTCOG prepare a 2010 ridership forecast based on a CBD employment level of 209,000, and in July 1987 it had NCTCOG prepare a ridership forecast using NCTCOG’s new, i.e., 1987, land use forecasts. Neither forecast was released to the public. NCTCOG’s new 2010 forecast of Dallas CBD employment, 153,000, was only 53 percent as large as the year-2000 figure of 288,000 that DART had previously used in planning its rail system. If this forecast is converted to wage and salary employment to make it comparable to earlier forecasts, 2010 CBD employment becomes 130,000, or only 45 percent of the level previously used by DART for 2000.

Forecasting Transit Ridership

Ridership forecasts prepared by NCTCOG for DART in 1983, prior to the first referendum, indicated there would be 546,000 rail boardings (unlinked trips) and 1,145,000 rail and bus boardings in 2010 if the proposed 160-mile rail system was built (Table 2).4 Three years later (1986), DART released new ridership projections for an “approved” 93-mile system based on the “2000-high” demographics, i.e., 288,000 CBD employees. The year-2011 projections for the completed 93-mile system indicated that there would be only 44 percent as many “unlinked” transit trips as were projected for the original
TABLE 2: 2010 Ridership projections for DART's proposed rail system

<table>
<thead>
<tr>
<th>Year of forecast, CBD employment, and miles of rail</th>
<th>Rail trips</th>
<th>Total transit trips</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linked</td>
<td>Unlinked</td>
</tr>
<tr>
<td>1983 Forecasts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>287,000 in 2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010/160 miles</td>
<td>NA</td>
<td>546,000</td>
</tr>
<tr>
<td>2010/93 miles</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>1988 Forecasts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>287,000 in 2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010/71 miles</td>
<td>180,000</td>
<td>220,333</td>
</tr>
<tr>
<td>2011/93 miles</td>
<td>241,000</td>
<td>298,000</td>
</tr>
<tr>
<td>1987 Forecasts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>153,000 in 2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010/93 miles</td>
<td>184,000</td>
<td>213,000</td>
</tr>
<tr>
<td>1988 Forecasts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>153,000 in 2010</td>
<td>Baseline, i.e., 1987 actual</td>
<td>NA</td>
</tr>
<tr>
<td>Traditional</td>
<td>152,000</td>
<td>174,000</td>
</tr>
<tr>
<td>Moderate</td>
<td>183,000</td>
<td>210,000</td>
</tr>
<tr>
<td>Aggressive</td>
<td>205,000</td>
<td>236,000</td>
</tr>
<tr>
<td>Conservative (developed by author)</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>


1986 Forecasts: Prepared by PBDC, September 1986. Published in DART, "DART Rail System Description," August 1986, Figure 2-2.


160-mile rail system for 2010. (The 2011 ridership figures are used because the final 22 miles of the rail system were not scheduled for completion until the end of 2010.)

In 1987, DART released still another set of 2010 ridership projections for an “approved” 93-mile rail system. These 1987 ridership forecasts were based on the “2000-medium” land-use forecasts prepared by NCTCOG in 1982 (the projections made after local review), except that projectized Dallas CBD employment was reduced to 153,000. The 1987 ridership forecasts indicated that the “approved” 93-mile rail-bus system would carry 357,000 “unlinked” transit trips, a level that was more than one-third as large as the 1983 projection used by IRTA-DART for the 160-mile system prior to the election. Even so, DART still refused to consider alternatives other than rail on the grounds that the voters had mandated rail in the 1983 referendum.

NCTCOG’s ‘Improved’ Travel Forecasting Model

NCTCOG’s 1987 land use forecasts were the result of an ambitious effort by the agency during 1983–87 to improve its land-use forecasting capabilities. In addition to improving its historical land-use database and estimating an improved land-use model, NCTCOG also completely revamped its travel forecasting model. After numerous delays, NCTCOG completed updated ridership forecasts for 2010 in spring 1988.

DART’s Shell Game

During May 1988 DART released a report describing updated 2010 ridership forecasts for its $2.9-billion, 92-mile rail-bus plan obtained by using NCTCOG’s 1987 land-use forecasts and NCTCOG’s “improved” travel forecasting model (DART 1988a). DART’s “updated ridership” report presented three 2010 projections (referred to as scenarios by the report) of transit and rail ridership for DART’s proposed 92-mile rail-bus system. Based on assumptions that are similar, if not identical, to those used for the 1987 ridership forecasts, the so-called traditional scenario indicated that about 15 percent fewer linked transit trips would use the proposed DART rail-bus network in 2010 (see Table 2).

In an effort to deflect attention from the 15-percent decline in total transit ridership obtained from NCTCOG’s “improved” travel forecasting models, DART had NCTCOG prepare two additional 2010 forecasts, which DART management labeled “moderate” and “aggressive.” DART no doubt hoped the public and the media would focus on the middle, i.e., moderate, forecast. DART’s gambit worked, as the moderate 2010 projections were the ones invariably reported in the media (Kelley 1988). DART’s misinformation campaign was facilitated by a judicious selection of names for the three scenarios: traditional, moderate, and aggressive. Optimistic, very optimistic, and incredibly optimistic would have been more appropriate.

