PART 3

Management and Staffing

Recent Developments in LRT Staffing and Productivity

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A number of new light rail transit (LRT) systems have come on line in the past 10 years, and several older systems have substantially renovated their physical plant. As the new systems reach maturity and the older ones adjust to new facilities, staffing changes may occur to take advantage of opportunities for enhanced productivity or to reflect the aging of the fleet and changing requirements for maintenance. System growth also may result in changed staffing needs. Analysis of current staffing and plans at a number of LRT operations in North America allows productivity factors to be derived. Definitions of labor classifications and job duties must be carefully considered when attempting to measure productivity, because the same functions are performed by staff in different classifications on different properties. The focus here is on the direct and indirect functions that must be performed to provide the transit services and on ratios of support to line operating and maintenance staff. Organizational decisions, notably the make-or-buy decision to perform functions with work force or to contract them out also play a role in productivity. Functions performed at a systemwide level on behalf of an LRT operation that is a small part of a large multimodal operation are also potentially significant in productivity. Section 15 data, although improved, still do not address these issues adequately, requiring that comparisons among properties be made with extreme caution.

A number of new light rail transit (LRT) systems have come on line in the past 10 years, and more will do so shortly. Several older systems have also substantially renovated their physical plant. It is therefore appropriate to examine current staffing and organizational arrangements to learn what productivity innovations are taking place. A related question is the way in which new LRT operations fit organizationally into transit systems that have been primarily bus-oriented.

Prior research indicated that properties differ widely in measured productivity rates (*1*). Sources of the differences include

- Equipment types,
- Labor practices,
- Environmental conditions,
- Operating procedures, and
- Errors in data reporting and differences in definitions.

To the extent that a pattern appears to be emerging, it can best be described as follows: The new LRT properties appear to be somewhat more willing to examine nontraditional ways of accomplishing the tasks needed to operate the system. A great variety of arrangements appear to exist for contracting out various work tasks and for sharing staff among operating divisions where functions performed are not unique to LRT operations. The overall thrust of these arrangements appears to be aimed at maximizing the scale economies that may exist in larger operations and thus minimizing the cost of LRT services.

The sections that follow discuss some of the staffing areas and how differences among agencies affect measured productivity. Attention is devoted to both the institutional and the measurement issues.

TRANSPORTATION STAFFING RATIOS

Operating Labor

Two measures of train operator productivity are annual average revenue vehicle hours per operator and ratio of operators to cars in peak service. Of the 10 U.S. LRT-operating properties reporting Section 15 data to UMTA for their fiscal year (FY) 1989, vehicle hours per operator ranged from 3,727 (Buffalo) to 1,100 (Pittsburgh) (*2*). However, it must be noted that several of the properties operate a multiple-unit train with only one operator, whereas others require one operator per car. Dividing the properties along those lines, a slightly different picture emerges, as presented in Table 1.

Except for San Jose, which was still in its initial stages of LRT operation, and Newark, which is a very high-frequency, short line with unusual operating characteristics, the productivity range for properties using one operator per train is completely above the range for properties with one operator per car, and the average for one-per-train operator productivity is more than 50 percent higher than for one-per-car properties. Among the unusual operating characteristics that may account for the apparently high productivity in Newark is that all cars are stored overnight at the Penn Station end of the line, eliminating deadhead trips out of revenue service. Also, qualified extra operators are drawn from the roster of a nearby NJ Transit bus depot and may not be counted in the rail operator head count. The issue of operator productivity is further complicated by the fact that some properties draw extra operators from the ranks of qualified bus operators but do not count them on the LRT operators' roster, thereby making the apparent productivity per LRT operator higher than it actually is.

