

# Workshop 3: Human Resources for Maintenance

## Issue Areas

The role of human resource management in maintenance is of critical importance. It is generally accepted that more effective maintenance depends on better training and worker-management cooperation, but no clear agenda for improvement has been developed. Workshop 3 participants were asked to discuss ways of improving employee selection and training and to identify other ways in which maintenance manpower can be made more productive. Participants were also asked to discuss union relations and cooperation among drivers, mechanics, and management.

## Resource Paper

James Gregory Mitchell  
Detroit Department of Transportation

In spite of hundreds of millions of dollars spent by federal, state, and local mass transportation agencies in the United States over the past two decades, significant improvements in the delivery of public service have not materialized. Such a statement is difficult for many of us in the mass transportation industry to accept, since it implies that we have not been doing our job. However, we are beginning to realize that this problem is almost universal in the transit industry. In fact, declining productivity, diminishing cost-effectiveness, and lower operating efficiency are fast becoming the rule rather than the exception in many U.S. industries.

It is time for us to openly acknowledge the scope of this problem and work together in finding solutions. But you do not need me to tell you this. UMTA Administrator Teele was quite clear and thorough in opening our eyes to this situation during his testimony to the House Committee on Public Works and Transportation, Subcommittee on Investigations and Oversight, in June 1981 (1). I urge those who have not done so to read the transcript of his address because it presents UMTA's justification for its diminished role in local mass transportation functions. In other words, we will be receiving fewer federal dollars in the years ahead for wages, new equipment, diesel fuel, etc.

For most of us, the choices are tough but crystal clear: We must either cut service, raise local revenue (higher fares or more taxes), or improve efficiencies. I believe all of us here understand which of these three unpleasant options will be the most popular with the people or agencies that direct us. I also realize how difficult it will be for most to improve cost efficiencies--not because of any deficiency in management expertise or commitment but because of the depth and breadth of the problem.

This paper focuses on the human resource component of the bus maintenance system. It is my feel-

ing that this component represents the single largest element of the mass transportation cost-efficiency problem and therefore that its solution will result in the highest level of improvement. Although exact percentages are difficult, if not impossible, to determine, it has been estimated that roughly 50 percent of the total bus maintenance workload on a typical day at the Detroit DOT is directly attributable to human resource problems--e.g., absenteeism, wrong diagnosis, improper application of maintenance procedures, or misallocation of labor resources. This percentage may sound high until one considers the numerous aspects of the human resource element and the many ways in which each can influence bus reliabilities and availabilities. For any maintenance manager, human resources should be evaluated whenever the percentage of "downed" vehicles exceeds about 20 percent during the peak, scheduled evening operations are often neglected in order to respond to corrective maintenance needs, or more than 5 percent of the operating fleet requires on-the-road service during an extended time period. At the Detroit DOT, we know we are in trouble because all of these key indicators are present.

Many U.S. maintenance managers are familiar with such symptoms. Because human resource difficulties are shared by a large number of transit properties, it is likely that common solutions can be found. In working together, we can minimize the resource drain on individuals that usually accompanies such involved problem solving. Finally, because human resource problems have been experienced by other U.S. industries in recent years, there is a good chance that much of our work has already been done for us. All we need to do is to evaluate the success of other improvement programs and determine their applicability to bus maintenance.

### WHERE WE ARE

In attacking any problem of such large scope, it is best to begin by identifying the nature of the problem--what it is and how it got to be that way. It is hoped that this preliminary step will prevent us from wasting time on symptoms and help us to focus on the deeper causes. Although my perspective has been formulated through close contact with the Detroit DOT over the past five years, I think many similarities with other urban bus operations will be apparent.

Because I so often hear senior maintenance personnel compare the dismal performance of today's work force with that of the "good old days", I decided to take a closer look at what made the old days so good, especially concerning the labor force. For obvious reasons, I limited this examination to four fundamental elements: skills, motivation, work environment, and organizational structure. No specific point in time was selected to separate "then" from "now" because there was an extensive period in

Table 1. Operating statistics for Detroit DOT: 1951-1981.

Year	Journeyman Mechanics	No. of Buses in Fleet	Revenue Miles Operated	Revenue Miles per Mechanic	Vehicles per Mechanic	Miles per Vehicle	Passengers Carried	Passengers per Mechanic	Passengers per Vehicle	Passengers per Mile
1951	409	2043	64 813 363	158 468	4.96	31 725	180 244 863	440 696	88 226	2.78
1960	268	1285	41 570 454	155 114	4.79	32 351	135 002 366	503 740	105 060	3.25
1965	204	1144	38 530 003	188 873	5.61	33 680	115 049 533	563 968	100 568	2.99
1970	186	1180	37 734 444	202 873	6.34	31 978	115 203 635	619 374	97 630	3.05
1981	198	803	26 999 883	136 363	4.06	33 623	66 017 000	333 419	82 213	2.45

Note: Data taken from annual reports and annual fleet inventories of the Detroit Department of Street Railways (1951-1973) and the Detroit DOT (1974 to present).

which things were neither all good nor all bad but in transition. A brief examination of the past 30 years at the Detroit DOT illustrates the extent of this transition period.

