

## Section 1: Improving the Way You Manage Your Day-to-Day Operations

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There may be customer service problems associated with the way in which you manage your system's operations on a daily basis. As described below, the daily operating procedures followed at your property can have a profound effect on the services your customers receive. Following is a discussion of how these procedures affect the services you can provide to customers as well as advice on how these functions might be improved.

### How Does Operations Management Affect Customer Service? .....

Operations management encompasses the many activities and skills needed to ensure that transit services operate on a day-to-day basis. This includes the scheduling and deployment of operating staff and vehicles; communications with drivers during service; supervision of service on the street; communication with riders, including the scheduling/dispatch of trips for a paratransit program and handling rider complaints; response to incidents, accidents and other such unplanned events; and service monitoring.

Some smaller transit agencies have a staff position for operations management. Even if your system has such a position, though, when you are a transit manager of a smaller system, you are likely to be responsible for some aspects of operations management.

Your system's ability to manage operations effectively on a day-to-day basis directly impacts your riders and the community you serve. With a sound operations plan that is well managed, the transit service that you deliver to your riders will be:

#### **Reliable by:**

- Monitoring service and on-time performance--making adjustments when justified.
- Maintaining good communications between drivers, road supervisors, and dispatch staff to share important information on significant traffic delays, detours, road conditions.
- Ensuring the availability of back-up drivers to cover all planned service (extra board).
- Having contingency plans that staff are familiar with in case of bad weather, natural disasters, or other unforeseen circumstances, and communicate these with your riders when necessary.

#### **Safe/secure by:**

- Developing and documenting policies for rider behavior (e.g., handling difficult passengers) to help deal with disruptive riders or situations.
- Encouraging good communications so drivers/dispatch share information on possible safety or security issues which might arise during service provision.
- Responding quickly to incidents, through dispatch or road supervision, before they escalate to larger problems.

- Developing and implementing procedures for bad weather, natural disasters, etc., to ensure the safety of your riders and operating staff.
- Assessing drivers' performance to ensure safe operations on the street.
- Providing good road supervision which periodically assesses operating conditions, including traffic patterns, routing, placement of bus stops and procedures for picking up/dropping off riders to ensure the safety of riders, drivers, and vehicles.
- Reviewing on-board farebox procedures/cash handling to minimize the potential for theft.
- Assessing safety of bus stop locations.

#### **Convenient by:**

- Developing driver assistance policies and procedures appropriate for your service.
- Periodically assessing stop locations to ensure rider convenience at their destinations.
- Developing procedures between drivers/dispatch to provide information on transferring passengers when service is running late.

#### **Clean/comfortable by:**

- Developing policies for on-board rider behavior, for example, no eating/drinking or audible music, to help ensure clean/comfortable vehicles and service.
- Supervising drivers' conduct of pre-trip inspections, on at least a periodic basis, to ensure they are checking vehicle interiors for cleanliness.
- Assuring facilities are well maintained.
- Assessing smoothness/comfort of ride by vehicle and driver.

This section provides a discussion of the processes and procedures of operations management. Additional resources pertaining to operations management are cited in the bibliography.

## **What are the Elements of Operations Management?.....**

With the primary objective of ensuring that transit services are deployed each service day in an effective and efficient manner, operations management brings together and builds upon various disciplines of a transit system. Those disciplines include *human resources*, which provides the appropriate number of trained drivers; *vehicle maintenance*, which ensures an adequate number of vehicles available for service; *risk management*, with its safety program; and *planning*, which designs an appropriate template (e.g., routing and timetable) for providing service and meeting rider demand.

The key elements of operations management include:

- Converting the service to be operated into work shifts for drivers (this is called "run-cutting").
- Scheduling and sending out drivers for their work shifts.
- Communicating with drivers during service.

- Supervising service on the street.
- Taking paratransit reservations; scheduling and dispatching paratransit vehicles and drivers.
- Communicating with riders, including trip reservations and scheduling for a paratransit program, and response to rider complaints.
- Farebox procedures, including cash handling, counting, and security.
- Response to incidents, accidents or other unplanned events.
- Service monitoring.

## Converting Service into Driver Assignments

Developing driver assignments from the service is typically a responsibility for operations management. Creating such assignments is also called run-cutting. The development of the driver work schedules will be influenced by a number of factors. For a larger transit system where the drivers are represented by a union, the labor contract will have a significant influence on the development of driver assignments. Typically, a transit labor agreement will address such factors as the minimum daily guarantee, which is the minimum number of hours for which a driver must be paid when reporting for regularly scheduled duty, and the maximum hours of spread, which limits the total number of hours that a driver can work from the time of the first portion of work to the end of the final portion of work, when the driver has more than one assignment. Smaller systems may not have a labor contract but may need to consider state labor laws, state and/or federal regulations on overtime pay, and the system's mix of full- and part-time driver positions, which should be indicated in your budget.

The type of service that your system operates also impacts the development of driver assignments. Fixed-route service, by its nature, does not generally change day by day. When the routing and timetables are established, it is then possible to develop driver assignments, and these assignments will not change until there is a service change or policy decision to re-design the assignments, for example, to provide more full-time positions. Most medium and large transit systems revise the schedules and re-cut the runs to coincide with seasonal service changes. This can typically occur up to three times per year.

Paratransit service is different. Demand for service often varies by day of the week and week of the month. Mondays, Tuesdays, Wednesdays, and Thursdays often experience greater demand than Fridays, although this may not be true in your system. The first week of the month may show higher demand than other weeks. Weather will also influence demand, more so than for fixed-route service, with bad weather depressing ridership and increasing cancellations and no-shows. The extent to which your paratransit program can respond to such variations will influence your driver assignments. With sufficient part-time positions, you have more flexibility to adjust driver assignments to meet changing ridership demand. Operations management will have more or less flexibility for scheduling, depending on your ratio of part-time to full-time drivers. Even with full-time positions where the position involves another assignment besides driving (e.g., driver training, dispatching, clerical work), you will have more flexibility to meet variable demand.

Developing the driver assignments, or run-cutting, is typically done manually for smaller systems. Operations management must first assess service span (what days and times does service operate) and supply of service (how many vehicles are scheduled and at what times). For fixed-route service, this will build upon the timetable and vehicle schedule. For paratransit service, you must also assess your demand, which will vary during the day, to determine the general times when service will be deployed. Depending upon your clientele, your system may have its heaviest service requirements between 6:00 and 8:00 am and again from 4:00 to 6:00 pm for commute trips or from 8:00 to 10:00 am and 1:00 to 4:00 pm for social service agency and medically related trips--or both of these. Whatever your "normal" schedules, be alert to unexpected loads, and be ready to place additional vehicles into service if you are able.

Once you know when service will be deployed by vehicle, you then must assess your driver positions and available work hours (How many 8-hour shifts are there? How many part-time shifts, and how many hours are the part-time shifts?). Remember to take into consideration the time before and after actual service periods needed for pre-trip inspection, to deadhead to the start of routes or first pick-up, and pull-in time, and any applicable regulations governing the work (e.g., labor contract, overtime, etc.).

Driver work assignments can then be determined by fitting the work positions into the service supply. This determination is usually not straightforward and will involve efforts to best "fit" work positions into the supply of service. This is particularly true for paratransit systems with variable rider demand and resulting supply of service. And it may be an iterative process, particularly at first, as you find that you may need to adjust the ratio of full- and part-time positions to better meet service demands. In any event, a key objective in the process is to try and match the supply of service--or the "runs"--with work shifts; essentially, make assignments where the pay hours for drivers are as close as possible to the hours behind the wheel (also called platform hours).

Most larger transit systems use computerized run-cutting programs due to the complexity of the various issues. Computer run-cutting programs allow staff to set the parameters of the labor regulations, the union contract (where appropriate), the length of service runs, pull-out/pull-in requirements, etc., and then to vary these to assess their impact on labor requirements and, ultimately, cost.

## **Scheduling Drivers and Vehicles**

Once driver assignments are developed, drivers need to be matched with work assignments and vehicles scheduled for service.

### ***Drivers***

The process where individual drivers are scheduled for specific driver assignments is known as a "shift bid," or "bid." In larger transit systems where drivers are represented by a union, the labor contract will generally address procedures for the bid. Such systems may have a bid up to three times per year, corresponding to scheduled routing and service changes. For smaller systems and those systems without scheduled bid requirements, bids take place less frequently.

Typically, for a smaller system, operations management will post the available work assignments where all drivers can see them. After a period of time, a week for example, drivers will be

requested to sign up for their preferred assignment. This can be done when all drivers are present (this may speed up the process) or on a one-on-one basis. The bid process generally recognizes seniority and full-time status, where the most senior full-time driver will have the first opportunity to sign up for work, the next opportunity goes to the second most senior, and so forth until the part-time positions. Then, the most senior part-time driver chooses the first part-time assignment, the second most senior part-time driver is next, and so forth. Operations management typically maintains the seniority list, where drivers are listed in order of their hire date, by full-time and part-time status. There are different methods of handling seniority, and this issue can be very important to employees.

Operations management must also have extra drivers available to send out in case one or more drivers do not show up for work as scheduled. These drivers are known as the "extra board" or "standby drivers" (although some transit systems recognize a minor distinction between the two terms). A rule of thumb that has been used in the transit industry has been to schedule about 10 percent of the drivers needed for scheduled pullout as extra board. You should recognize, however, that there is great variation here: an individual transit system must determine what is appropriate for its own situation. Operations management may find that with a small, very stable transit system, the cost of a daily extra board is not affordable. Other agencies may find that assignment of one to two drivers to stand-by is appropriate and that if the drivers are not needed for driving duties they can be assigned to administrative or other tasks (though this can be affected by collective bargaining agreements).

Once drivers have reported to work each day, operations management is responsible for ensuring that drivers leave the garage at the scheduled time for their scheduled assignments; this is called "pull out." While a smaller transit system may not have a person dedicated to operations management, it is important that there be some supervision during pull-out times. This will allow you to monitor the arrival of your drivers (Are they arriving early enough to pick up their assignment and do their vehicle inspection, but not clocking in before they're supposed to?); to assign scheduled work to a stand-by driver if the assigned driver does not show up; to make sure that drivers receive appropriate paperwork (driver manifests for a paratransit program); to supervise drivers' pre-trip inspections (Do drivers really check all the items on the form? Are there lights on in the parking area at 5:30 in the morning so drivers can properly inspect vehicles?); and to handle last-minute vehicle changes when a driver finds that the assigned vehicle should not be taken out.

### ***Vehicles***

Assignment of vehicles will depend upon the composition of your fleet and type of service. A standardized fleet, where all vehicles are the same type and age, makes this issue easy: any vehicle can be scheduled for any assignment. Generally, however, fleets have some variation. One practice that is generally followed in the transit industry is to assign the newest vehicle or lowest operating cost vehicle to the longer assignments. Older vehicles or those that are more costly to maintain will be assigned to the shorter operating periods or to closer routes where breakdowns can be addressed quickly.

You must also consider your ridership characteristics when scheduling vehicles for service. For fixed-route service, routes with greater usage and load levels, you should clearly use higher capacity vehicles. For paratransit service, vehicle assignments may be more complex. For

example, it is important to ensure adequate wheelchair positions where your scheduling function has grouped riders using wheelchairs on the same trip or in areas where individuals using wheelchairs are frequently carried. It may also be important to know the maneuverability of your vehicles when assigning vehicles for pick-ups and drop-offs at medical complexes, shopping areas, or other locations with limited access service roads or driveways.

In rural areas where some routes may be very long or the hills steep, fuel capacity or hill climbing/braking may be other factors that may need to be considered when scheduling vehicles for work assignments.

## Communications with Drivers

Operations management is responsible for communications between drivers out on the street and the dispatch office. For a paratransit service, communication is essential, as dispatchers must be in continual contact with drivers to control and monitor the pick-up and drop-off of riders throughout the service day. For a fixed-route service, communication may not be continual but is important for monitoring on-time performance, responding to breakdowns or problems, and sharing information on traffic or other conditions that might impact safety or reliability.