It is interesting to note that the staffing plan for the St. Louis Metro Link assumes 1,668 train hours per operator per

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TABLE 1 Annual Average Revenue Vehicle Hours per Train Operator (2)

Property	Annual Hours per Operator
Properties Using One Operator per Train	
Buffalo	3726.9
San Diego	2789.7
Portland	2308.7
6-city arithmetical average	2254.4
San Francisco[a]	1745.1
Sacramento	1734.6
San Jose	1221.5
Properties Using One Operator per Car	
Newark	2008.0
Philadelphia	1546.1
6-city arithmetical average	1409.3
Boston	1298.8
Cleveland	1294.2
New Orleans	1207.9
Pittsburgh	1100.9

[a]San Francisco uses one operator per car for the surface portions of its operation and one per train in the MUNI Metro subway portion.

year. Given that the St. Louis operation will initially be composed primarily of one- and two-car consists, the productivity ratio agrees well with the reported statistics for one-operator-per-train properties.

Transportation Administration and Support

Other things being equal, the higher the ratio of operators to administration and support staff, the lower the operating cost. Table 2 presents the ratio of operators to transportation support staff, which ranges from 8.33 for New Orleans down to 1.16 for Buffalo.

Some of the variations in the ratio are readily explained. One-operator-per-car properties could be expected to have a higher ratio of operators to support than one-per-train properties, because administration and support are more a function of the number of trains on the line than the number of cars. Staffing plans for some LRT systems currently under construction indicate that street supervision will be performed by the same staff that supervises bus operations, possibly augmented by a few positions. It is not clear how the numbers reported in the Section 15 data were derived for properties that do not have a dedicated LRT supervisory staff.

It is difficult to account for doubling or halving the ratio, as occurred in San Francisco, New Orleans, Philadelphia, Pittsburgh, and Cleveland. Possible explanations include

- Inconsistencies in reporting,
- Expansion of service (more operators, no more support), and
- Adding support staff without more service.

It is interesting to note that the newer properties, as a group, appeared more stable than the older ones in this ratio.

The Baltimore Central Light Rail Line operations plan projects 2.4 revenue vehicle operators per transportation administrative/support staff member; the St. Louis Metro Link plan calls for 1.33 operators per transportation support staffer. However, the St. Louis plan includes eight people in a position classified as "operations/security supervisor." Eliminating those positions would bring the ratio up to 1.89.

TABLE 2 Operators per Transportation Support Staff Member

Property	Ratio 1987 Data	Ratio 1989 Data
Properties Using One Operator per Train		
San Diego	2.00	2.43
Portland	2.06	1.87
Sacramento	1.10	1.82
San Francisco	5.14	1.74
San Jose		1.46
Buffalo	0.90	1.16
Properties Using One Operator per Car		
New Orleans	4.00	8.33
Newark	2.97	5.12
Philadelphia	8.33	3.87
Pittsburgh	0.92	2.53
Boston	2.09	2.44
Cleveland	3.17	1.25

SOURCE: UMTA Section 15 Data, 1987 and 1989.

MAINTENANCE STAFFING RATIOS

Cars per Maintainer

The definition of maintenance staff varies somewhat among properties. Car cleaners and hostlers, for example, are included with maintenance staff on some properties, with transportation staff on others, and are contract employees on a third group. With the exception of two outliers, however, the ratio of cars per maintainer ranges from 1.0 to 2.6, as presented in Table 3. The variations observed over time have several sources. San Diego expanded its fleet significantly. Sacramento added staff. Buffalo and Newark may have reclassified staff positions for reporting purposes.

Interpretation of the 1989 ratio of cars to mechanics is somewhat ambiguous. At first glance, one might assume that

TABLE 3 Cars per Maintainer

Property	Ratio 1987 Data	Ratio 1989 Data
Boston		5.7
San Diego	1.67	2.6
San Jose		2.6
Sacramento	3.71	2.4
Portland	2.00	2.0
Cleveland		1.9
Buffalo	1.29	1.8
Philadelphia		1.5
New Orleans		1.2
Newark	3.00	1.0
Pittsburgh		1.0
San Francisco		0.7

SOURCE: UMTA Section 15 Data, 1989 (2); interviews with system representatives, 1987.

a property with relatively few maintainers (i.e., more cars per maintainer) was more efficient or enjoyed a relatively trouble-free fleet, or both. However, many other factors can influence the ratio.