The cover memorandum sent with the updated ridership report to the DART board’s Planning and Development Committee makes no mention of the 15-percent decline relative to the previous year’s forecast. Instead the memorandum contains the following statement about the forecasts:

Based on a range of input assumptions, three scenarios have been formulated: 1) traditional and [sic] transit assumptions, 2) moderate transit assumptions, and 3) aggressive transit assumptions. To continue to be conservative [emphasis added] in our planning and design activities, the “moderate” scenario will be used. . . . This forecast results in little change from previous DART forecasts (Thorstad and Anderson 1988).

The memorandum fails to acknowledge that the so-called moderate scenario makes assumptions about fares and other forecast variables that were explicitly designed to produce the “little change from previous forecasts” result, and does not explain how the use of assumptions that are more favorable to transit ridership than those used in earlier projections can be regarded as “conser-
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“...Finally, the memorandum makes no mention of the fact that the lower fare assumptions, required to achieve the “little change from previous DART forecasts” result, caused projected annual fare revenues to decline by $21 million for 2010, or by 35 percent, although this information can be gleaned from the body of the report (DART 1988a, 1988b).

While DART’s cover memorandum implies that the moderate scenario is “conservative,” the assumed increases in parking charges and auto-operating costs are quite large, and no justification is provided for departing from the assumptions employed in the 1987 and 1988 traditional projections of 2010 ridership. The usual practice in such sensitivity analyses is to bound the most-likely scenario, which is presumably traditional 2010, by a higher (more optimistic) and a lower (more pessimistic) scenario. DART instead supplemented its most-likely scenario with two higher and more optimistic scenarios. The only plausible explanation for DART’s unconventional approach is its unwillingness to acknowledge the fact that NCTCOG’s improved travel forecasting model produced ridership forecasts for 2010 that were 15 percent lower than those obtained a few months earlier using the same assumptions and NCTCOG’s unimproved model.

A Conservative Scenario

Table 3 presents sensitivity analyses of 2010 transit ridership projections constructed by the author using transit ridership elasticities released by DART (1988a, Table A2-1) and alternative projections of several important explanatory variables. The table includes the three DART scenarios, as well as a “conservative” scenario (developed by the author) such as the one DART should have used. Projected percentage changes in the six explanatory variables and in transit ridership are both compared to base-year, i.e., 1986, conditions.

The first column of numbers contains elasticity estimates obtained from NCTCOG-DART’s improved travel forecasting model (DART 1988a). The last four columns give estimated percentage changes in ridership obtained by multiplying these elasticities by projected percentage changes in fares, transit in-vehicle time, auto in-vehicle time, wait time, CBD parking costs, and auto-operating costs. These percentage changes, shown in columns 3 to 6, were obtained from DART’s updated ridership report, DART’s “Do Nothing Alternative Report” (discussed subsequently here), or other information prepared by DART or NCTCOG.

The bottom line in Table 3 gives the overall increase in ridership between 1986 and 2010 for the four scenar-

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**TABLE 3: Sensitivity analyses of DART ridership projections**

<table>
<thead>
<tr>
<th>Selected variable</th>
<th>Elasticity</th>
<th>Percentage change in explanatory variable</th>
<th>Percentage change in projected transit ridership</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1986 vs.</td>
<td>1986 vs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>traditional</td>
<td>moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fares</td>
<td>-0.19</td>
<td>50.0</td>
<td>-17.9</td>
</tr>
<tr>
<td>Transit time</td>
<td>-0.20</td>
<td>-23.1</td>
<td>-23.1</td>
</tr>
<tr>
<td>Auto time</td>
<td>0.18</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>Wait time</td>
<td>-0.22</td>
<td>-33.3</td>
<td>-33.3</td>
</tr>
<tr>
<td>CBD parking</td>
<td>0.38</td>
<td>20.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Auto-operating cost</td>
<td>0.07</td>
<td>40.0</td>
<td>57.0</td>
</tr>
<tr>
<td>Sum of selected</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBD employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>growth, 1986–2010</td>
<td></td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Projected ridership,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>including effect of</td>
<td></td>
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<td></td>
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<tr>
<td>CBD employment</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>growth</td>
<td></td>
<td>88</td>
<td>121</td>
</tr>
</tbody>
</table>

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*a. The 40-percent increase in transit ridership for the conservative scenario with only 50 percent as much CBD employment growth relative to 1986 was obtained by summing separate forecasts of CBD and rest-of-region ridership. The rest-of-region forecast was obtained by reducing DART’s projected rest-of-region increase in transit ridership obtained for the 2010 traditional scenario, which was 70.9 percent, by 11.6 percentage points, the amount accounted for by the alternative transportation variable assumptions. The alternative (lower) forecast of CBD transit ridership then was obtained by scaling projections of 2010 CBD transit trips obtained using a regression of 1980 CBD transit trips to work on 1980 CBD employment in 1980. A detailed description of these procedures is available from the author.