Typically, transit agencies have at least one two-way radio system with capabilities for multiple frequencies for internal communications. Communication between the vehicles, with mobile units, and the base station, or dispatch office, is real time, and the system can be configured with communication possible between each driver and the dispatcher at the base station as well as between all the drivers. For a smaller system, one channel where all drivers are linked together with dispatch can be beneficial for information sharing and monitoring reliability. However, for a larger system with more drivers in service at any period, it is important that there be private channels between each driver and dispatch. This will help avoid extraneous and unnecessary radio "chatter" which can be distracting.

Improved technology now has available two-way radios that are digital, rather than the original analog style, and do not use a repeater. Digital two-way radios can provide a broader transmission range and may provide for improved communications where the service area is very hilly. Costs for the equipment and for air time need to be considered.

In more recent years with advances in cellular telephone technology and their decreasing costs, some smaller transit agencies have begun using cell phones to allow communications with the transit system's main office. Before this option is considered, you must determine adequacy of coverage throughout your service area. Such a communication system is appropriate only for smaller agencies (with up to perhaps ten vehicles) as the operating costs for two-way radios are considerably less than cellular phones when you have a larger fleet. Where your system has commuter services or other long distance routes in suburban areas, cellular phones may provide effective communications for those vehicles operating outside your radio coverage area.

To minimize the time required for common messages, communications between drivers and dispatch should use message codes--or "ten codes"--when possible. This is important to standardize communication, limit transmissions to the essentials, and help the clarity and

understandability. A listing of the ten codes used by a large transportation provider is shown in Exhibit 1A on page OM.17.

## **Supervising Service on the Street**

Smaller transit systems may not have the staffing, or it may not be cost-effective, to dedicate a position to monitor service on the street. But even for very small transit services, it is essential that some time is spent out on the street observing and monitoring actual operations on a regular basis. Generally, systems with more than ten vehicles in service should dedicate at least part of one position to street supervision. If you cannot dedicate even part of a position, a staff member with supervisory responsibilities must get out on the street and observe and monitor day-to-day service on a periodic basis. In addition, as the manager, you should also spend some time, on a regular basis, observing actual day-to-day operations. This is essential in ensuring that your transit services are safe and reliable and meet the needs of your riders.

Essentially, the objective of the road supervisory function is to ensure that the transit services are operating as scheduled and plan to provide high-quality, safe and efficient service to the riding public. Typical responsibilities with this function include:

### **Ensuring safe operation of the vehicles**

- Watching operational, street, and traffic conditions; reporting problems.
- Informing drivers and dispatch of hazardous conditions or situations.
- Checking on driver performance and providing feedback as appropriate (this may include unobserved checks).
- Monitoring operations, including schedules.
- Watching on-time performance of routes for fixed-route service or trips for dial-a-ride service.
- Observing drivers to ensure they follow proper routing.
- Looking for situations that may cause unexpected or regular delays in service.

### **Problem solving**

- Responding to accidents and incidents.
- Ensuring proper reporting for accidents and incidents.
- Responding to road calls or other breakdowns; the road supervisor may be able to fix minor problems and avoid sending out another vehicle ("switch-out"), which is costly.
- Handling emergency detours; the road supervisor should check out each detour before the transit vehicle is sent to ensure safe operations.
- Cooperating with local law enforcement or other local departments in handling special events, detours, or other events that might disrupt normal service.
- Responding to any serious fare disputes between a rider and driver to obtain facts and resolution.

## **Communications**

- Providing assistance and encouragement to drivers as appropriate.
- Monitoring relationships between drivers and riders.
- Providing a liaison between drivers and transit system management.

The road supervisor, or other staff performing the road supervision function, typically drives a car or other non-service vehicle, though there may be times when a service vehicle should be used (e.g., fixed-route systems with a relatively high number of riders needing wheelchair lift capabilities may have a road supervisor use a lift-equipped vehicle for quick response to balance capacity or for lift failures). The road supervisor should have a means of communication, at least with dispatch. This could be a mobile radio unit or a cell phone.

## **Communicating with Riders**

Operations management is responsible for communications with riders, including answering riders' inquiries about the service, for example, questions on routing or schedules for a fixed-route service, as well as handling and scheduling trip requests for a paratransit program. Operations management must also ensure that policies and procedures are in place to address service and behavior expectations for riders. Such policies and procedures are important when operations management must deal with rider complaints, another of its responsibilities.

### ***Passenger Information***

At smaller transit agencies, all staff should be able to handle questions about service days and hours, fare structure, and other basic information questions, although one person may be designated as the primary resource for telephone inquiries. For a fixed-route system, information requests will be routine questions on bus stop locations, schedules, etc. To assist with such questions, staff answering rider information calls should have readily available the most current routing map, route schedules, specific bus stop locations for all routes (all stops, not just major stops or checkpoints), fare structure, and fare policies (e.g., exact change, transfers, etc.). For a paratransit program, passenger information is more complex, involving trip requests and scheduling.

### ***Paratransit Trip Requests***

There are two basic types of trip requests for a paratransit program: immediate response and advance reservation. With immediate response service, a rider calls for a trip when he or she is ready to go, similar to traditional taxi service. This type of trip request is typically used in a general public dial-a-ride service, with trips served within 30 minutes to two hours of the time of the request, depending upon demand. Advance reservation service is the most common type of scheduling for paratransit service, particularly for programs serving seniors and persons with disabilities. With advance reservation service, riders call in advance—for example, 24 hours, two days, seven days, and up to 14 days for some ADA complementary paratransit systems—to request their trips. While there are combinations and variations on these two basic types, a key objective for trip scheduling is to group trips with similar origins and/or destinations to increase the number of passengers carried on each trip.



### ***Scheduling***

Trip requests and scheduling can be handled manually, as is the case for many small paratransit programs, with computer assistance, or, for larger systems, with full automation. With proper procedures and training, manual scheduling can be done effectively for up to about 20 vehicles. Most immediate response, manually scheduled systems use a large map as a scheduling aid to visualize requested trips and create vehicle "tours" in which pick-ups and drop-offs are linked. The scheduler will typically develop core vehicle "tours," composed of repeat or subscription trips into which are added one-time trips which share origin/destination and pick-up/drop-off time parameters with the core trips. Computer-assisted scheduling systems can be beneficial for systems as small as ten, or even fewer, vehicles and are almost essential for larger ones. Such systems can help with retrieving rider information (pick-up/drop-off addresses, mobility aids, special needs, etc.), pre-assigning riders to vehicles or runs, editing of driver trip manifests, printing of such manifests, and calculation of rider fares and billing for social service agencies. Fully automated scheduling systems, with their more significant costs, make sense for larger paratransit systems, generally with 30 or more vehicles. These systems include a digital map component that allows the computer, rather than a person, to suggest trip assignment to particular vehicles. Even these sophisticated systems, however, require well-trained staff with scheduling experience and knowledge of the service area to operate the computerized programs and ensure effective results.

Whatever type of reservation and scheduling system that your transit system uses, you must ensure that operating staff treat each caller and each rider with courtesy and respect during the trip request and scheduling process. The rider's phone call to request a trip is typically the first point of contact with the transit system, and it is critical that this be positive.

Grouping Trips by Area and Time of Day. Grouping passengers according to similar areas of origin and/or destination and by time of day of departure/arrival enables more people to be served than would otherwise be possible, increasing a system's cost effectiveness. Another strategy for grouping trips is to designate certain days for service to a given community or subregion within your service area. For example, residents of a particular subregion might be required to limit trips to Mondays, Wednesdays, and Fridays. By designating service to specific areas on certain days and ensuring that the public is aware of the service schedule, effective transportation can be provided to a large geographic area with a sparsely settled population.

Arranging Trips to the Availability of Resources. Requesting that transportation specifically for recreational and other non-essential trips be scheduled according to times when vehicles are available increases a demand-responsive transportation system's productivity by matching demand to the system's transportation supply capabilities. In order for this strategy to operate successfully, it is necessary to have a policy that allows the scheduler to work with passengers and other service providers when a particular day or time is booked to capacity and identify other times when transportation resources are available.

In some cases, a human service agency may be willing to adjust its schedule to better accommodate the limitations of the transportation system. Similarly, an employer might be willing to allow an employee to work a slightly different schedule in order to accommodate the time schedule of a subscription route. Therefore, it is important that schedulers negotiate alternative pick-up days

and/or times with both individual passengers and with organizations whose clients use public transportation services.

Operating trips that transport clients of several different agencies is the basis of coordinated service. This practice reduces duplication of routes and results in a more efficient use of vehicles, drivers, and funds. Rural transportation systems should seek to maximize their level of coordinated service by sharing trips among human service agencies.

**Scheduling Subscription Service.** Subscription trips form the base, or core, of many rural public transportation systems. Subscription service involves transporting an individual or a group to a destination on a regular basis. An example of an individual subscription trip is transporting an individual to a dialysis center on Mondays, Wednesdays, and Fridays. An example of a group subscription trip is several senior citizens that are taken to a nutrition center on a regular schedule. Similar times are scheduled for each "to" and "from" trip for the subscription period.

Subscription services are usually more productive, in terms of passenger trips per hour of service, than other types of demand-responsive trips because there is a greater certainty of number of passengers, and locations of origin(s) and destination(s). Subscription services often experience peak demand during early morning and late afternoon hours, similar to school buses.

**Scheduling and Dispatching Return Trips.** Demand-responsive return trips present a greater challenge to scheduling and dispatching than do subscription trips because demand-responsive passengers are less likely to know at what time they will be returning to their point of origin. Subscription trip passengers are usually participating in an activity with a known ending time, facilitating the return trip.

Estimate and note in your schedule each return trip time. Making and noting an estimate will allow the scheduler/dispatcher to build a schedule and deploy a vehicle for the return trip, while recognizing that the actual time of departure is subject to change.

### ***Rider Policies***

Your transit system should develop and document policies for riders, addressing general issues including fare payment and eating/drinking/smoking on board vehicles and, where appropriate, more specialized issues, such as no-shows for a paratransit program, to help structure operations. Such policies articulate your expectations of riders when traveling on your system and, importantly, also help your staff manage operations by establishing standards against which conformance can be assessed.

Written policies should address:

- Fare payment
- Fare structure
- Smoking
- Eating and drinking on board
- Playing radios/personal sound devices

- Number of shopping bags or personal effects on board
- Pets on board
- Disruptive behavior
- Flag stops

For a paratransit system, additional policies should be developed and documented, addressing:

- Door-to-door vs. curb-to-curb pick-up and drop-off
- Wait time--how long will your driver wait for the rider to appear at the rider's pick-up location?
- Cancellations and no-shows
- Escorts/personal care attendants and companions
- Service animals
- Custodial responsibilities
- Eligibility
- Advance reservation requirement

### ***Rider Complaints***

Communications with riders means dealing with rider complaints, though there will also be compliments and suggestions. For any complaint, it is important to acknowledge the rider's unhappiness and respond in a non-judgmental manner. This will involve obtaining and documenting the facts surrounding the complaint (What was the time and route number of the bus where the driver was rude? What was the specific pick-up location and time when the bus "didn't show up?"). Such information can be documented on a "customer service form." (See Exhibit 1B.) With the rider's information, operations management can then follow through and investigate the complaint. For certain complaints and possibly for certain riders, it will be important to provide a response. This will show to the rider that your system takes complaints seriously and is committed to customer service. Some transit agencies may provide a "complimentary ride ticket" (also called an "oops ticket") to the rider to address certain complaint situations, particularly when the problem appears to be the fault of the transit system.

In addition to complaints from riders, your system may receive complaints or comments from members of the community who see some incident with one of your vehicles and want that incident reported. Such occurrences are typically related to moving in traffic (e.g., a transit vehicle traveling too fast) and should be documented when reported. (See sample form in Exhibit 1C.) Where there is adequate information about the event, operations management should investigate and follow through as appropriate.

## **Fare Collection and Cash Handling**

Operations management is responsible for the collection of fares from the riders and the safe and proper handling of the farebox receipts, particularly the cash. Fare policies as well as day-to-day procedures affect these activities.