In Table 1, four important operating statistics are traced over three decades, from 1951 to 1981. Some of these statistics are combined to produce popular efficiency ratios, such as vehicles per mechanic and passengers per vehicle. Clearly, some ratios have changed dramatically while others have not. It is especially interesting to note that very little change has taken place in the miles-per-vehicle ratio, a commonly used measure of bus maintenance efficiency. All other factors being equal, this would indicate a fairly consistent level of mechanic efficiency for the 30-year period. Even though vehicles per mechanic decreased about 36 percent between 1970 and 1981, varying levels of coach reserves or spares could account for such differences. Concerning revenue miles per mechanic, a large percentage of the Detroit DOT labor force in the 1965 and 1970 figures included helper mechanics (not counted in the journeyman mechanic figures) whereas the 1981 data include almost none. In summary, the overall systemwide operational load has not really changed in terms of how much road service is delivered by the maintenance work force through annual mileage accumulations per vehicle.

As with many other areas of human experience, senior bus maintenance employees may be selective in recalling the positive aspects of their job while suppressing the negative. The summary data here do not imply that there was a higher level of maintenance skills in the "good old days". However, the perception that mechanics were better skilled can be as damaging to present worker performance as the actuality would be. If employees feel that their individual contribution to the overall operation is of little value, there is no reason to expect from them a high degree of concern over work quality, attendance, or cooperation.

If the historical data from the Detroit DOT do nothing else, they should demonstrate that the human resource problem is not as simple as we once thought--i.e., better-skilled mechanics. If mechanics in the past were better skilled and therefore more effective in maintaining the fleet, then the Detroit DOT should have experienced dramatic decreases in miles per vehicle during this 30-year period. We need to look deeper at this problem, analyze other aspects of the human element of bus maintenance, and offer solutions that include skills improvement as one component rather than as the entire answer.

Two other important aspects of the bus maintenance function that affect worker performance are workplace environment and organizational structure. In the old days, the workplace environment was more amenable for several reasons. In general, garage and shop facilities were newer, cleaner, and in better operating condition. The Detroit DOT division that had responsibility for facility construc-

tion and maintenance was larger and hence more effective prior to the City's budget crises in the early 1970s. In addition, the important function of building cleaning, heating, ventilating, and repairs was properly addressed through an adequate budget and staffing level.

Another important aspect of workplace environment concerns the homogeneity of the work force. At no other time in the history of the Detroit DOT has the character of the maintenance staff been so varied. Differences in age, race, and sex have created the setting for many potential conflicts--conflicts between coworkers and between mechanics and supervisors. It is probably a natural human instinct to attribute many interpersonal conflicts to the most "obvious" cause--i.e., age, race, or sex. Because we are such visual creatures, it is difficult to go beyond what we see to determine the root cause of on-the-job conflicts, hostilities, and fears. However, we have discovered that differing value systems are usually the cause of many interpersonal conflicts. This subject is discussed in more detail later in this paper.

Organizational structure is often neglected as a contributing factor in worker performance, but its effect has been observed at the Detroit DOT. The most critical manifestation of this phenomenon is the widespread perception by maintenance personnel that there is no clear-cut line of control and responsibility within the organization. In the old days, there were, at most, five layers of management responsibility between the lowest-level worker and the highest level of authority, the general manager. Everyone knew exactly who made what decisions. The most involved issues were settled in a few days. The line between acceptable and nonacceptable behavior or performance was clear. Today, the organizational structure at the Detroit DOT is complex. Several peripheral agencies influence the activities of the Detroit DOT and its bus maintenance function, although little direct contact is ever made between these organizations and the employees. Through funding relations with UMTA, the Michigan DOT, SEMTA, and various City of Detroit departments, many key policy issues are decided by interests far removed from Detroit DOT employees and passengers. Because of the influence of the City's Civil Service Commission, the Human Rights Development and Personnel Department, and numerous state and federal agencies that are often involved in employee disciplinary actions, labor relations are not always consistent.

All of these organizational changes have affected the way mechanics and supervisors view their job and their employer. It is understandable that uncertainties related to budget and labor relations are transferred to work performance. Unclear or changing departmental goals and policies are easily filtered down to all levels of maintenance.