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As these data indicate, the so-called traditional scenario, which uses assumptions similar to those used for the 1987 ridership projections, indicates that linked transit trips would increase by 88 percent if the proposed $2.9-billion rail-bus system were built. Changes in the six transportation variables account for only 14 percent of the 88-percent increase; employment and population growth appear to account for most of the rest.  

As the data in column 3 indicate, DART analysts assumed for both the 1987 projections and the traditional scenario that transit fares would increase by 50 percent, CBD parking charges would increase by 20 percent, and auto-operating costs would increase by 40 percent between 1986 and 2010 (all in constant dollar terms). The 1987 ridership forecasts and all three DART scenarios assume that transit trip times would decrease by 23 percent, auto trip times would increase by 5.9 percent, and transit wait times would decrease by 33 percent.

To achieve the “little change from previous forecasts” result obtained for the moderate forecast, DART analysts changed the 50-percent fare increase to an 18-percent decrease, CBD parking charges from a 20-percent to a 40-percent increase, and auto-operating costs from a 40-percent to a 57-percent increase. These changes, for which no justification was provided, together produced a 21.7 percentage point increase in projected transit ridership relative to the traditional scenario. The aggressive scenario featured further transit fare decreases, still higher auto-operating costs, and even higher CBD parking rates. In addition to including the large increase in CBD parking costs shown in Table 3, the aggressive scenario assumed a $1.00 ($1984) parking charge for major non-CBD destinations. Parking at all non-CBD destinations was free for the 1987 forecasts as well as for DART’s traditional and moderate scenarios.

Thus, the author’s “conservative” scenario is conservative only in comparison to the three DART scenarios. It uses the same fares as are used in the traditional scenario, and assumes increases in CBD parking and auto-operating costs that are half as large (10 versus 20 percent and 20 versus 40 percent) as those used for the traditional scenario. The author’s conservative scenario also modifies DART’s highly optimistic assumptions about the expected performance of the proposed LRT. DART’s proposed 93-mile rail system was to have had more than 100 street-level grade crossings, and yet DART assumed it would achieve an average operating speed of 37.1 miles per hour, a figure significantly higher than those achieved by the newest, fully grade-separated, heavy rail systems.

The conservative scenario uses average running speeds for the proposed LRT that are 20 percent lower than the speeds DART assumed for its three scenarios. Another area where the enthusiasm of DART analysts may have colored their judgment about system performance is average transit wait times per trip, which in DART’s analysis are 12 minutes for the 2010 bus-rail system versus 18 minutes for the current bus system (in spite of the fact that DART’s 2010 rail-bus system would require 12 percent more transfers). The conservative scenario narrows this differential by assuming that the decrease in average wait times for DART’s 2010 rail-bus system would be 20 percentage points less than the decrease the three DART scenarios assume.

As noted previously, if DART’s sensitivity analyses had conformed to standard practice, DART would have bounded its most-likely scenario (traditional) by a more optimistic one (moderate) and a less optimistic one, such as the author’s conservative 2010 scenario. In this case, DART and the media would have reported the following results in connection with NCTCOG’s new travel forecasting model:

- The model produced a 15-percent decrease in 2010 ridership relative to the earlier, i.e., 1987, forecast.
- The new model in combination with more optimistic assumptions (higher CBD parking charges and higher auto-operating costs) and fares that were 18 percent lower than fares in 1986 (rather than 50 percent higher as in the 1987 forecast and traditional scenario), produced ridership figures that were only 0.4 percent higher than those obtained for the 1987 forecast.
- The use of the model; less optimistic assumptions about LRT speeds, waiting times, parking charges, and auto-operating costs; and the same fare assumptions as were used in the 1987 and traditional forecasts resulted in projections of transit ridership that were less than half as large as those obtained in 1987 with NCTCOG’s old model.

While the updated ridership report does not provide information on projected changes in auto in-vehicle trip times, it does indicate that the speeds of home-based work trips made in the DART service area are expected to decline from an average of 29 miles per hour in 1986 to 27 miles per hour in 2010, or by about 8 percent. Off-peak auto speeds, however, are expected to decline by less than one-tenth of one percent. The weighted average of projected peak and off-peak decreases in highway speeds gives the 5.9-percent increase in auto trip times used for all four scenarios. This should clearly be regarded as an upper bound estimate, since average speeds for auto trips made to and from the CBD and within DART rail corridors are expected to decline by even less than average speeds for the entire DART service area.

These surprisingly small decreases in highway speeds (given claims by supporters of the rail plan that auto congestion will grow much worse between now and 2010) are due to the significant additions to the region’s highway network anticipated between 1986 and 2010. DART’s updated ridership report indicates that freeway lane miles in the DART service area will increase by 44 percent and arterial lane miles by 38 percent between 1986 and 2010, while employment in the DART service area, a good proxy for peak hour travel, will increase by 45 percent over the same period. Employment within the
beltway around Dallas, however, is expected to increase by only 30 percent, and CBD employment is expected to increase by only 31 percent between 1986 and 2010.