***Fare Policy and Collection***

Most transit agencies have developed fare structures which require exact fares, and some provide other fare media in addition to cash--tickets, passes, tokens, etc. While there may be policy and marketing reasons to have a multi-tiered fare structure (various fare categories, peak vs. off-peak fares, etc.) and various fare media, a simpler fare structure is easier to monitor and manage. Exact fares mean that drivers do not have or give change, eliminating one source of possible cash mishandling. Fewer fare categories mean that drivers can better monitor the deposit of fares or fare media into the farebox. A simpler fare structure can also be easier for riders to understand and comply with.

Most transit agencies also have a policy prohibiting drivers from handling fares. Again, this eliminates a source of potential cash mishandling as well as one opportunity for misunderstanding between rider and driver. Riders should be instructed to deposit their fares directly into the farebox or other collection device. Also, if possible, your transit system should use transit-style, locking fareboxes: they improve the security of the fares as well as the image of the transit system. If your system cannot afford transit-style fareboxes, use some sort of locking box to collect fares; it is best not to use an envelope, cardboard box, or the driver's pocket. A simple locking box can be purchased at a hardware or stationery store for less than \$20.

***Farebox Vault or Collection Box Procedures***

Each farebox vault or locking collection box should be numbered or individually identified, allowing operations management to track their use by vehicle and driver. At the end of the service day or as directed by management, drivers should remove the farebox vault or other collection device and these should be placed in a secure location prior to counting. For a smaller transit system, this might be a locking cabinet, locking desk drawer, etc. Access to this secure location should be very limited.

At the end of the service day, each driver or the dispatcher should count up the riders by fare category from the dispatch log or vehicle passenger log or counters, to determine the expected farebox receipts. Typically, drivers at smaller transit agencies (paratransit and fixed-route) record all boarding passengers by their fare payment category (e.g., regular, elderly, or disabled passengers); when these counts are totaled by fare category, it is possible to calculate what the fare revenues should be.

***Farebox Counting and Reconciliation***

With a record of expected farebox receipts, operations management can then reconcile actual receipts in the farebox vault or fare collection device, by comparing what is expected and what is actually received. Independent of the determination of how many passengers were carried, the cash must be emptied from the vaults or collection boxes and counted, taking care to record the count by vault or box number. While the farebox receipts (cash, tickets, etc.) are being counted, there should be a second person present. This provides a modest "check and balance" to deter cash mishandling.

When reconciling expected and actual receipts, there will be times of "overages" and "shortages." This can happen for a variety of reasons. Drivers may not record the proper fare category for each rider; or riders may deposit too much money because they don't have exact change. Riders may deposit too little money (accidentally or on purpose) and go unnoticed by the driver; or riders may put in items that at quick glance look like coins (car wash tokens, arcade tokens, foreign coins,

etc.). Finally, drivers may forget to mark cancels or no-shows on their trip manifest. While such overages and shortages are relatively common, they should not be significant, and they should be monitored to assess if there is a consistent pattern; for example, if one driver seems to consistently have overages, he or she may not be counting all boardings. If farebox and passenger counts agree exactly on a regular basis, this, too, can suggest a possible problem.

After counting and reconciliation, cash receipts should be prepared for bank deposit or other deposit to a secure location, in accordance with your system's policies. Records should also be kept of the farebox receipts, either on a daily basis if vaults or collection boxes are "dumped" daily or each time that the receipts are counted and reconciled.

As an alternative to having the cash counted and deposited by your system staff, some banks and armed courier services will handle this function for you for a small fee. Depending upon how much cash is received through the farebox and the amount of staff time (and therefore cost) needed for counting, monitoring security, and deposit, it may be cost effective to have this function done through those services.

## **Response to Incidents, Accidents or Other Unplanned Events**

An important responsibility of operations management is response to incidents, accidents, or other unplanned events that disrupt or could potentially disrupt your service. The operations management function should develop, document, and practice contingency plans to address such situations.

### ***Incidents/Accidents***

Incidents may be as simple as a rider tripping while boarding your bus with no apparent injury, to more serious situations, for example, a rider verbally abusing the driver or another rider. Operations management should develop and distribute to all drivers a form for reporting incidents. The form can be designed to be a "check off" for the more common incidents faced by your transit system, with space to allow for a narrative description of what happened. Depending on the severity of the incident, the driver should report the particulars to dispatch at the time of occurrence. Dispatch staff may be able to assist in some cases or will advise a supervisor to travel to the vehicle's location for direct attention. When dispatch and other staff become involved, they, too, should fill out an incident report form to document what happened. Such documentation provides support and a "history" should there be any continuing issues with an incident.

Accident response procedures are generally developed as part of the transit system's safety plan. Generally, procedures have the driver report the accident and its seriousness to dispatch immediately, attend to any injuries, and then deal with the reporting procedures.

Operations management should ensure that drivers have an adequate supply of reporting forms for incidents and accidents or that such forms are available on the vehicle. Driver training should include an introduction to reporting forms for incidents and accidents and practice in filling them out.

### ***Bad Weather***

With serious bad weather, it may be advisable to curtail certain routes or shut down your transit operation entirely. Procedures should be developed so that you have a plan for such occurrences.

Depending on your location and the frequency of serious bad weather (e.g., far northern parts of the country may experience serious snowstorms several times each winter), your system's information materials should address your bad weather plans so that riders know in advance what to expect so they can make plans should transit operations be disrupted.

### ***Emergencies/Natural Disasters***

Emergencies and natural disasters by their nature give little or no warning. Operations management should develop procedures to follow when faced with an emergency or natural disaster. Emergencies might include a major industrial accident, serious hazardous waste spill, or terrorism. Natural disasters will vary by region of the country and the specifics of your location, for example, earthquakes, floods, etc. Mutual Aid Channels are shared radio frequencies for public safety officials to share information during emergencies.

As a first step, you can contact your city or county emergency services department to see if there is local or state guidance for disaster response. You can also contact your state's transportation department to see if the state has guidance for transit agencies on emergency and disaster procedures. You might also make contact with your local chapter of the American Red Cross. The Red Cross assists victims of disasters and, depending on the type of disaster, might require transportation services.

Procedures for your system should then be developed. They may be brief, with limited guidance beyond following the direction of local or designated disaster officials. Such procedures can set up a "chain of command" so operations staff know which staff person will be in charge, directing the system's response, and providing the appropriate information to riders and the public. Importantly, your staff needs to know what agencies and perhaps specific government officials can authorize your vehicles into emergency service.

Transit agencies interested in maximizing their ability to assist during emergencies should talk to their local emergency officials such as the local police/fire departments about the mutual aid frequency. It may be possible at a minimal cost to program the Mutual Aid Channel<sup>1</sup> into your multi-channel radio. This will ease communications should your vehicle be called on for emergency service.

## **Service Monitoring**

Service monitoring through the operations management function includes both the day-to-day informal observations of the road supervisor or staff assigned to periodically supervise on-street operations and the more formal monitoring through activities such as on-off counts, on-time performance checks, bus stop inventory, and planning studies.

### ***Informal, Day-to-Day Monitoring***

The day-to-day observations and monitoring of your system's service is an important responsibility of operations management. Such efforts supplement the more objective analyses that are

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<sup>1</sup> Mutual Aid Channels are shared radio frequencies for public safety officials from a number of organizations or jurisdictions to share information during emergencies.

accomplished through data reports with numerical information on ridership, productivity, and other indicators. The road supervisor or staff assigned to periodically assess on-street operations should be alert to the many factors that impact service performance and provide feedback so that such factors can be assessed. These include:

- Routing patterns
- Traffic
- Bus stop locations and boarding/alighting activity particularly at busy stops
- Safety issues
- Access into and from shopping centers, medical complexes, apartment complexes
- Driver safety/performance
- Rider behavior

### ***More Formal Monitoring***

On a periodic basis or no less than every two years, you should formally assess your transit operations. While you may not be able to conduct a "formal" study on this frequency, you should step back and review your service for possible improvement on a periodic basis. Sometimes peer groups or independent consultants conduct such assessments. Operations management will be involved to help manage and participate in data collection for the assessment. This may involve:

- Checking each route's running time to review scheduled versus actual time.
- Reviewing on-time performance, including times at checkpoints.
- Conducting boarding/alighting counts to review activity at bus stops and possible need for stop improvements, changes.
- Conducting a passenger survey.
- Conducting a transfer count and analysis.

These more formal activities should be supplemented with the direct experience and observations from the operations management function to develop well-rounded suggestions for service improvement.

## **Operations Data Collection and Recordkeeping**

### ***Data Collection***

Dispatchers, drivers, and transit system managers need an efficient record keeping system. Dispatcher's records are used to coordinate all runs and passenger services at demand-responsive systems. Drivers' records are the basis for evaluations of the transit system, reports to the state and federal governments, and information for financial management.

### ***Dispatcher Records***

The dispatcher should record sufficient information to coordinate all passenger trips. Information may be recorded manually, or entered and stored electronically. There should be a permanent file of the names, addresses, and telephone numbers of all subscription riders and the days, hours, and

destinations of scheduled rides. The dispatcher should record the name, address, telephone number, destination, and date and time of pick-up for all demand-responsive passengers. If a pick-up is to be at a hospital, large business firm, or shopping center, the dispatcher should request complete information on the exact pick-up point within the institution, business, or commercial complex. Ask passengers if they have any special needs, such as a wheelchair lift or a child safety seat. Record this information in the passenger's file.

## ***Driver Records***

- Driver logs serve as the basis for:
  - Billing human service agencies for contracted rides
  - Documenting services to your advisory board or committee
  - Collecting operating statistics
  - Evaluating the productivity of various routes and hours of operation

To achieve accurate record keeping and to promote the construction of a comprehensive database, ensure that drivers track information throughout the day, such as:

- Passengers carried
- No-shows
- Time of pick-up
- Beginning and ending route mileage and time
- Beginning and ending passenger miles

One approach that has been particularly effective has been to require passengers with more than one no-show in a pre-determined period of time to pay for the trip.

Some transit systems issue computer-printed photo ID cards to all passengers who are eligible for a fare discount. This helps to prevent fraud by ensuring that only those customers who qualified for the discount, such as those who are elderly or disabled, receive the discounted fare. Eligible passengers show the ID card to the driver when boarding to receive the discounted fare.



## Exhibit 1A: Ten Codes for Radio Communication

Code	Message	Code	Message
10-01	Signal Weak	10-51	Wrecker Needed
10-02	Signal Good	10-52	Ambulance Needed
10-03	Stop Transmitting	10-53	Road Blocked
10-04	Affirmative (OK)	10-54	Hit and Run
10-05	Relay (to)	10-55	Intoxicated Driver
10-06	Busy	10-56	Intoxicated Pedestrian
10-07	Out of Service	10-57	Breathalyzer Operator Needed
10-08	In Service	10-58	Direct Traffic
10-09	Say Again (repeat)	10-59	Escort
10-10	Negative	10-60	Investigate Suspicious Vehicle
10-11	_____ On Duty	10-61	Stopping Suspicious Vehicle
10-12	Stand-By	10-62	Burglars Breaking & Entering
10-13	Existing Conditions	10-63	Investigate _____ At
10-14	Message Information	10-64	Crime in Progress
10-15	Message Delivered	10-65	Armed Robbery
10-16	Reply to Message	10-66	Notify Coroner
10-17	Enroute	10-67	Investigate Death
10-18	URGENT	10-68	Livestock in Highway
10-19	In Contact	10-69	Advise Present Phone Number
10-20	Location	10-70	Improperly Parked Vehicle
10-21	Call (by phone)	10-71	Improper Use of Radio
10-22	Disregard	10-72	Have Prisoner in Custody
10-23	Arrived at Scene	10-73	Mental Subject