Employee motivation is, of course, determined by factors such as skill level (or perceived skill level), workplace environment, and organizational

structure. If employees are not satisfied with these three fundamental job requirements, they probably lack motivation and have developed poor attitudes. So high motivation and good attitudes will, to a large degree, develop automatically as skill level, workplace environment, and organizational structure improve. Managers must realize that motivation and attitude are extremely difficult to shape without the presence of these other factors. Such efforts have been attempted without very much long-term or widespread success. Incentives ranging from individual attendance record awards to intergarage performance competitions have been attempted, but such efforts only result in rewarding those who already possess high motivation due to extraneous factors. The vast majority of employees who need help are not affected.

The causes of the human resource problem in public transportation, as in many other U.S. industries, are fundamental in nature, relating to the basic tenets of job satisfaction: self-esteem, workplace environment, organizational structure, and motivation. However, before we establish a plan of action, an examination should be made of studies and findings in other industries.

#### CHANGING VALUES OF WORKERS

Many research efforts have been undertaken in this country over the past few years in order to define the national human resource problem and establish an agenda for improvement. Many of the findings from these investigations indicate that the problem is largely related to a changing value system among workers.

The traditional profile of a typical worker as a man working full time to provide full support for his wife and children has drastically changed. Today, fewer than 20 percent of American workers conform to this profile (2). With this transformation, the labor force has also changed its view of the job itself--what it should be and what the worker can get out of it. Unlike their parents, today's workers want more than money out of a job; they also want self-fulfillment. If this desire is not met, workers can easily become dissatisfied, unproductive, unreliable, and, ultimately, part of the increasing number of job nomads.

Psychologists Abraham Maslow and Morris Massey, among others, have contributed a great deal to the understanding of this aspect of human nature. Their studies have helped us to analyze the causes of job dissatisfaction as being closely tied in with the individual's overall success in attaining higher-order needs. More exactly, when the basic human needs of food, shelter, health, love, etc., are met (or, as Massey points out, taken for granted), people set their sights on higher life goals. The bountiful good life portrayed on television and ingrained in the American Dream constantly reinforces such thinking. What are these higher life goals? They probably vary among individuals, but most include a deeper value of job satisfaction--i.e., attaining esteem and self-actualization through one's career. For many people, these higher-order needs can only be met at the workplace.

#### WHAT MUST BE DONE

As was done on a small scale at the Detroit DOT, the bus maintenance industry must evaluate the nature and extent of the national human resources problem. Because of the severity of the symptoms, I think we will find out that the problem reaches all the way to the core of the job concept.

A relatively inexpensive means of starting this

evaluation process involves mailed surveys or questionnaires. In this way, management and union leadership from many U.S. bus maintenance properties could provide valuable input within a short time. If a significant degree of commonality were found among a large number of transit properties, then a coordinated and comprehensive approach would be justified. It may be appropriate to select a small, representative group of properties for in-depth analysis and pilot program implementation. Once improvements are demonstrated, final versions of the program can be disseminated to other sites.

Preliminary investigations in this area at the Detroit DOT have indicated that two important job elements can be addressed in order to meet many of these basic deficiencies. The first involves improving the effectiveness of the mechanic through better on-the-job reference material. Job performance aids (JPAs) are designed to provide clear, simple, and easily used instructions to the mechanic in completing repairs, adjustments, removals and replacements, and even trouble-shooting activities. Currently, we are about halfway through an UMTA pilot program for RTS-II JPAs, and the signs are encouraging. Not only are mechanics capable of doing more complex jobs with fewer errors, but their self-esteem and job pride are improving. We think this will help lift their low motivational levels.

The second job element on which we have spent a considerable amount of effort is improving first-line supervisor effectiveness. The Detroit DOT has given classes in both the technical and humanistic aspects of supervision. Through videotape lectures by Morris Massey, we have attempted to enlighten our supervisors on the changing values of today's mechanic and how that influences job behavior. However, many of these supervisors are inexperienced and need guidance on the fundamental aspects of their job. Furthermore, their lack of experience in bus maintenance limits their effectiveness in assigning work and providing technical support to mechanics. The Detroit DOT simply does not have the capabilities to address properly this critical element of the human resource problem. It is hoped that successful programs from other transit properties can be easily transferred to Detroit.

We have also discovered, through management-by-objectives sessions, that it is important to clearly express departmental goals, objectives, and priorities to the mechanics through first-line supervision so that everyone knows how they relate to the overall organization.

As mentioned earlier, many of the deficiencies in human resource utilization are common to the vast majority of U.S. "blue collar" industries. Research should be done to determine the degree of success experienced by other industries in improving these deficiencies. In Detroit, automobile manufacturers have done a great deal of research on the applicability of successful practices in other countries--Japan and Sweden, for example--in attaining high levels of worker motivation, commitment, reliability, and productivity. These and similar studies should be examined for possible use by bus maintenance operations.