In addition to assuming smaller decreases in transit in-vehicle and waiting times and lower CBD parking and auto-operating costs, the author’s conservative scenario also assumes only about half as much growth in CBD employment between 1986 and 2010 as is assumed for each of the three DART scenarios. Taking into account both the more conservative assumptions about changes in the six transport variables and the lower CBD employment levels reduces the projected increase in transit ridership between 1986 and 2010 from 88 percent to 26 percent. Rather than showing a 15-percent decrease relative to the 1987 projection, this scenario represents a 43-percent decline.

DART’s ‘Nonexistent Study’

While DART’s updated ridership report presented three 2010 forecasts, it omitted the most important one: a forecast of 2010 transit ridership for an all-bus system using the same projections of land use and transportation input variables as were used in DART’s 2010 rail-bus ridership forecasts. While neither NCTCOG or DART officials would acknowledge the existence of such a forecast, it was clear that some kind of “all-bus,” or “do-nothing” projection had been prepared. DART kept these “do-nothing” ridership forecasts under wraps because, as the following discussion reveals, they unambiguously demonstrated that DART’s proposed $2.9-billion, 93-mile rail system would carry only slightly more riders than even an unimproved bus system, that is, one virtually identical to DART’s 1986 all-bus system.

On June 21, 1988, four days before the referendum on bond financing, under pressure from Sensible Metropolitan Area Rapid Transit (SMART), a citizen’s group urging a no vote on the referendum, DART released a study, completed several weeks earlier, showing that an all-bus system, very much like DART’s existing system, would carry only 13,217, or 5 percent fewer, riders in 2010 than were projected to use DART’s $2.9-billion rail-bus system in the same year.

At the time that DART reluctantly released its do-nothing (all-bus) ridership forecasts, DART and NCTCOG spokesmen mounted an aggressive disinformation campaign designed to discredit the forecasts by claiming they were irrelevant to the debate about whether DART’s rail system should be built. David McCall (chairman of DART’s board), for example, argued that comparisons of the 2010 all-bus system to DART’s 2010 rail-bus plan were invalid because:

- Even under the most pro-bus scenario imaginable, rail still is projected to carry more passengers than buses (McCall 1988).

Similarly, Gordon Shunk (director of NCTCOG’s Transportation and Energy Division) provided Charles Anderson (executive director of DART) with a carefully crafted “for the record” memorandum (suitable for distribution to the media) in which he stated:

The results described in the June 3 memorandum accompanying the study data actually were inappropriate for comparison to any rail forecast. They were the results of a tentative forecast of travel on the 1986 bus system if it were operating in the year 2010. The subject forecast reflected current bus speeds rather than speeds that are anticipated to occur in 2010, which are likely to be slower. . . .

In retrospect, the terminology used in the June 3 memorandum was inappropriate. The subject forecast was not a DART Do-Nothing and should not have been represented as such. An accurate Do-Nothing forecast would have to be based on bus speeds that are anticipated to occur in 2010, which are likely to be slower (Shunk 1988).

My analyses of the do-nothing projections indicate that they were, in fact, highly relevant to the debate. The bus system assumed for the 2010 do-nothing scenario is “do nothing” with a vengeance. In particular, it is an unimproved all-bus system with only 61 percent as many transit service miles as the extensive rail-bus network included in DART’s 2010 rail-bus plan forecasts. Indeed, DART’s 2010 rail-bus plan actually provided 18 percent more bus-miles than were assumed for the unimproved 2010 “do-nothing” all-bus system.

Taking Increased Congestion into Account

The principal objections of DART and NCTCOG spokesmen to comparisons of projected transit ridership for DART’s 2010 do-nothing (all-bus) alternative and its costly 2010 rail-bus plan were that bus speeds for the 2010 all-bus system were obtained from a 1986 highway network and that use of speeds from the more congested 2010 highway network would have increased 2010 bus travel times and decreased ridership. Fortunately, this claim is easily evaluated using the data on 1986 and 2010 highway speeds discussed previously.

Average peak-hour highway speeds in the DART service area are expected to be 9 percent slower in 2010 than in 1986, and, as discussed previously, the weighted average of anticipated changes in off-peak and peak speeds is -5.9 percent. The effect of the lower 2010 highway speeds on bus ridership can be determined by converting the projected decrease in highway speeds to a percentage increase in travel time and multiplying this figure by NCTCOG’s in-vehicle transit time elasticity.
DECEPTION IN DALLAS

This calculation indicates that a 5.9-percent increase in bus (in-vehicle) trip times would reduce bus use by 2,393 trips per day.\textsuperscript{11}

The calculation described above tells only half the story. While increased congestion would mean longer trip times for bus riders, it would also increase trip times for car users. Fortunately, the NCTCOG-DART travel forecasting model includes an auto trip time elasticity as well as the transit trip time elasticity discussed previously. This auto travel time elasticity indicates that transit use will increase by .18 percent for each 1-percent increase in auto travel time.