Obviously the degree of contracting-out influences the staff count and thus the ratio. A more detailed financial analysis, however, would identify maintenance contract costs that could be taken into account in examining the overall efficiency of a property's LRT maintenance. Similarly if the fleet is relatively new and still under warranty, with manufacturer's staff performing some of the maintenance tasks, the ratio will appear higher than it might several years hence.

Another possible explanation for a high cars-to-mechanics ratio is a high spare ratio, which could be the result of a number of influences:

- An older fleet kept in active reserve and hence counted as part of the active fleet, but in reality used very little,
- Advance purchase of rolling stock in anticipation of system expansion,
- A shortage of maintenance bays, forcing cars to be sidelined awaiting their turn for repairs, or
- A shortage of qualified mechanics, with the same result.

Baltimore's operations plan calls for 1.94 cars per maintainer; St. Louis' for 16 vehicle maintainers for 31 cars, also a ratio of 1.94. Baltimore is open to the possibility of splitting assignments of maintenance staff between their heavy and light rail vehicles, an option not available to St. Louis.

Vehicle Maintenance Administration and Support

The ratio of vehicle maintenance staff to supervisors and support staff varies widely among properties, as shown in Table 4. Unlike transportation employees, the efficiency issue is less clear-cut in vehicle maintenance. A high ratio of maintainers to support staff may reflect, for example, any of the following:

- A large shop with a large number of employees supervised by a few managers,
- Contracting out car cleaning, reducing the number of support staff, or
- Purchasing and stores employees counted as part of central staff rather than dedicated to LRT.

In contrast a low maintainer-to-support-staff ratio may reflect the presence of supplier-furnished maintainers performing warranty work on a newer fleet. The same property in later years might have more maintainers doing running repairs, fleet overhauls, and so forth without adding to the support staff.

Baltimore's CLRL operations plan calls for 1.06 vehicle maintainers per maintenance support staff member. Support staff includes six car cleaners. St. Louis projects a ratio of 2.29 vehicle maintainers per maintenance support person. However, car cleaning is to be contracted out; the ratio would be lower otherwise. It is interesting to note that none of the "newer" LRT systems has experienced a ratio of maintainers to support staff as high as that projected for the two systems soon to come on line.

Perhaps the fairest conclusion that can be drawn from the Section 15 data is that such variables as fleet age, percent of maintenance work done under warranty, and percent of unit overhaul done by staff versus percent contracted out must be taken into account before any judgment is made about the efficiency of an individual property's staffing pattern. Simple comparisons based on the Section 15 data are not likely to be very helpful.

TABLE 4 Vehicle Maintainers and Maintenance Administration and Support (*2*)

Property	Ratio	Property	Ratio
Newark	4.11	Boston	1.09
San Francisco	2.70	San Jose	0.99
Philadelphia	2.64	Cleveland	0.94
New Orleans	1.60	Sacramento	0.85
Pittsburgh	1.22	Portland	0.73
Buffalo	1.16	San Diego	0.62

Nonvehicle Maintenance

The 1989 reported staffing for nonvehicle maintainers appears generally consistent with the 1987 data reported in an earlier study (*1*). Table 5 presents the ratio of nonvehicle maintainers per track mile in 1987 and 1989. The difference in the Newark data is viewed as an anomaly, possibly caused by a redefinition or an error in reporting for Section 15 in 1989. (The 1987 figure, based on a direct interview with supervisory staff in Newark, is thought to be more reliable.)