Another important factor to consider in this problem approach concerns management-labor cooperation. It must be understood by all parties that the goals being sought will benefit both sides and that this is not an attempt to merely squeeze more work out of employees for the same amount of pay. Union leadership must recognize that improvements in labor efficiencies are required in order for the industry to reverse declining trends. Management must understand that an employee's ability and willingness to properly perform assigned duties are inescapably

tied in with fundamental elements of human behavior that go beyond a good day's work for a good day's pay.

Again, the Detroit automobile makers provide an example of an increasingly cooperative relationship between management and labor. In many cases, management has given up a certain degree of policy control while labor has sacrificed pay and fringe benefits, all for the common good of the organization. It took a financial disaster for both sides to recognize that their respective fates were inseparable.

We must be cautious, however, about placing too much emphasis on the traditional role of union leadership. Many indicators suggest that union members are becoming as alienated from their leadership as they have traditionally been from management. According to the June 24, 1980, Wall Street Journal "Labor Letter", workers voted to repudiate their unions in 75 percent of the 1979 decertification elections nationwide, the second highest percentage in 30 years (figures are not available for 1980-1981). Furthermore, in a survey published in the Journal's "Labor Letter" on May 16, 1980, the number of union members favoring laws that state workers cannot be required to join a union or pay dues rose from 43 to 72 percent. These and other signs show that employees themselves must be dealt with directly in solving major human resource problems. Union representatives, though elected, should no longer be viewed as being capable of speaking for their membership in all matters.

Another important task to be completed in the early stages of this effort is to convince the policymakers of the importance of the undertaking. Without their continuing support, the comprehensive and time-consuming job of human resource improvements cannot take place. At the core of this selling job is the familiar trade-off between long-term goals and short-term, day-to-day responses. Unlike private enterprise, we do not have an objective improvement measure like the profit margin to help us monitor success. Our criteria will be much less tangible and therefore less likely to be understood by the policymakers. However, a nationwide, coordinated approach should be helpful in this regard.

Organizationally, the bus maintenance industry must establish a coordinated, comprehensive approach. Human resource problems are shared by many properties, and the needed solutions are too complex for a piecemeal attack. Entities such as UMTA or APTA provide the type of organizational structure needed. In fact, there probably exist committees or subgroups at both of these agencies that have been charged with such responsibilities.

#### SUMMARY AND CONCLUSIONS

The human resource problem in bus maintenance has developed over many years. The decline of the workplace environment and the increasing complexity of the organizational structure are major contributors to this condition. Diminishing worker skills, or the perception of diminished skills, and motivational deficiencies have also had significant impacts on labor's effectiveness. Research indicates that workers' changing view of the job and the concomitant need for self-actualization and self-esteem also influence the present situation.

Better on-the-job reference material improves the motivation and self-esteem of the mechanic while also improving vehicle reliability. Enlarging the scope of the traditional supervisor's role to include an awareness of changing job values and difficulties related to worker motivation also helps overall human resource management. Furthermore,

standardizing personnel practices and clearly defining departmental objectives and priorities through supervisory staff improve staff harmony.

Once the industry confirms these findings nationwide, a series of pilot programs can be developed in order to refine improvement actions. It may then prove cost effective to set up regional "schools" where managers and supervisors can be taught these techniques and be provided with the appropriate written documentation to take back to their bus properties.

#### REFERENCES

1. Testimony of Arthur E. Teele, Jr., Administrator of the Urban Mass Transportation Administration. In *Financial and Productivity Problems of Urban Public Transportation*, Hearings Before the Subcommittee on Investigations and Oversight of the Committee on Public Works and Transportation, U.S. House of Representatives, 97th Congress, 1st Session, June 25, 1981, pp. 343-388.
2. D. Yankelovich. *New Rules in American Life: Searching for Self-Fulfillment in a World Turned Upside Down*. *Psychology Today*, April 1981.

## Workshop Report

Kay Inaba, Chairman  
Susan R. Butler, Recorder

Participants in Workshop 3 identified the following eight problem areas in their review of the topic, human resources for maintenance:

1. Performance measurements and standards,
2. Technical information and training,
3. Line-level maintenance supervisors,
4. Upper-level maintenance managers,
5. Motivation,
6. Upper-level management awareness of maintenance needs,
7. Training packages, and
8. Communication.

All were felt to warrant action. High priority was assigned to performance measurement, training, and line-level supervision. Medium priority was assigned to technician motivation and communication skills of upper-level maintenance management. Lower priority was assigned to upper-level management's awareness of the importance of maintenance, training packages, and interproperty communication.

#### PERFORMANCE MEASUREMENTS AND STANDARDS

##### Problem

The general lack of performance standards in maintenance hampers both training and planning. The associated lack of performance measurements makes it very difficult to quantify the effects of improvement techniques, such as better management techniques and better maintenance training and information packages.

The need for computerized performance measurements and standards is especially acute in maintenance because of management's general lack of interest in maintenance and maintenance-related variables. One way to communicate effectively with