The net effect of lower highway speeds (increased travel times) is found by multiplying the sum of DART's in-vehicle transit time elasticity (-0.20) and its auto travel time elasticity (0.18), i.e., -0.02, by the estimated increase in transit in-vehicle travel times. Since the weighted average of peak and off-peak highway speeds is expected to decrease by 5.9 percent between 1987 and 2010, the NCTCOG-DART travel forecasting model indicates that the anticipated increase in congestion would decrease peak-period transit ridership by less than two-tenths of one percent. The results of these calculations are shown in Table 4. The projected increases in highway congestion, which DART and NCTCOG spokesmen made so much of, would reduce ridership on the 2010 all-bus system by a mere 239 trips.

DART's 2010 ridership projections for its rail-bus system include 6,000 to 8,000 linked transit trips to/from suburban communities outside the DART service area. While the operating costs and vehicle miles of service of these non-DART services are not included in the system mileage and cost data, the projected trips are included as part of system ridership. Neither these services nor the people using them are included in the 2010 all-bus network or ridership projections.

Adding transit trips originating outside the DART service area to the 2010 ridership projections for the all-bus system eliminates more than half of the 13,000-trip difference between the 2010 rail-bus and 2010 all-bus (do-nothing) projections. Subtracting the 239 transit trips lost because of greater congestion in 2010 and adding the 7,000 trips originating on non-DART services in 2010 to the 2010 all-bus system reduces the difference in projected 2010 ridership on the rail-bus and all-bus systems to less than 6,500 trips. Table 4 shows the results of these calculations.

Table 4 also includes the results of a calculation that assumes DART would operate a conventional all-bus system in 2010, but that it would expand system coverage to the point where the all-bus system offered the same number of bus miles of service as the combined bus and rail service miles assumed for DART's 2010 rail-bus plan. Of course, the operating costs of this expanded all-bus system would still be significantly lower than that of DART's 2010 rail-bus plan because operating costs per bus vehicle mile are only 60 percent as large as LRT operating cost per train mile (Edmonton 1987).

DART's updated ridership report does not provide an elasticity for transit service miles, but an unpublished paper by Allen (1987), a consultant to DART, contains an estimate based on a statistical analysis of DART's operating experience. Allen obtained a service elasticity of .32 for central city services and somewhat higher service elasticities for suburban local and express services. The estimates in Table 4 were obtained using the lower elasticity. The 2010 all-bus, same-service-miles ridership forecasts in Table 4 indicate that, assuming Allen's estimated service elasticity is valid, 2010 ridership on the expanded all-bus system would increase by 42,179 trips. This is 35,723 more trips than are projected for by DART's $2.9-billion bus-rail network in 2010.

DART could have easily increased ridership on its 2010 all-bus system by charging lower fares than on its far more costly 2010 rail-bus system. The effect of lower fares on bus system ridership can be estimated using the fare elasticity from NCTCOG's travel forecasting model. As the ridership estimates in Table 4 reveal, a 44-percent decrease in fares (the same as DART assumed for its moderate rail-bus scenario) would add almost 17,000 more riders to the all-bus system. Thus, a conventional all-bus system with the same number of transit service

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline
Projection & Year & Planning assumption & Elasticity & Percentage change & Added ridership & Linked transit trips & All-bus minus rail \\
\hline
2000 Rail & 1983 & CBD 288,000 & NA & NA & 486,551 & NA \\
2010 Rail & 1997 & CBD 153,000 & NA & NA & 253,000 & NA \\
2010 All-bus & 1988 & CBD 153,000 & NA & NA & 216,000 & NA \\
2010 All-bus & 1988 & Same as rail & NA & NA & 202,783 & (13,217) \\
2010 All-bus & 1988 & 2010 highway speeds & -0.02 & 5.9 & (239) & 202,544 & (13,456) \\
2010 All-bus & 1988 & Non-DART-area service & NA & NA & 7,000 & 209,544 & (6,456) \\
2010 All-bus & 1988 & Same service miles & 0.32 & 65.0 & 42,179 & 251,723 & 35,723 \\
2010 All-bus & 1988 & 44\% lower fares & -0.19 & -44.0 & 16,953 & 268,675 & 52,675 \\
2010 All-bus & 1988 & 20\% less bus wait time & -0.22 & -20.0 & 8,922 & 277,598 & 61,598 \\
\hline
\end{tabular}
\caption{Alternative projections of daily transit use}
\end{table}

miles as are assumed for the DART 2010 rail-bus plan and charging fares that are 44 percent lower would carry 52,675 (30 percent) more passengers than DART’s costly rail-bus system as projected for 2010.