*Shaded boxes denote codes most commonly used.*

## Ten Codes (cont'd)

10-24	Assignment Completed	10-74	Prison or Jail Break
10-25	Report To (Meet)	10-75	Records Indicate Stolen
10-26	Estimated Time of Arrival	10-76	Prowler
10-27	License Permit Information	10-77	Assist Fire Department
10-28	Registration Information	10-78	Flag Detail
10-29	Records Check	10-79	
10-30	Danger, Caution	10-80	Fire Alarm
10-31	Pick Up	10-81	Report Condition of Fire
10-32	_____ Units Needed	10-82	Stranded Motorist
10-33	HELP ME QUICK	10-83	Animal Carcass
10-34	Time	10-84	Out on Street (N E S W)
10-35	Reserved	10-85	Returning to Station
10-36	Reserved	10-86	Make Hard Copy and Hold
10-37	Reserved	10-87	Armed and Dangerous
10-38	Reserved	10-88	Routine Traffic
10-39	Reserved	10-89	Out at Residence
10-40	Fight In Progress	10-90	Out at _____
10-41	Beginning Tour of Duty	10-91	
10-42	Ending Tour of Duty	10-92	Contact All Officers
10-43	Chase	10-93	
10-44	Riot	10-94	Subject With a Gun (type)
10-45	Use Signal 13 (Bomb Threat)	10-95	Subject With a Knife
10-46	Bank Alarm	10-96	Shots Fired in Area of _____
10-47	Complete Assignment Quickly	10-97	Assistance Needed: County or State or Local Law Enforcement
10-48	Detaining Subject	10-98	Domestic Trouble
10-49	Drag Racing	10-99	Shoplifting (J = Juvenile)
10-50	Accident, PD-PI-F	10-100	Burglar Alarm

## Exhibit 1B: Sample Customer Service Form

### CUSTOMER SERVICE FORM

Date: \_\_\_\_\_ Time: \_\_\_\_\_:\_\_\_\_\_AM/PM Taken By: \_\_\_\_\_

Complaint \_\_\_\_\_ Commendation \_\_\_\_\_ Suggestion \_\_\_\_\_

Customer Name: \_\_\_\_\_ Agency: \_\_\_\_\_

Address: \_\_\_\_\_ City/State/Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

### NATURE OF INCIDENT

\_\_\_\_\_ Driver Conduct/Attitude

\_\_\_\_\_ Late \_\_\_\_\_ Early

\_\_\_\_\_ Did Not Show

\_\_\_\_\_ Vehicle Maintenance

\_\_\_\_\_ Other \_\_\_\_\_

\_\_\_\_\_ Careless Driving/Comfort

\_\_\_\_\_ Disturbance

\_\_\_\_\_ Air Conditioning/Heating

\_\_\_\_\_ Telephone/Dispatch

Customer's Remarks: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Investigation: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Investigation By: \_\_\_\_\_ Date: \_\_\_\_\_

Date Customer Contacted: \_\_\_\_\_ By: \_\_\_\_\_

Within 5 Days? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Record of Final Action: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Manager's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Date Sent to \_\_\_\_\_: \_\_\_\_\_

**Exhibit 1C: Sample Incident Form**

Date of Report \_\_\_\_\_ Date of Occurrence \_\_\_\_\_  
Time of Call \_\_\_\_\_ am/pm Time of Occurrence \_\_\_\_\_  
Report Taken by: \_\_\_\_\_

**LOCATION OF OCCURRENCE**

City \_\_\_\_\_ Street/Highway \_\_\_\_\_  
Place of Occurrence \_\_\_\_\_  
Caller's Direction of Travel \_\_\_\_\_ Reported Vehicle's Direction of Travel \_\_\_\_\_

**DESCRIPTION OF EVENT:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**DESCRIPTION OF VEHICLE:** ☐ Sedan ☐ Van ☐ Sm. Bus ☐ Lg. Bus ☐ Highway Coach

COLOR OR ID \_\_\_\_\_ VEHICLE NO. \_\_\_\_\_

**CALLER IDENTIFICATION:** ☐ REFUSED TO PROVIDE

Name \_\_\_\_\_ Telephone: (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_  
Address \_\_\_\_\_

---

**INVESTIGATION**

Referred to: \_\_\_\_\_ Please complete by: \_\_\_\_\_

Results of the Investigation:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Operators Name \_\_\_\_\_

Corrective Action \_\_\_\_\_

## Section 2: Improving How You Maintain Vehicles

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You may have identified problems your system is having servicing customers effectively because vehicles are not available or in good condition. Vehicle maintenance can determine whether or not you have the vehicles in the condition needed to provide customers with reliable, safe, and comfortable services. Following is a discussion of the importance of vehicle maintenance on your services as well as advice on how vehicle maintenance functions might be improved.

### How Vehicle Maintenance Can Affect Customer Service .....

As a transit manager, one of your major responsibilities is to ensure an effective vehicle maintenance program. If you are diligent and reasonably successful, your riders and the community that you serve will have:

***Reliable service***, which

- Is on-time
- Experiences few, if any, limited service interruptions due to road calls
- Sees few, if any, missed trips because of vehicle down-time
- Operates wheelchair lifts in good working order

***Safe, well-maintained vehicles***, ensuring

- The vehicles meet or exceed safety standards
- Safe equipment for riders, the transit driver, and other drivers on the road

***Clean and comfortable vehicles***, which

- Have exteriors free of dirt, grime, and graffiti
- Have interiors free of dirt, grime, trash, and graffiti
- Provide seating to riders that is clean and in good condition
- Have wheelchair securement areas with appropriate equipment in working order and clean
- Have functioning heating and A/C systems during the appropriate seasons

Depending on the size of your transit system, you may have a staff person in charge of maintenance--a maintenance manager--but in many smaller systems, the transit manager is also the maintenance manager. Even if you have the staff and resources to delegate the day-to-day duties of vehicle maintenance, you are ultimately responsible for vehicle maintenance and need to understand what makes an effective vehicle maintenance program and why it is so important--from ensuring good customer service to providing safe equipment and helping control transit operating and capital costs.

This discussion provides an overview of the various issues that should be considered for a vehicle maintenance program and the highlights of its components. Additional resources with information pertaining to maintenance management are cited in the bibliography.

## Philosophy of Vehicle Maintenance .....

The words "philosophy" and "maintenance" may seem incongruous in the same sentence, but you should recognize the philosophy followed by your maintenance program, either knowingly or by default. Four "philosophies" have been identified relative to vehicle maintenance:

1. **Condition-based maintenance** - With this philosophical approach, the transit system monitors the condition of vehicle components to predict pending failure. Diagnosis is made based on inspection or trend monitoring to identify imminent failure, and the repair is then scheduled and performed before the vehicle becomes inoperable. One advantage to this approach is the achievement of maximum useful life from the component.
2. **Fixed-mileage maintenance** - Here, maintenance is done at regular mileage intervals, such as every 6,000 miles, and, in some parts of the country, is driven by state regulations. Preventive maintenance follows this philosophy and is increasingly the critical foundation of an effective vehicle maintenance program. This philosophy works especially well for the various components where there is a known relationship between miles traveled and component failure. A variation on this approach is fixed-time, where maintenance is performed at a particular time interval, say every 30, 45, or 60 days. The fixed-mileage approach may be particularly appropriate for transit agencies in rural areas where access to qualified maintenance facilities may be difficult or limited and when the costs for unscheduled repair are much greater than premature replacement of a component.
3. **Operate-until-failure maintenance** - Some transit agencies adhere to this philosophy, sometimes called "road call maintenance" or "demand maintenance," perhaps because of service demands, lack of spares, or limited access to maintenance, but it can be a dangerous approach because of the real potential for failures and even accidents during service and the resulting detriment to customer service. However, this approach may be appropriate for certain components, for example, those with no safety impact and without a direct relationship to miles traveled.
4. **Design-out maintenance** - This philosophy is for components that show on-going, long-term maintenance problems. In some cases, vehicles have a design flaw or cannot operate adequately in the transit system's conditions, so it may be necessary to modify either the component itself or possibly the overall system. The vehicle manufacturer may provide the solution or modification if the problem results from a design issue.

Each of these four maintenance philosophies may have a place at your transit system at some time, depending upon circumstances; however, there generally is a *dominant* philosophy that your transit system will follow. The overall goals and objectives of your transit system as well as the particular objectives of your maintenance program will influence this specific philosophy.

## What are the Objectives of an Effective Maintenance Program? .....

Generally, the objectives of an effective maintenance program are:

### 1. To provide the number of vehicles needed to meet daily service demands.

This can be accomplished by:

- Minimizing breakdowns by having a good preventive maintenance program.
- Ensuring sufficient maintenance capability/staffing levels to provide quick turn-around.
- Minimizing the number of spare vehicles necessary by scheduling maintenance effectively.

### 2. To ensure the vehicles are safe, serviced, and clean, by:

- Having a good quality control program, with a transit manager who takes an active role in maintenance.
- Ensuring good communication among all system staff and, as appropriate, outside contractors. Drivers need to understand their role in maintenance through pre-trip inspections; mechanics should follow-up with drivers if additional information is needed for a specific problem; dispatchers must know the daily roster of vehicles available for service, as modified by maintenance scheduling.
- Establishing an appropriate schedule for vehicle cleaning, exterior and interior, and monitoring the results.

### 3. To provide maintenance at a reasonable cost, by:

- Tracking expenditures for individual vehicle costs, functional costs, and total maintenance costs.
- Maintaining good maintenance cost data to help with capital planning.
- Determining which maintenance functions should be performed in-house by your staff and, for many transit agencies, which should be contracted to outside vendors.

## Components of a Vehicle Maintenance Program .....

### What Are the Components?

The major components of vehicle maintenance include preventive maintenance and the repair function. Other components include: a management information system (MIS) or recordkeeping method to schedule and track maintenance activities and costs; warranty management; consumables such as tires, parts, and fuel; vehicle servicing; and vehicle storage. Additionally, the type of vehicles in your fleet as well as the ratio of spare to service vehicles will impact your maintenance program greatly, although you may have limited control over these two factors. (See Exhibit 2A.)

## Components Are Interrelated

The components of a vehicle maintenance program are interrelated. The MIS, for example, builds upon the data coming from activities in both preventive maintenance and repairs. Also, the number of spare vehicles will influence scheduling for preventive maintenance. And, a decision to increase an aspect of preventive maintenance, for example, the brake inspection frequency, will likely decrease the corresponding work needing repairs or replacement. Such an action will also likely decrease the road call rate for the item, brake failures as the example, as the particular work is shifted more to preventive maintenance rather than repairs.

## Description of Vehicle Maintenance Components

The various components of vehicle maintenance are described below. For detailed descriptions and discussion on the specifics of conducting vehicle maintenance, you will want to consult with the various manuals, publications, and other technical resources that are available on vehicle maintenance, and tailor your own program based on your particular vehicles and operating environment. Various resources are provided in the bibliography in Appendix B.

## Preventive Maintenance .....

Preventive maintenance, or PM, has been called the cornerstone of an effective maintenance program, and it is certainly an essential component of any effective maintenance program. Preventive maintenance or PM is the practice of scheduling certain types of routine maintenance at specified intervals, typically by miles but also by time for certain items. By performing systematic, regularly scheduled maintenance procedures at specified intervals, your system can minimize malfunctions. This approach can be contrasted to the practice of simply making repairs when something goes wrong.

Your preventive maintenance program should be designed around your specific vehicles, it should fit your operating environment, and should change when the vehicle or operating conditions change. PM may be more expensive in the short run but will likely result in the lowest overall "life-cycle" costs when all vehicle related expenses are considered.

## Considerations in Establishing Your Preventive Maintenance Program

When you set up your PM program, you should consider the following:

- Establish all the service intervals as multiples of a common denominator. For example, if oil is changed every 3,000 miles, consider doing tire rotations every 6,000 miles and transmission fluid services every 24,000. A consistent service interval will minimize the number of times the vehicle has to go in for maintenance work and can improve labor efficiency.
- Think about seasonal or environmental conditions of your operating environment that may affect maintenance and impact the service interval for your PM program. If you operate in



severe winters, for example, you may need to change the oil more frequently than every 3,000 miles because of cold starts/running. And you may need to replace air filters more frequently when driving over salted or sanded roads. For rural operations, if you drive on unpaved, dusty roads, your vehicles may need more frequent oil changes and shock absorber replacement.