Except for Buffalo, the newer properties generally require fewer nonvehicle maintainers per track mile than the older ones. This may be attributable to low-maintenance design of track, power distribution, and facilities (including stations) in the newer systems. On the other hand, some portion of the staff ratio reduction on newer systems is caused in some cases

TABLE 5 Nonvehicle Maintainers per Track Mile

	Ratio	
Property	1987 Data	1989 Data
Newark	2.35	0.05
Sacramento	0.43	0.22
San Diego	0.29	0.46
Portland	0.82	0.86
Boston		1.26
Pittsburgh		1.51
San Jose		1.59
Cleveland		1.68
San Francisco		1.72
New Orleans		1.88
Philadelphia		2.17
Buffalo	5.56	5.30

SOURCE: UMTA, Section 15 Data, 1989 (*2*); interviews with representatives of properties, 1987.

TABLE 6 Nonvehicle Maintainers per Station (2)

Property	Ratio
Newark	0.04
Sacramento	0.82
San Diego	0.86
Portland	1.04
Boston	1.15
San Jose	1.55
Cleveland	1.64
Buffalo	5.34
Philadelphia	6.20
Pittsburgh	7.24
San Francisco	10.33

by contracting out station cleaning and other nonvehicle maintenance (e.g., wayside cleaning in San Diego). Baltimore expects a ratio of 0.84; St. Louis, 0.80.

The number of stations in the system is apparently not a major determinant of the size of the nonvehicle maintenance staff. If it were, the ratio of nonvehicle maintainers per station would be expected to be fairly uniform across systems. Instead, as Table 6 shows, there is a very wide variation.

The San Francisco ratio appears extremely high because only the nine stations in the Muni Metro portion of the LRT system are counted. The system has 54.2 mi of track, however, and the ratio of nonvehicle maintainers to track miles is reasonable for an older system. Similarly Pittsburgh reports 13 stations but 62.4 mi of track. Both Philadelphia and San Francisco have a significant amount of street running, which places different demands on nonvehicle maintenance than operation on private right-of-way.

TABLE 7 Administrative Employees as Percentage of Total Operating Staff (2)

Property	Percentage
New Orleans	1.7
San Francisco	3.4
Sacramento	8.7
Newark	9.2
Pittsburgh	9.5
San Diego	11.5
Buffalo	12.5
San Jose	14.8
Philadelphia	15.1
Boston	15.8
Portland	19.7
Cleveland	19.9

ADMINISTRATIVE STAFFING

Table 7 presents the ratio of administrative to total operating employees. No pattern of older versus newer systems emerges in analyzing the statistics. The systems with lowest ratios are generally smaller parts of larger transit systems that may be somewhat more integrated into the overall agencies. However, Philadelphia, Boston, and Cleveland do not fit this explanation. Their administrative staffing ratios may reflect scale diseconomies of larger agencies.

Baltimore's staffing plan calls for no additional staff classified as purely general administrative; St. Louis' projects six employees in the operations division not assigned to transportation or maintenance. The difference may in part reflect the fact that Baltimore already has a functioning heavy rail division. St. Louis' administrative staff would represent 4.7 percent of the positions in the rail organization.

CONCLUSIONS

Staffing ratios, as reported in the last few years, appear to be somewhat more stable for individual systems than in the first years of the Section 15 program. However, the newer systems are still growing, and staffing may be expected to change as systems expand, fleets age, and new arrangements for contracting out services are attempted. The LRT systems of the United States are still a very varied lot in their staffing patterns and their needs, and are likely to remain so over time.

Although the overall quality of Section 15 data has improved somewhat in the past few years, the anomalies identified in the course of research suggest that there is still room for error and misinterpretation. It remains important for users of Section 15 data to inquire further as to the reasons for seemingly major differences in productivity measures among properties. All the reasons that have been cited, such as contracting-out decisions, the size of the LRT operation, and where it fits in a larger organization, the stage of development of the LRT service—and more—may be valid explanations for seemingly drastic differences among properties.

REFERENCES

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