Besides producing DART’s 2010 do-nothing analysis, which it released only under heavy pressure from SMART, NCTCOG completed and provided DART with still another highly relevant set of completed ridership projections for a scenario termed RAIL86: “The projection (RAIL86) assumes the imposition of the 2010 transit network, including rail, on 1986 highway, demographic, and cost data as used in the 1986 validation run” (Nour zad and Samfield 1988b). These analyses, which were formally submitted to DART on June 6, 1988, and which DART still has not released, strongly support the findings of NCTCOG’s 2010 do-nothing study.

NCTCOG analysts found that DART’s proposed $2.9-billion rail-bus system, if it were operating in 1986, would carry only 12,822 more linked transit riders than DART’s existing (1986) bus system. As Nourzad and Samfield (1988b) point out, “This marginal increase is remarkably consistent with the previously observed difference between the 2010 ‘do-nothing’ and 1986 ‘traditional’ forecasts, where an increase of 13,217 linked transit trips was observed.” Since both the 1986 all-bus (validation run) and the RAIL86 projections were based on 1986 highway speeds, they provide further evidence that the congestion arguments advanced by DART and its apologists have little merit and that they were intended solely to confuse the media and the public and to divert attention from the damaging findings of DART’s “nonexistent” do-nothing ridership projections. The RAIL86 study also provides further evidence that most of the projected increase in transit ridership between 1986 and 2010 is attributable to projected employment and population growth, and their assumed locational patterns, rather than to implementation of the proposed rail system.12

The foregoing assessments of DART’s 2010 do-nothing all-bus and RAIL86 studies make it clear that an intelligent and aggressive package of network expansion, service increases, and lower fares would attract many more riders than would ride DART’s proposed 2010 rail-bus system. It should be emphasized that none of the projections shown in Table 4 assumes any capital expenditures to improve bus system performance. Experiences in Houston, Washington, D.C., Los Angeles, Ottawa, and Pittsburgh indicate that large increases in bus system performance and speeds can be bought cheaply through the construction of Transitway-HOV (high occupancy vehicle) facilities or short sections of exclusive busways (Kain 1988a). These inexpensive improvements would, of course, attract still more riders to an all-bus system.

Cost-Effectiveness of the DART Rail Plan

The ridership projections for DART’s “nonexistent” do-nothing alternative indicate that DART intended to make capital outlays of $431,000 for each additional transit rider in 2010. If the 7,000 trips by non-DART services are either subtracted from the 2010 rail-bus patronage figures or are added to those for the all-bus system, capital costs per additional daily transit user become $898,000.

In a press release distributed two days before the election, DART told a very different story. Table 5 presents estimates used by DART in its press release of the “incremental annualized capital cost per incremental rider” by line for DART’s proposed 92-mile rail system. These

### TABLE 5: Projections of rail ridership and cost-effectiveness measures for 2010

<table>
<thead>
<tr>
<th>Rail line</th>
<th>Transit ridership per day</th>
<th>Capital cost</th>
<th>Added operating cost</th>
<th>Capital cost per added trip</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Incremental</td>
<td>Per year (mils)</td>
<td>Total</td>
</tr>
<tr>
<td>Plano</td>
<td>55,000</td>
<td>21,400</td>
<td>5.99</td>
<td>$906</td>
</tr>
<tr>
<td>Garland</td>
<td>22,000</td>
<td>6,600</td>
<td>1.85</td>
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</tr>
<tr>
<td>Oak Cliff</td>
<td>33,000</td>
<td>11,200</td>
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<tr>
<td>S. Oak Cliff</td>
<td>29,000</td>
<td>14,300</td>
<td>4.00</td>
<td>394</td>
</tr>
<tr>
<td>Irving</td>
<td>25,000</td>
<td>8,100</td>
<td>2.27</td>
<td>372</td>
</tr>
<tr>
<td>Carrollton</td>
<td>17,000</td>
<td>6,100</td>
<td>1.71</td>
<td>315</td>
</tr>
<tr>
<td>Las Colinas</td>
<td>5,000</td>
<td>a</td>
<td>a</td>
<td>307</td>
</tr>
<tr>
<td>South Dallas</td>
<td>29,000</td>
<td>6,700</td>
<td>1.88</td>
<td>86</td>
</tr>
<tr>
<td>East Dallas</td>
<td>13,000</td>
<td>9,500</td>
<td>2.66</td>
<td>77</td>
</tr>
<tr>
<td>Entire system</td>
<td>228,000</td>
<td>83,900</td>
<td>23.49</td>
<td>$2,928</td>
</tr>
</tbody>
</table>

Notes: Transit ridership is based on NCTCOG P3LS forecast of DART 93-mile rail system with 153,000 CBD employment in 2010. Incremental ridership is the difference in linked transit trips (riders) between DART 2010 integrated rail and bus systems and a 2010 all-bus system. Annuitization is based on 280 equivalent days of usage per year. Capital cost estimates are from March 1988 and are based on 1988 dollars. Annualized capital costs are based on an annuitization factor of .105 (10-percent discount rate and 40-year life of capital assets). Las Colinas ridership impacts are included with the Carrollton line.
calculations are based on an incremental (DART rail versus all-bus) 2010 ridership of 83,390 trips. While DART, as far as I have been able to determine, never released a 1987, all-bus system ridership projection for 2010, these all-bus forecasts appear to have been done at the same time and in the same way as the 1987 2010 rail forecasts. Both assume 153,000 CBD employment in 2010 and both were prepared using NCTCOG’s “old” forecasting model.