- Preventive maintenance should also include a regular schedule for washing and cleaning the vehicles. While clean vehicles are clearly a better image for your riders and community, certain dirt and grime, such as salt from the roads in winter, will accelerate rusting and vehicle aging; chlorine compounds used to control dust on unpaved roads will have the same effect.

## What's Involved in Setting Up a PM Program?

Preventive maintenance builds upon the input and inspections of both drivers and maintenance workers. These include the driver pre-trip inspection and the mileage-based inspections. The driver pre-trip inspection has your drivers inspect their vehicles before departing the garage or yard for revenue service. This pre-trip inspection covers exterior, interior, and under the hood checkpoints as well as a check for emergency equipment and should be tailored to your own transit system. A typical form for a pre-trip inspection is shown in Exhibit 2B of this chapter. The inspection by your drivers is the critical first step in the PM program as they may be the first to spot a problem or potential problem. Their observation and comments on the pre-trip form become a starting point for the mechanical inspection. Drivers should also note any problems or defects that become apparent during operations. Typically, such problems can be identified on the pre-trip inspection form. It should be noted that driver pre-trip inspections are required in certain circumstances, for example, when the Commercial Driver's License (CDL) requirements apply (when the transit vehicles have a gross vehicle weight rating [GVWR] of 26001 lbs. or more, or are designed to carry 16+ passengers including the driver).

The mileage-based inspections monitor a specified list of components with similar life cycles. This inspection typically involves lubrication, filter replacement, inspection for wear and damage, and fluid level check. Other aspects are included depending upon which mileage inspection is being performed. An effective PM program must tailor the inspections to the specific vehicles that your system operates. Once the specific tasks for the inspection have been determined, the mileage interval can be established. Often the frequency of an oil change sets this interval. Then, a successive PM program can be developed. A common approach uses the "A-B-C-D-E" classification, where the "A" is the initial inspection and performed upon the vehicle's accumulating mileage equal to the basic interval. Subsequent inspections are performed at higher mileage intervals, depending on the equipment, its age, and component makeup. Each subsequent inspection is more thorough than the previous one, until the cycle repeats. All inspections include the tasks of the initial inspection.

Generally, only minor repairs are conducted during the PM inspection. Repairs, other than minor repairs, should be recorded through the repair order process with the repairs being performed later.

## Repair Function

Once it is determined that a vehicle needs maintenance work (through the driver pre-trip, a PM inspection, road call, accident, etc.), the actual mechanical work must be scheduled, performed, and documented. This is essentially the repair function, both for routine repairs and those necessitated by emergencies such as accidents.

The most effective way to record and track work is through the use of the "repair order" (or "work order"). This form becomes the critical record for documenting the repair and its associated costs, including labor hours. (See Exhibit 2C.)

Once the repair has been completed, information on the repair must go into the history of the specific vehicle. For a smaller transit system, this may simply be a file folder, organized by vehicle. For a transit system with a computerized maintenance MIS, the information should also be entered into the database.

Management of vehicle repairs will vary depending upon whether you have your own maintenance staff or if another organization or contractor performs the work. While you lose the immediate control over the repair if it is done outside, you must still monitor and record all the work and assess the costs to ensure cost effectiveness.

## Management Information System (MIS)

Every transit system, no matter how small, must establish a process for recording the performance of individual vehicles and a method for analyzing overall maintenance performance and costs. Such a process, usually called a management information system, or MIS, tracks maintenance information, including PMs, repairs, costs by vehicle, fuel use and efficiency by vehicle, and road calls.

For a small transit system, the MIS might consist of file folders for each vehicle plus a mileage board that can be posted on a wall and updated to track the need for PM work. For a larger system or for those with some computer capabilities, an effective MIS will use a computer, which can handle larger amounts of data more easily. With a computer, a simple spreadsheet can be developed to track the PM schedule, and various computer software programs are available for fleet maintenance. When a transit system has less than about 25 vehicles it may be difficult to justify the purchase of fleet maintenance software, because of the initial cost, possible training costs, and annual support fees. This is true particularly if maintenance is contracted out, but software is available for a range of transit system size. Typically, fleet maintenance software will provide basic PM scheduling, development of work orders, tracking of parts inventory and fuel consumption, with other capabilities also available. Software prices vary, with the number of users or the number of vehicles in the fleet impacting the cost. For a single user application, fleet maintenance software costs vary from around \$1,300 to \$5,000, with one software package at more than \$30,000; costs for training may be an additional charge, and there are annual fees for support and software "upgrades" (such support is generally recommended).

With an MIS providing data on the individual vehicles, it is then possible to create summary reports which you can use to assess the performance of your maintenance function, including costs

and service reliability. Such summaries include, for example, a vehicle mileage report, fuel consumption and efficiency, road call summary, and maintenance costs.

## Consumables

For a transit system, consumables include such items as fuel, oil, tires, and parts. As the transit manager, you must monitor the costs for consumables since fuel, tires, and parts are three of the six major cost centers for the maintenance function (the others include labor, equipment/facility, and vehicles).

Your direct control over consumables will depend upon your system's arrangements for fueling and maintenance. For example, larger transit agencies will often establish their own fueling capabilities, but for smaller transit agencies, the environmental issues involved with installing your own fuel tank argue against this approach. The use of alternative fuels, increasingly more common, will also influence fueling arrangements.

## Vehicle Servicing

This term covers all the services designed to prepare the vehicle to go out again for revenue service the next day or for its next assignment. Servicing is not mechanical inspection, though a check is usually made for obvious leaks, broken mirrors, lights, and problems with tires. Servicing generally also includes light interior and exterior cleaning, with periodic more thorough cleaning.

In larger transit systems, there may be staff specifically responsible for vehicle servicing. However, in smaller systems, drivers often do the bulk of the servicing work. Drivers may also be responsible for cleaning the vehicles, for example, by taking the vehicle to a local commercial car wash. Other options include contracting with a vendor to come to your facility with special equipment to clean your fleet. Or, if you contract out your maintenance, vehicle cleaning could be included as part of the scope of services.

## Vehicle Storage

Without your vehicles, you cannot provide transit service. Thus, you must protect the fleet and ensure that the vehicles are parked in a safe and secure area. To provide adequate security, it may be appropriate to have the parking area fenced. Additionally, you should ensure that the parking of the vehicles maximizes forward driving; backing a bus or van is hazardous.

For some rural systems, you may find that storing the vehicles at an alternate site is appropriate because of long distances between your location and that of the initial revenue service (or deadhead). Such off-site parking is often called a "park-out." Sometimes, the alternative site is the driver's home, as the driver may drive the bus home in preparation for the next day's service to avoid lengthy deadhead. A word of caution here: try to make sure that the vehicle receives the same standard of maintenance as do the vehicles parked in your system's yard. If you do not see the vehicle every day, it becomes more difficult to track mileage, monitor the pre-trip inspection forms, and assess its cleanliness.

## Warranty Management

A warranty is an assurance by a manufacturer that a product will perform properly for a specified period of time or level of use. If the product does not meet this assurance, the manufacturer or supplier must correct the problem. Your vehicles will come with several warranties, from the supplier, body builder, and suppliers of major components. Generally, the warranties include some combination of mileage and time, and often exclude certain "consumable" items, such as brake pads and batteries.

As a manager, you should realize that aggressive management of your vehicles' warranties can be an effective and cost-saving strategy. You should read over and become familiar with all the warranties provided with each vehicle. Importantly, be sure to understand who is responsible for which warranties: is it the vehicle supplier or the local service representative of a component supplier? Vehicles may not be perfect when they are delivered new and vehicle manufacturers expect that some adjustments will be needed. If problems or issues are discovered, make sure that you take the vehicle to the appropriate facility for correction.

Most warranty repairs can and should be handled by the local auto or truck dealership that represents the chassis manufacturer. But in order for your warranty to be honored, you must take the vehicle to an authorized representative. If the representative cannot solve the problem, you should contact the vendor who delivered your vehicle, as this vendor will be familiar with all aspects of your vehicle and should be able to help find an appropriate alternative to solve the problem.

Also, to ensure maximum benefit from the warranties, you can use the warranties as a basis for future maintenance activities by ensuring that any required service is directly incorporated into your PM program (for example, the lubrication schedule for the lift). You should review the performance and condition of specific warranty-related items and components at a service interval shortly before any major warranty milestones to ensure that you realize as much benefit as possible from your warranties.

## Vehicle Type and Fleet Size

The type of transit service that your system provides will influence the type of vehicles that you operate. Often, smaller transit agencies and those providing paratransit service use mini-vans, standard and modified vans, and/or body-on-chassis (often called cut-away) buses. While there is great variety among such vehicles, they are unlike a standard 40-foot bus in that their primary components are not built for transit use. Small transit agencies are more likely to be able to find qualified mechanics more easily than larger transit systems, since typical vehicles and their major components are manufactured by major auto makers. You are also more likely to find qualified garages in the community to do your work on a contract basis.

Larger vehicles built specifically for the transit industry have more specialized components and require somewhat more specialized maintenance skills. If you operate this type of vehicle, you may need to expend more effort to find qualified mechanics if your system does its own maintenance or to find outside vendors to handle work contracted out.

The size of your fleet and number of vehicles that you need during peak periods will impact your maintenance program. It is very important to ensure that you have some back-up or spare vehicle capability so that maintenance needs will not adversely affect your service for your riders. Guidance on an appropriate number of backup vehicles has been provided by various sources. One source (*Policies and Procedures Handbook for North Carolina Rural Transportation Operators, 1995*) suggests:

# of Regular Vehicles	# of Backup Vehicles
1-7	1
8-13	2
14-20	3
21-29	4
30-39	5

Other sources suggest a slightly higher ratio of backup vehicles: for a smaller system, defined as less than 100 vehicles, the Canadian Transit Handbook reports that 85 percent of the total fleet should be available for scheduled service, 5 percent allocated for an "accident allowance," and 10-20 percent assigned to maintenance.

## Structuring Your Maintenance Program .....

Many smaller transit agencies contract out some, if not all, of their vehicle maintenance program. While drivers still conduct pre-trip inspections, commercial garages, municipal or county maintenance facilities, or other agencies, such as a school bus operator, may do preventive maintenance and repair work. However, when your system grows or your system has particular characteristics (e.g., rural location, specialized vehicles), it may be appropriate to hire maintenance capabilities.

The issues related to in-house maintenance and to contracted maintenance are discussed in several of the resources identified in the bibliography. Your transit system's decision will be impacted by various factors, including your resources and space to develop your own maintenance facility, your ability and desire to hire your own maintenance staff, and proximity to existing maintenance facilities that could maintain your vehicles.

Among the advantages to having your maintenance contracted out include the avoidance of the substantial fixed investment of equipping a repair facility and the ability to gain technical expertise without hiring and training your own staff. There may be disadvantages, though. Scheduling of maintenance work can be more difficult; you may need more than one maintenance provider, as some of maintenance work on buses is specialized, so more than one vendor must be found, and

turn-around time may be longer than desired if the vendor does not stock necessary parts. However, some of these issues can be addressed with a well-written and specific contract.

Use of an outside maintenance facility can be informal, on an as-needed basis. A more formal approach would be to develop a written contract, which can be competitively bid.

If you decide to develop an in-house maintenance function, staffing becomes an important issue, once facility and equipment needs are resolved. Determining the number of mechanics to hire will be impacted by various factors, including the type of vehicles and their age, the degree of standardization of your fleet, and the rigors of your operating environment. General guidelines have been published, indicating the number of vehicles that one full-time mechanic can handle, by type of vehicle:

Type of Vehicle	Number of Vehicles
Car	20-30
Van or modified van	15-30
Body on chassis	5-20
Buses or heavy-duty vehicles	3-10

Source: Ohio DOT, *Maintenance Manager's Manual for Small Transit Agencies*, 1988.

Regardless of whether you have your own maintenance facility, contract out your work, or operate with some combination of the two, you must monitor the structure to ensure that it remains effective for your system and delivers quality maintenance service. This is part of your management function.

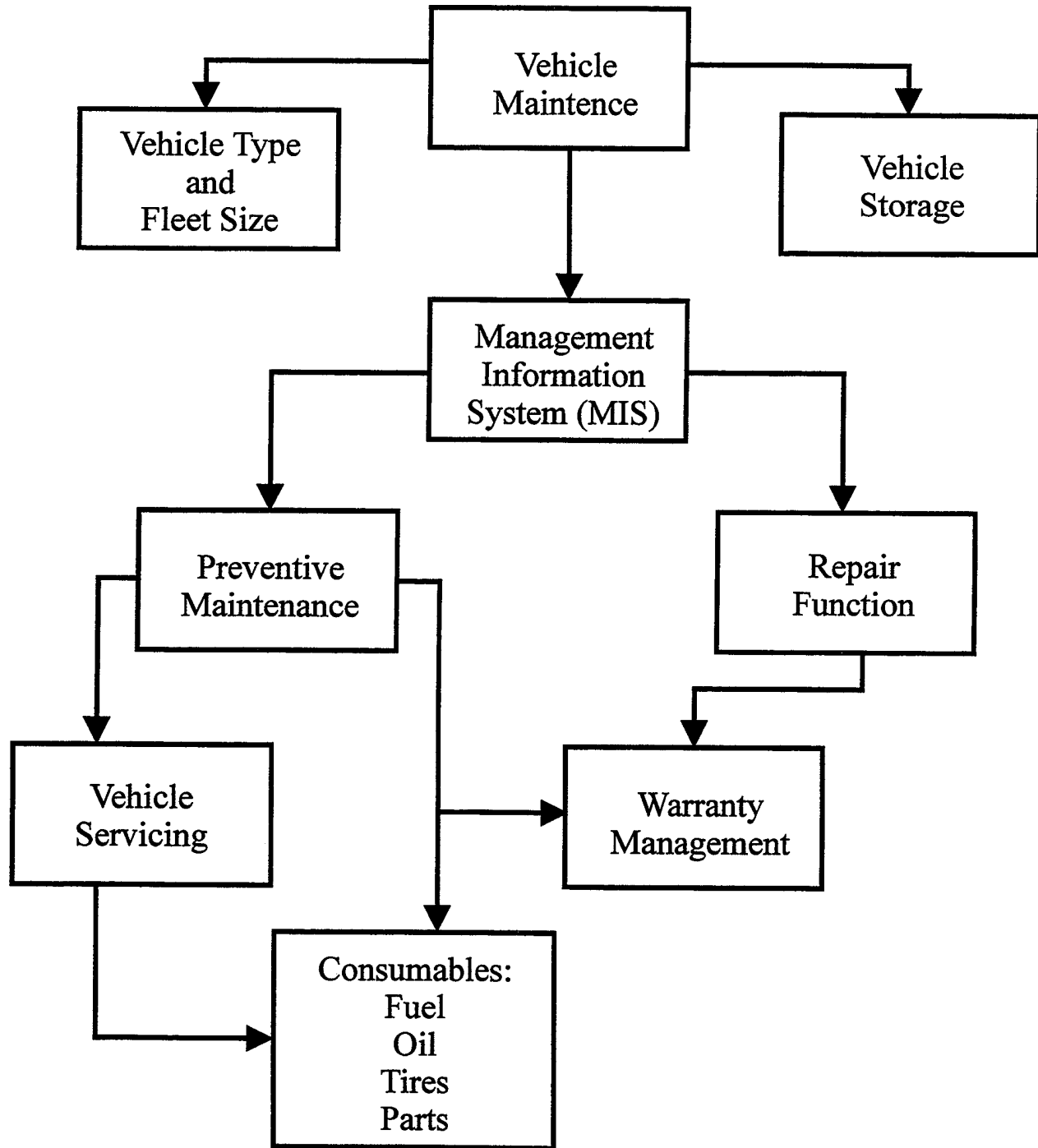
## Managing Your Maintenance Program.....

Even if you have limited experience with vehicle maintenance, it is very important for you to take an active role in the program. With an active role, you will communicate to your staff the vital importance of the vehicle maintenance function. What are some of the specific things you can do to take an active role and ensure that maintenance receives appropriate attention?

- Involve maintenance staff in training drivers on pre-trip inspections.
- Periodically review drivers' pre-trip inspections to ensure thorough and proper completion of the inspection.
- Randomly inspect a vehicle after preventive maintenance to see that the inspection and services were conducted.
- Review the breakdowns to assess possible causes--driver related? preventable? repeat problems?
- Review random vehicle records for repeat repairs or ongoing problems.

- Provide scheduled opportunities for drivers and mechanics to discuss vehicle and servicing issues (this could be part of a regular scheduled staff meeting, such as safety meetings).
- Ask to see any parts that are replaced, and try to determine if the parts have actually failed and are associated with the original problem.
- For major component failure, assess cause of failure--fatigue? improper maintenance? driver error?

**Exhibit 2A: Components of Vehicle Maintenance**





# Exhibit 2B: Pre-Trip Inspection Checklist

## DAILY BUS REPORT

Bus/Vehicle # _____		Day: _____	Date: _____
Driver 1 _____		Driver 2 _____	Driver 3 _____
Miles (End Yard) _____	Miles (End Yard) _____	Miles (End Yard) _____	Total Miles _____
Miles (End Route) _____	Miles (End Route) _____	Miles (End Route) _____	Revenue _____
Miles (Start Route) _____	Miles (Start Route) _____	Miles (Start Route) _____	
Miles (Start Yard) _____	Miles (Start Yard) _____	Miles (Start Yard) _____	Oil _____
Body/Seat Damage (Describe) _____	Body/Seat Damage (Describe) _____	Body/Seat Damage (Describe) _____	Fuel _____
_____	_____	_____	
_____	_____	_____	

Daily Check List	Check (✓) if O.K.	If Defective, mark (X)	All Defects must be described on bottom of DBR
	Driver 1	Driver 2	Driver 3
1 Air System			
2 Belts/Hoses			
3 Oil Level			
4 Water Coolant			
5 Water/Oil Leaks			
6 Tires/Lug Nuts			
7 Head Lamps			
8 Turn Signals			
9 Hazard Lights			
10 Clearance Lights			
11 Brake Lights			
12 Backup Lights			
13 Glass (AM)			
14 Mirrors			
15 Clean Exterior			
16 Proper Decals			
17 Brake Pedal			
18 Air Gov. Cut In & Out			
19 Stat. Air Press. Loss			
20 Appl. Air. Press. Loss			
21 Low Air Press. Wring			
22 Backup Beep/Horn			
23 Emergency Exit			
24 W/C Lift & Cover			
25 Passenger Door			
26 Heater/Defroster/A.C.			
27 Wipers			
28 Chime			
29 Emergency Brake			
30 Seat Belts			
31 Clean Interior			
32 Passenger Seats			
33 Hand Rails			
34 Modesty Panels			
35 Gauges:			
Oil      Vacuum			
Amp      Temperature			
Air      Speedometer			
36 Vehicle Shut Down			
37 Fire Extinguisher			
38 First Aid/Accident Kit			
39 Emergency Reflectors			
40 W/C Ties/Restraints			
41 Transfers			
42 Schedules			
43 Vault Check			
44 Radio			
45 Fuel Card			
46 Registration			
47 Insurance Sticker			
48 Current Vehicle Cert. (SPAB/GPPV)			
49 Flashlight			
50 Horn			
51 Other			
52 Other			

Explanation of Defects or other Comments: \_\_\_\_\_

\_\_\_\_\_

## Exhibit 2B: Pre-Trip Inspection Checklist

### General Notes about the Daily Vehicle Inspection Checklist

An important part of preventive maintenance is the establishment of strong communication ties between drivers, mechanics, and management. An easy way to ensure and document this communication link is by way of the driver's daily vehicle inspection checklist.

- ✓ Drivers should be given blank copies of the checklist on the following page to keep on a clipboard in their vehicle.
- ✓ Each driver will need to conduct the inspection and fill out the checklist before beginning his/her route.
- ✓ Drivers should add comments to the checklist if a problem arises during the shift.
- ✓ All checklists are to be submitted to the maintenance manager at the end of the shift.
- ✓ The driver should keep track of preventive maintenance needs (according to the preventive maintenance schedule) and record this information in the maintenance reminder box. This information allows the maintenance staff to schedule and perform the required service in a timely manner.

Note that the attached checklist is a sample and you may choose to add or delete items at your own discretion. In any case, documented daily inspections must be included in the permanent vehicle file.

## Exhibit 2C: Sample Work Order Form

Maintenance Repair Order						RO NUMBER			
						14420			
VEHICLE INFORMATION						REASON FOR RO			
Location - Project		Vehicle Number		PMI <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D		Road Call <input type="checkbox"/> R			
Date Entered Shop		Make/Year		Normal Maint <input type="checkbox"/> N		DBR <input type="checkbox"/> T			
Date Left Shop		Odometer		Accident <input type="checkbox"/> X		Vandalism <input type="checkbox"/> V			
Reference RO#		DBR Number							
LABOR									
Repairs Needed		Repairs Completed		Date	Mech	Hrs			
Total Mechanic Labor Hours									
PARTS									
Qty	Part Number		Description		Cost	Total			
Total Parts Cost									
FLUIDS					TIRES				
Qty	Desc	Grade	Cost	Total	Qty	Size	Description	Cost	Total
qt	Motor Oil								
lb	Grease								
qt	ATF				Total Tire Cost				
gl	Coolant				OUTSIDE LABOR				
pt	Brake				Vendor		Description	Cost	
pt	Gear Oil								
lb	Freon								
Total Fluid Cost					Total Outside Labor Cost				
COMPLETED BY:					TOTAL RO COST				

Vehicle Maintenance

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## Section 3: Improving the Way You Manage Risk

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If you have identified potential or real customer service problems created by the way in which you manage your system's risks, this chapter is for you. Managing risk not only reduces losses, but also, from a customer standpoint, it can make your services safer and more reliable. As described below, effectively managing risk to your customers requires you to be vigilant in a number of management functions. Following is a discussion of the importance of managing the risks associated with customers using your services as well as advice on how these functions might be improved.

### What Is Risk Management and Why Is It Important to Your Customers? .....

In our daily personal lives, each of us has come to understand that there are certain "risks" involved in owning and driving an automobile, renting or owning a house and, when it comes right down to it, living. To handle the potential costs of accidents and losses in our personal lives--and to give each of us peace of mind (as well as to satisfy state laws in the case of autos)--it is common to buy auto insurance, homeowner's and renter's insurance, life insurance, and medical coverage for illness or injury. Our individual decisions to buy or not to buy such insurance policies are the result, whether we recognize that we have done this or not, of a personal risk management process, which has assessed the "risks" we face and the alternatives which are available to manage the uncertainty of future accidents and losses.

As managers and administrators of transit systems, regardless of the number of vehicles we operate and the type of system, the process of risk management that we need to organize and carry out is very much the same as what we do as individuals. Regardless of whether we are considering our personal or business lives, "risk" is the potential for unintended loss or damage. How we, as managers, choose to deal with this potential for loss can have a significant impact on the future success, financial health, and even survival of our organizations.

The process of recognizing the potential losses that exist in any situation, developing and weighing alternatives for managing potential losses, implementing the selected alternatives and monitoring the outcome is called *risk management*. In more precise terms, risk management is a "systematic process for planning, organizing, directing, and controlling the resources and activities of an organization to protect its assets and minimize the effects of accidental loss."<sup>1</sup>

This section provides a brief introduction to the process and procedures of risk management in a typical transit organization. It is recommended that transit managers and organizations consult with risk management professionals as to the adequacy and appropriateness of their individual programs. Additional resources pertaining to risk management are cited in the bibliography.

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<sup>1</sup>Policies and Procedures Handbook for North Carolina Rural Transportation Operators, October 31, 1996, Page 9-2.

## Risk Management in Your Transit Organization.....

Rather than an administrative function to be assigned and addressed only when your system's insurance policies come up for renewal, risk management must be understood from the outset as not only a specific administrative function, but also a part of each manager's and employee's job description.