If DART’s updated, i.e., 1988, rail and all-bus forecasts for 2010 (obtained using NCTCOG’s improved forecasting model) are used, as they presumably should be, the incremental annualized capital cost per incremental rider becomes $85 rather than the $13 claimed by DART in its press release. The incremental operating costs of DART’s 2010 rail plan, moreover, would come to an additional $6 per added trip (see Table 5). The comparison is even worse if the incremental ridership figures are adjusted to reflect the 7,000 non-DART riders. In this case, DART’s $2.9-billion rail-bus system would provide only 3,228 more transit round trips a day than DART’s unimproved all-bus system in 2010 for a capital cost per additional user of $175 and an incremental operating cost per additional round trip of $12.50.

Assessing the Dallas Example

What do the preceding analyses of DART land use and travel forecasts indicate? They strongly suggest that, in the past at least, DART could not be trusted to provide voters and policymakers, or even its own board, with accurate and unbiased information about the ridership, benefits, and costs of its proposed rail systems and, more important, of alternatives to its extravagant rail plan.

The analyses call into question the techniques used by DART and its supporters to persuade Dallas voters first to provide DART with a dedicated source of tax revenues and then to approve the sale of long term bonds to build an extravagant rail transit system. The motivations, accountability, and integrity of the professionals and political leaders involved in selling rail transit to the region’s voters warrant close examination. While some advocates were clearly acting out of perceived self-interest, the unswerving and blind commitment of many others to rail is difficult to explain in these terms. I leave it to others, more skilled in bureaucratic and political analysis to provide an explanation. While the specific findings presented in this article are limited to Dallas, abuses similar to those described here are commonplace and occur in varying degrees in virtually every metropolitan area, both in the United States and overseas.

AUTHOR’S NOTE

This article benefited greatly from both substantive and editorial suggestions by Sanjay Daniel, Ross Gittell, John R. Meyer, Don Pickrell, Steve Polzin, Gordon Shunk, Mark Stein, and Sam Zimmerman. It goes without saying that none of the above agrees with all that is included in the article or is responsible for any errors that remain.

NOTES

1. During September–November 1981 Dallas and several contiguous cities and towns created Interim Regional Transit Authority (IRTA), a temporary regional transit authority to devise a transit plan for the region; in December 1982 IRTA changed its name to DART (DART 1988d).

2. DART did not even stoop to the common practice of developing, evaluating, and rejecting “strawmen” as part of the process of selling the voters and public officials on the need for a rail system. DART was able to avoid even the pretense of studying alternatives to its preferred rail system because its willingness, until recently, to renounce federal capital assistance enabled it to avoid the Urban Mass Transportation Administration (UMTA) alternatives analysis process.

3. The possibility that Dallas CBD employment actually fell between 1957 and 1977 or was at its post-World War II high in 1957 cannot be completely discounted (CBD employment in retailing, manufacturing, and wholesaling very likely declined by large amounts during this period), but estimation error is also quite likely. TEC used payroll data and these data could easily have been contaminated by employment estimates that were for the entire firm rather than for workers employed in the Dallas CBD.

4. The terminology “linked” and “unlinked” trips refers to the treatment of transfers. A single bus-rail-bus trip to work is counted as three boardings (unlinked trips), but only one linked trip. While linked trips are more meaningful for most purposes, transit agencies have increasingly reported boardings (unlinked trips). Statistics on boardings can produce a seriously misleading impression of the impact of a new rail system on transit ridership, since introduction of a new rail system invariably leads to more transfers as many trips previously made as a single bus trip are converted to two or even three boardings (unlinked trips). Boardings on Atlanta’s transit system (rail plus bus), for example, increased by 47 percent between 1980 (the year the first segment of Atlanta’s rail system began operating) and 1987; linked trips, however, increased by only 2.3 percent during the same period.

5. It is difficult to determine precisely when NCTCOG completed these ridership projections. A memorandum describing the projections was sent to the DART board’s Planning and Development Committee on May 10, 1988, but it appears that the DART staff had the projections, or at least the traditional scenario, several weeks or even months earlier. Steve Polzin, DART’s manager of systems planning, in commenting on an earlier draft of this article, indicated that his staff received a 2010 forecast based.
on a CBD level of 153,000, which was not necessarily the first, during July 10, 1987, ten months before the updated ridership forecasts were sent to the DART board and released to the public.