While you need to assign the specific administrative functions involved in risk management to an individual or department, the fact is that responsibility for the development, implementation, and success of the risk management program will involve everyone at your property:

**Management** has a key responsibility to define the objectives of the risk management program, identify potential risks and develop strategies to manage those risks. Once adopted, your managers, from the general manager to the road supervisor, must be knowledgeable of the risks involved in their areas of responsibility as well as the system as a whole and actively demonstrate their commitment to the adopted program.

**Finance** staff need to be involved in selecting specific alternatives for managing potential losses and the financing of those strategies.

**Human Resources** will be involved in the development of recruiting, selecting, and hiring programs, personnel policies, and medical and other benefits programs, which contribute to attracting and retaining a workforce that promotes the objectives of the risk management program.

**Maintenance** staff have a crucial role not only in developing the program, but also in overseeing much of the facility and equipment aspects of risk avoidance, inspection, and control.

**Training and Safety** personnel carry out the direct education of new employees and retraining of existing staff on the risks present in operating transit services and their avoidance. The system's safety program sets forth the specific elements of this training and the activities of the safety personnel.

**Operating and Administrative Employees**, most noticeably through your system's safety program, will be involved in recognizing and avoiding risks, as well as in identifying new areas of potential risk before the occurrence of a loss.

## The Risk Management Process .....

The operation of passenger transportation services can present by its nature many opportunities for unintended losses to customers and to your system every day. The opportunities for loss include not only vehicle accidents in traffic or difficult road conditions, passenger falls on vehicle steps or within vehicles, and employee injuries, but also less obvious opportunities for loss, such as the theft or disappearance of cash or documents, and fire, flood, or environmental loss at a facility. The risk management process involves a methodical examination of your organization and its facilities, equipment, and operations, and the identification of ways in which the opportunity for loss can be minimized through your actions as a manager. New training programs may be needed, policies

updated, or equipment or facilities changed. Because we can't eliminate all potential for loss, in most systems the process also includes buying insurance to protect the organization when accidents or losses do occur.

Although risk management in most systems is an ongoing process, most successful risk management programs follow a process involving the following general steps:

1. Risk Identification--What types of risks is your system likely to face?
2. Measurement and Evaluation--How frequent might each type of loss be, and how large is the damage likely to be?
3. Analysis of Alternative Strategies for Managing Risk--What are the possible actions your organization can take to protect itself from loss at an affordable and stable cost?
4. Program Development and Implementation--What combination of strategies, that is, risk avoidance, loss control, and risk transfer, will result in the most effective and economical results for your system?
5. Program Monitoring and Review--How are you going to monitor and refine your risk management program to ensure it is effectively minimizing current risks and addressing new opportunities for loss?

## Risk Identification

The first step in the risk management process is to identify the risks that your transit system faces. These risks can be identified from records of the losses the system has had in the past (that is, the system's loss history), the losses of similar transit systems, transit industry risk management data, and projections by risk management professionals. The general types of loss that can be encountered in normal transit operations include:

- Automobile Liability losses originate as a result of or related to the operation of the your system's insured transit, administrative, and/or maintenance vehicles. This category is the largest area of exposure for a transit service and generally involves the most serious potential losses.
- General Liability losses involve personal or bodily injury, property damage, or other loss not resulting from or related to vehicle operations. While not an area of major exposure for most transit systems, losses in this category could involve libel or slander, and passenger injuries and property damage not related to vehicle operations (at offices or facilities, for example).
- Property Losses to vehicles through collisions or natural disasters and real and personal property. Such losses can be caused by fire, theft, or natural causes, such as floods, earthquakes, tornadoes.
- Director and Officer Liability losses can arise out of a manager's or director's responsibility for ensuring that the system complies with local, state, or federal laws and regulations as well as from claims of negligence in discharging management responsibilities.

- Employee Liability and Worker's Compensation losses can arise out of illness or injury of employees arising out of the conduct of their job duties or exposure to chemicals or hazardous materials in the workplace.
- Environmental Losses can result from failure of underground storage tanks or spillage of hazardous materials.
- Contractual Liability can arise from leases, rental agreements, construction and consulting agreements, special services contracts, and employment contracts.
- Business Interruption losses can arise from natural disasters, and computer or communications systems failures.

Other areas of loss, which are less common but potentially significant, might include violation of civil rights, ADA, sexual harassment, and pollution related to stormwater or other discharge, and waste disposal.

## Risk Measurement and Evaluation

This part of the process assesses the likely frequency and seriousness of the potential losses identified above. If yours is not a new transit system, your own loss history will provide much of the information needed to determine the likelihood of a particular type of loss and the damages that might result. If adequate loss histories are not available or if your past risk management performance is not an adequate indication of present and future performance, then information from peer systems could be used to estimate reasonable loss rates and damage values.

Catastrophic losses are more difficult to estimate in terms of frequency and damages. It is most difficult to estimate the losses involved in a major vehicle accident, the injuries to occupants and others, and the settlement values in the event of operator negligence or fault. There are sophisticated loss projection techniques available to insurance companies, which can predict the probability of such occurrences and the severity of loss in such an event based on past loss history and the characteristics of your services. In most cases, however, the experience of your own and peer systems will provide basic guidance as to the levels of loss in such events, which should then be reviewed with qualified legal counsel familiar with tort laws and legal settlements in your area.

### *Analysis of Alternative Strategies to Manage Risk*

With a reasonably complete picture of the potential areas of loss for your transit system, frequency of occurrence and potential damages, you and your management team are ready to determine how best to manage these risks. Your strategies include:

1. Risk Avoidance: Certain risks may be eliminated if the policy, practice, or activity is better discontinued. The environmental exposure of underground storage tanks, for example, has been determined by many agencies to be a risk that is best avoided by removing or not installing such tanks. Similarly, operation in severe weather conditions, such as ice or sleet, may constitute a situation during which services might be curtailed if high losses were projected with no reasonable means of mitigation.



2. Loss Prevention and Control: Loss prevention and control aims at lessening the projected losses in your system by reducing the number of projected losses and minimizing the damages when a loss does occur. Prevention involves changing system operations, policies, and procedures to reduce or prevent the occurrence of projected losses. If experience shows, for example, that drivers are frequently injured while assisting passengers in wheelchairs up and down curbs and stairs, then "prevention" involves reducing the opportunities for having to assist wheelchairs up/down steps and stairs. Actions which could be taken to prevent this risk include establishing a policy that either prohibits assisting individuals in wheelchairs up/down steps and stairs or limits the number of steps or stairs, and clarifying operating procedures for boarding/deboarding passengers at curb cuts and driveways to eliminate curbs.

When we have prevented those risks that are possible, we then need to work to "control" our risks by taking actions that limit the size or extent of the losses that do occur. Continuing the example of assisting individuals in wheelchairs, we can control the extent of injuries that do occur through better driver training. This training includes the proper body mechanics involved in raising a wheelchair up or down a stair and teaching proper lifting techniques in general and stretching exercises to relieve back strain.

Loss prevention and control must be a continuous process in every organization since your staff, passengers, and operating conditions are constantly changing. Identifying risks and working to prevent and control them is an important aspect of many day-to-day functions of a transit system:

- Recruiting, Screening, and Hiring Employees must focus on finding and hiring qualified individuals who have an awareness of the importance of safety and their role in it.
- Training/Retraining Programs not only teach the basic skills needed for jobs in your organization, but also highlight risks in each job and how they are to be prevented or controlled. New and existing employees are also informed of recent accidents and trained to prevent them and how to respond in the event of accident or emergency to obtain assistance and minimize the damage.
- Safety Programs must be integrated into every aspect of the organization and its operations. Effective safety programs include a wide range of activities, from information and training to recognition and awards.
- Facility Design and Maintenance requires close attention to identifying potential loss opportunities and actions to prevent these on a continuing basis.
- Equipment Selection and Maintenance involves not only regular maintenance of vehicles and equipment to minimize failures, but also the specification and selection of vehicles that are designed with safety in mind. Examples of "risk-sensitive" vehicle design factors might include the installation of quality, ergonomic driver's seats to provide adequate back support and correct driving posture, the positioning of wheelchair securements with sufficient clearance for safe installation, and the installation of back-up warning devices and clearance mirrors on the front and rear of the vehicle.

- Loss Review Activities are critical from the perspective of informing all system staff of accidents that have occurred and how these might have been prevented or minimized. Loss records are also used to spot trends that will indicate a need for management's involvement, review of policy or procedure, and possible training or safety programs.

## ***Risk Retention***

At this point in your risk management process, you have identified your potential losses, assessed the frequency and possible damages from each type of loss, and then determined how these losses might be avoided, prevented, or controlled. What remains are those losses that are inevitably going to occur. Some of these will be relatively infrequent or minor in damages, while other possible losses will be major, unpredictable events with potentially serious damages. Considering losses that are going to occur no matter what you do, risk retention is the determination of how much of the losses your system should pay for directly.

Remember that the objective of risk management is to "minimize the effects of accidental loss." One of the ways to minimize the effects--that is, the costs--of accidental loss is to undertake to pay for relatively small, predictable damage costs directly rather than transfer these losses to an insurance company. This is not a negative comment on insurance companies--they generally agree that it is more cost effective for a company or organization to take direct responsibility for the costs of minor losses up to some dollar amount determined by the size of the organization and its financial capabilities.

There are at least three ways to retain specific levels of risk in any organization:

1. Deductibles: Most of us have a certain "deductible" level in our automobile insurance. Below that level we pay for the damages of any loss, and above that, the insurance company pays. The concept is exactly the same for your transit system. The deductible level--usually stated in terms of "XX dollars per occurrence" and with an aggregate deductible limit--is set based on the total number of losses which have been projected during the policy period and the resulting damage cost. Deductible levels can vary from \$500 per occurrence to \$5,000, depending on the area of loss, system's financial capabilities, and loss history.
2. Self-Insured Retentions: Also known as "SIRs," self-insured retentions are basically much larger deductibles and are generally found in automobile liability policies. The first major difference between deductibles and SIRs is that self-insured retentions usually are set at levels of \$15,000 to \$25,000 per occurrence or more with a "stop-loss" aggregate SIR limit of, for example, \$250,000, or some other specific amount. The other major difference is that under an SIR arrangement, the policy holder is directly involved in claims management and settlement--after all, up to the SIR limit, these are the system's dollars, which are being spent on damages and settlement.

Self-insured retentions can either be "funded" or "unfunded." With a funded SIR, the insurance company will determine the expected level of losses and require a deposit and payments toward this level on a regular basis. In this arrangement, actual losses are paid out of these deposited

funds, and any funds remaining at the end of the year are refunded to the system.<sup>2</sup> Unfunded SIR programs have no such deposited funds, and the insurance company has no responsibility for payment of claims within the SIR level. If a system's losses greatly exceed the projected levels or the system has other financial troubles, there may not be sufficient funds in current accounts to pay claimants. In this event, the system's risk management strategy--unfunded self-insurance retention--can place the organization's survival at risk. Unfunded self-insurance retention is not a responsible risk management strategy.

In considering either deductibles or self-insured retentions, there should be a direct and identifiable cost trade-off between the level of deductible or SIR and the premium cost of the system's insurance for this area of risk. The decision becomes one of how much management control you feel you can exert to make sure that actual losses come in below the projected level. To the extent that your losses are below the projection, your system should save money with deductibles or SIRs.

3. **Self-Insurance:** For sizable organizations with strong financial capabilities or for very specific areas of risk where losses will be infrequent and small, self-insuring against projected losses can be an alternative to procuring regular commercial insurance. In the case of a large organization with a strong financial position, the organization might choose to self-insure for all losses in an area of risk up to a level of \$1 million or \$5 million, and purchase insurance coverage for catastrophic losses over this amount. For smaller organizations, self-insurance is often a reasonable choice for areas of risk in which a loss appears unlikely, the damage would be within the organization's ability to handle, or the cost of insurance to cover the risk is judged to be unreasonably expensive. Flood and earthquake risks, for example, are usually self-insured by most organizations.

As with unfunded self-insurance retentions, self-insurance assumes that the organization has or will have the financial resources to cover its losses and settlements when they come due. If losses and resulting damages and settlements are higher than anticipated or the organization's financial strength was overestimated, self-insurance can place an organization at risk of financial disaster.

### ***Risk Transfer***

Either in conjunction with or as an alternative to risk retention, risk transfer involves shifting the financial responsibility for losses to a third party. There are basically three options for risk transfer:

1. **"Hold Harmless" Clauses:** These are legal agreements that another party will accept all risk of loss and cost of damage, settlement, etc., with regard to a particular activity or undertaking. Rental agreements, leases, technical and consulting agreements usually contain hold harmless clauses transferring the risks involved in use or specific activities from one entity to another. The drawback with hold harmless clauses is that they assume that the other party has the financial capacity to handle the transferred losses regardless of how large they might be.

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<sup>2</sup> It's not quite this easy, since cases will remain open past the end of the policy period. Following the close of a policy period, there are regular loss reviews and policy settlements at 3, 6 and 12 months and then at regular intervals until all claims are closed. The cost impact of such open claims, since SIR costs can go up as well as go down, are one drawback to SIRs.

Ultimately, the organization with the "deeper pockets" can become responsible despite hold harmless requirements.

2. Contracting: The shifting of insurance costs and risks has become one argument in favor of contracting for transit management and operation. Inherent in this position is that the contract operator must satisfy the system's insurance requirements and provide adequate documentation of policies and financial strength.

**SEE "RISK MANAGEMENT WITH CONTRACTED OPERATIONS," BELOW.**

3. Purchase of Insurance: This is the most common means of shifting the financial responsibility of risk management losses in an organized manner with predictable costs. Due to the importance of how purchasing of insurance takes place, this is addressed as a separate section below.

**SEE "PROCURING INSURANCE."**

## **Risk Management Program Development and Implementation**

Through the earlier steps of the risk management process, you have identified potential risks in your workplace and organization, have determined how these risks might be avoided, prevented or controlled, and then have decided upon strategies for the management of these risks. Your risk management program involves actually implementing all of the actions that you have identified, which can result in lowering your risk, and, ultimately, the costs of damages, settlements, and insurance.

Earlier in this section it was stated that risk management is a "systematic process." The result of this process needs to be a program of policy, procedure, equipment, facility, and other changes that are specifically related to desired prevention and/or minimization of risks. It is difficult, if not impossible, to assess whether the identified changes have been made without a documented program of changes to be made and the intended results. A risk management program can also determine whether changes have had the intended impacts, and it can fine tune areas where unintended losses continue to occur at unacceptable rates.

## **Program Monitoring and Review .....**

For most organizations, the risk management process is continuous from one year to the next, with peaks of activity when insurance policies are renewed or major accidents occur. Monitoring systems and reports need to be established to produce timely and accurate summaries of accident losses and projected financial impacts as well as progress reports on implementation of system changes to prevent and control losses. The monthly loss review is one such report that lists all accidents and losses occurring during a month and summarizes the resulting damages and costs. Analysis of loss reports assists in identifying organizational and operational areas that require additional risk analysis to understand and to properly respond to continuing losses.

As a quick reference and management tool, it is important that your organization prepare an insurance summary showing all of the policies which are in force and the details of each. Among the basic details that should be shown are each policy carrier, policy number, areas of coverage, policy limits, deductibles or SIRs, policy effective dates, premium amounts and payment terms, and broker or insurance agent.

The importance of risk management to a transit organization cannot be overstated. Risk management is the major area of controllable cost within most transit organizations. Within the general scheme of management priorities, regular review of the risk management program, accident losses, insurance policies, and overall costs must be given the highest priority.

## Procuring Insurance

Buying specific insurance policies is the primary form of risk transfer for both individuals and organizations. Insurance coverages are generally referred to and written with regard to a primary area of risk, although often insurance to provide coverage for related risks will be combined into a coverage "package." Homeowners' liability policies and commercial package policies are examples of combined insurance.

As a transit system, the types and amounts of insurance you buy will reflect the risks identified within your risk management process, the estimated total damages which were determined, and the amount of risk your organization is able and comfortable with retaining. As mentioned earlier, the insurance programs of similar transit systems--types of coverage, policy levels, terms and costs--will provide valuable comparisons for you in the procurement process.

## Types of Insurance Policies

The insurance coverages your transit organization will be buying are written with regard to primary areas of risk. The principal insurance policies you will be concerned with are:

- Automobile Liability.
- General Liability.
- Automobile Physical Damage, which includes coverage against loss or damage to the system's vehicles due to both collision and comprehensive risks.
- Building and Contents policies cover losses to specified facilities and different categories of property due to fire and other causes. Among the special areas of property coverage included are computers and media equipment, valuable papers, and mechanics tools.
- Director's and Officer's Liability protects directors and officers of your organization against personal risk of loss related to claims arising out of their execution of assigned duties and responsibilities.
- Worker's Compensation provides coverage for employees of the organization for job-related illness and injury. The extent and terms of worker's compensation coverages are specified by each state.

- Employee Dishonesty coverage is generally written as a package policy providing protection against forgery and alteration, theft or disappearance of cash or negotiable securities, and employee dishonesty related to misappropriation of funds.

Many other specialized insurance coverages are available and may be needed based on the specific risks identified for your system.

In each of these coverage areas, the level of insurance your system requires may be obtained as the direct "face value" of the basic policy itself. This is referred to as the primary coverage. Insurance may also be obtained through the purchase of either excess insurance or umbrella insurance to achieve higher limits of coverage than provided by the primary coverage. Excess and umbrella policies are generally written for a specific dollar limit of coverage in excess of the referenced primary policy.

## Insurance Pools

Transit providers in a number of states have organized "insurance pools" to jointly share the risks involved in providing transit services--essentially forming their own insurance company. Participants contribute a computed "premium" that reflects the cost of their projected losses plus an overhead contribution for claims management and administration. As a group, the pool members share risk management programs and resources with the objective to help all members to reduce their losses, resulting in savings to each member and the pool as a whole. Pools often purchase excess insurance to cover extraordinary losses over a certain limit per occurrence and stop-loss coverage to limit overall losses to a specified, usually annual, amount.

Insurance pools are sensitive to the commitment of each participant system. Poor or ineffective risk management practices can have financial impacts for all members. Additionally, once a system joins an insurance pool, that commitment is generally for a multi-year period, meaning that the system may not easily change its mind and shop for less-expensive coverages. Finally, the success of the pool, like a self-insured retention, may not be proven until all claims are closed, which is often several years following the end of each policy year.

## Soliciting Insurance Quotes

Once you have determined the types and amounts of insurance your transit organization needs, you will need to get insurance quotes. Just as if you were going to contract for consulting assistance or contract for the operation of transit services, your processes will be similar:

1. Timing Your Solicitation: As with any complicated project, you will need to work backwards from the expiration dates of current insurance policies and leave plenty of time for companies to assess your insurance needs, review loss histories and visit facilities, and to negotiate for the most effective policies and terms. For a complex insurance program, the process from releasing a request to the effective date for the coverages can be as long as 4 to 6 months.
2. Sources of Insurance: Insurance for public and specialized transit systems is written generally only by a very few companies in the U.S. This is because the risk is quite different from that

experienced in other business enterprises and its losses are highly unpredictable. The few primary insurance companies that will write automobile liability, general liability and excess coverages are either "direct writing" companies or write their policies through insurance brokers. A review of the major transit industry publications can show advertisements for most of the transit insurance providers.

3. **Preparing Your Request:** Like preparing a request for proposal for a major project, you will obtain the best insurance quotes if prospective insurance companies are provided with the underwriting and organizational information they require in a comprehensive package. While additional specific information may be needed, your insurance package should contain:

- Organizational description, structure, establishing authority.
- Names, positions, and resumes of primary officers.
- Detailed descriptions of the transit services operated, including maps and schedules.
- Annual operating data, including total passengers, passengers by type, miles, vehicle hours of service.
- Facility locations and descriptions of activities at each.
- Vehicle listings indicating specialized equipment, total mileage by vehicle, seating and standee capacities, cost new and present depreciated values.
- Employee payroll data by wage classification.
- Driver listing, names, social security number, driving records.
- Equipment and contents listings and values, including computer equipment by location.
- Complete and current loss histories for the prior five years.
- Descriptions of recruiting and hiring programs, training programs, safety and risk management programs.
- Insurance summaries for prior five years.

Finally, you need to tell them how their quotes are to be submitted:

- Levels of insurance coverage to be quoted.
- Any special coverages, policy forms, or wording needed for specific projects or clients.
- Bid procedures.
- Any formats in which quoted costs are to be presented to facilitate your review.

## Evaluating Insurance Quotes

Evaluation of the quotes you receive for transit insurance will be time-consuming and technical. To properly interpret the quotes and conditions to the offered insurance coverages, you may find it beneficial and efficient to procure professional risk management assistance. At a minimum, these factors need to be considered in the evaluation of insurance quotes:

- Financial strength/rating of proposed insurance carriers.
- Terms of the insurance being offered, including who is insured, what risks are covered/excluded.
- Is the offered insurance "Occurrence" or "Claims Made" form? "Occurrence" covers any claim arising from a event during the effective dates of the policy; "Claims Made" covers a claim only if that claim is made or presented during the effective dates of the policy. Extension of the dates on a Claims Made policy entails payment of additional premium.
- Quoted premiums for the coverages offered, including any conditions for assessment of additional premium.
- Payment terms for deposits, base premiums, deductibles and SIRs, any retrospective premiums based on settlement of losses and claims during and after the policy period.
- The carrier's risk management and claims settlement philosophies.
- Administrative and claims procedures and requirements.
- Opportunities for transit system involvement in claims management process.
- References from other transit systems.
- Multi-year commitments, if available.

## Managing Your Insurance Program.....

Placing the insurance coverages and obtaining the policy documents does not end your involvement with the insurance company--it is only the beginning. Under the terms of your policies, you may have deductibles, self-insured retentions, or your system may be subject to additional premiums depending upon the ultimate level of your losses. You may also have an opportunity for a return of premium if your losses are closed out at less than specified levels. Finally, even if there are no opportunities for specific additional payments or refunds, your losses during any policy year--including the claims management and settlement costs controlled by the insurance company--will impact your loss history and policy premiums for five years following the close of that year. There are obviously strong reasons to take an active role in managing your insurance program.

Besides receiving regular claims reports from your insurance carriers, scheduling periodic policy and claims reviews are most important. You need to know if claims are being submitted in a timely and complete fashion to allow prompt response by the carrier and actions toward settling and closing claims should be reviewed on a case-by-case basis.

During the policy period and on a permanent basis afterward, care needs to be taken to safeguard and maintain the actual policy documents, amendments and endorsements, and documentation of premium payments. These documents could be required to document insurance coverages years afterwards.



## **Risk Management with Contracted Operations .....**

If your transit organization contracts for transit operations either for all your services or for a portion of your service program, your system will need to decide whether the system or the contractor will provide the insurance. If the system provides the insurance, the contractor will carry out much of the loss prevention and control responsibility. If the contractor is responsible for providing the system's primary insurance coverages, the risk management process will be the same as that described here, except that it will be done by your contract operator. In either case, the transit system has a vital interest in the resulting risk management program for several reasons. First, your system's reputation and image will be determined, in part, by the safety record, claims management, and settlement practices of your contractor and insurance carriers. Second, the system's loss history under the contractor affects your ability to obtain insurance at a reasonable cost whether you place the policies now or may want to do so in the future. Third, your system could be ultimately responsible for settlement of losses in major accidents if the insurance carriers cannot or if the contractor is no longer financially viable.

Ensuring the effectiveness of a contractor's risk management program begins in the earliest stages of preparing a request for proposals for transit services. Among the required proposal submissions should be following information from prospective contractors:

- Risk management program
- Recruiting, selection, and hiring requirements
- Training/retraining requirements and programs
- Safety program
- Insurance summary and claims and loss histories

## **Conclusion .....**

This has been a very brief overview of a critical function for every transit organization. Risk management not only involves significant amounts of each system's budget, but the success or failure of your risk management program can seriously hamper system performance, tarnish its reputation, or put the organization's long-term survival in question.