6. Some perspective on these projected increases is provided by DART’s experience during 1983–88, when a 50-percent fare cut (which became increasingly larger in real terms over the 1983–88 period) and a 91-percent increase in the vehicle miles of service led to a 22-percent increase in unlinked transit trips.

7. NCTCOG’s mode split model is nonlinear and multiplicative, and thus the results obtained from running the full forecasting models may differ somewhat from estimates obtained by summing the individual changes calculated from the reported arc elasticities. Nonetheless, use of this method to predict the difference in transit ridership for the traditional and moderate scenarios yields a difference of 17.2 percentage points as compared to a difference of 17.6 percentage points obtained by NCTCOG from running the full model.

8. None of the four new, fully grade-separated, heavy rail systems studied by Pickrell (1989) in his UMTA-funded study comparing forecast and actual outcomes for new federally financed rail systems attained speeds that are even close to those assumed by DART for its partially at-grade LRT. Actual average operating speeds for the four heavy rail systems were: Washington, D.C., 23 mph; Atlanta, 23.9 mph; Baltimore, 17.1 mph; and Miami 31.5. Pickrell also presents estimates of actual operating speeds for four new LRT systems that, like the proposed DART system, are less than fully grade-separated. Actual speeds for these LRT systems are: Buffalo, 17.5 mph; Pittsburgh, 16.2 mph; Portland, Oregon, 19.6 mph; and Sacramento, 20.5 mph. Finally, Pickrell found that actual speeds were less than forecast speeds in five of the seven systems for which he was able to obtain both actual and forecast speeds, and were the same for one. Only Pittsburgh, with an actual operating speed of 16.2 mph, and a forecast speed of 15.8 mph, and Miami, with an actual speed of 32.2 mph and a forecast speed of 30.8, did better than forecast.

9. DART’s use of lower fares in the moderate scenario accounted for more than half of the increase in transit ridership relative to the traditional scenario. The 50-percent fare increase assumed for the traditional scenario (relative to 1986) reduces transit ridership by 9.5 percent. Replacing this assumed 50-percent increase with a 17.9 percent decline in the moderate scenario produces a 3.4-percent increase in place of the 9.5 percent decline obtained for the traditional scenario. Use of the higher CBD parking charges and auto-operating costs of the moderate scenario and the same fare as in the traditional scenario and 1987 forecasts results in a 12.6-percent decline in transit ridership relative to the 1987 forecasts.

10. The reference to DART’s “nonexistent study” reflects repeated denials of the study’s existence by NCTCOG and DART officials. Surprisingly, these denials extended to David McCall’s letter sending the study to David Fox, chairman of Sensible Metropolitan Area Rapid Transit (SMART). McCall, chairman of the DART board, states, “[T]his is to officially inform you that there is no DART or COG study in existence which proves that, to quote your letter, ‘If DART does not build its rail system, but simply improves its bus operations, the result would be more riders than projected under the rail scenario.’” Elsewhere in the letter McCall states, “[I]t seems terribly clear that the request for the alleged, nonexistent study is no more than a last-minute ‘red herring.’” and “By raising the specter of this nonexistent study, SMART has confirmed by its own actions what we have said all along: that your group supports a no-action, do-nothing approach to preserve the concrete-and-buses status quo, regardless of the traffic congestion caused if the public were to choose your do-nothing policy” (McCall 1988).

11. Actual increases in bus in-vehicle time would probably average much less than 5.9 percent since bus speeds depend to a significant extent on passenger loading and unloading times, which would not be affected by lower highway speeds. In addition, the streets most heavily used by DART buses are expected to experience smaller increases in congestion than the DART service area as a whole. Thus, the analyses provide an upper bound estimate of the effect of lower bus speeds on 2010 do-nothing transit ridership.

12. As was true of the earlier comparisons, the rail-bus network used for the RAIL86 ridership projections provided far more (3.4 times as many) vehicle miles of transit service than the 1986 all-bus system. Since the all-bus system carried almost as many passengers as DART’s extensive 2010 rail system, there is a huge difference between the productivity of the two systems. Operating cost differences are even larger, since nearly a third of the vehicle miles in the rail-bus system are much more expensive LRT miles.

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R. Bruce Stephenson · · · · · "Duel in the Sun: Competing Urban Visions in St. Petersburg, Florida, 1980-1985," a doctoral dissertation in history undertaken at Emory University, 1988

The Catherine Bauer Wurster Prize, for the best published article in American planning history (1986-1989)

Christopher Silver · · · · · "Urban Planning in the New South," published in the Journal of Planning Literature, Autumn 1987

The Theodora Kimball Hubbard Prize, for the best conference paper in American planning history


The National Student Research Paper Prize, for the best student research paper in American planning history (1988-1989)

Jay C. Getz · · · · · · · · · · · · · · "Transforming Conscience into Legislation: Lawrence Veiller and the Professionalization of Housing Reform," produced at the Department of Urban and Regional Planning, University of Illinois at Urbana-Champaign, under Professor Albert Z. Guttenberg

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