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## OVERSIGHT OF FARE COLLECTION PRACTICES

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### SUMMARY REPORT

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16. Abstract  This report documents an oversight study of fare collection practices in the transit industry. The oversight was designed as an investigation of practices currently used in the transit industry to evaluate the impact of farebox revenue collection and control issues as related to the development and implementation of revenue fare structures, fare instruments, and fare media design. The report is a synthesis of current practices at 13 separate transit operations visited. It presents collectability and control issues facing transit operators in the management of historic fare structures, along with observations on control practices and measures which should be considered in the implementation of new revenue pricing structures, new fare instruments and operating standards. The oversight focused on and examined two major concerns: adequacy of internal control systems governing the collection and control of revenues at transit agencies, and impact of such collection conditions on revenue forecasting and fare structure and design. General findings are presented according to five areas of inquiry by the study team: financial planning, general management approach, sales and collection, revenue processing, and special situations.					
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## Report Summary

### *INTRODUCTION*

In recent years, public sector providers of mass transit service in the United States have become increasingly dependent on direct and indirect user charges to cover a higher percentage of their operating costs. This transition is driven by many factors, including a continued decline in available government funds for direct support of operations.

For many public services, projected and actual reduction in government funding to meet operating requirements have been addressed through increased attention to user fees as a source of additional income and closer evaluation of service provided to control and reduce operating costs. In the mass transit environment, direct user fee income is the revenue generated through the farebox from transit patrons.

As the need to rely on the farebox as a key source of operating funds has risen, transit operators have taken various actions to use pricing and fare instrument design as a means to market their service to prospective passengers. Through institution of marketing tools related to pricing, flexibility of access and promotion, transit operators have unveiled an era of market-based solutions to address their need to earn revenue. Together with attention to service adjustments and quality of service, these revenue fare formulation practices have directly addressed the travel patterns and demands of the riding public.

With use of the farebox as a marketing tool for transit operations continuing to gain favor as a means to improve ridership statistics, fare structures adopted through this approach must be developed in a framework that recognizes the prime motivation for fares - the generation of operating revenue. As transit operators become more reliant on private sector pricing and distribution techniques, attention to private sector revenue management practices must be pursued on a parallel course.

In the course of exploring novel fare models and media, transit operators must face the questions of collectability and controllability of the newly designed features. To attract customers, fare structure implementation must provide customers with readily available, easily applied fare media, under conditions which promote the instruments' use. To maximize the revenue generated from the designed fare structures, transit operators must ensure that the revenue cycle, through which sales proceeds are collected, processed and controlled, is thoroughly secure to protect the operator's earnings.

Fare media sale transactions, as well as revenue collection functions through which the revenue earnings can be realized must be adequately monitored, managed and structured to prevent loss. Failure to thoroughly consider collection and control factors in its revenue structure can expose

a transit operation to revenue loss from its fare practices. Revenue loss may include under collection of correct fares, fare evasion, and theft and misappropriation of collected fares.

This oversight addresses current revenue management and operational practices in the mass transit industry. The oversight considers historic as well as newly developed fare structures to assess collectability and controllability issues which have been addressed by industry practitioners.

### **PROJECT GOAL**

The Federal Transit Administration Office of Service Innovation has initiated this oversight under 99 USC Chapter 5327(c), which calls for the performance of management and financial oversight reviews particularly in the areas of internal control practices.

The oversight was designed as an investigation of practices currently used in the United States mass transit industry to evaluate the impact of farebox revenue collection and control issues as related to the development and implementation of revenue fare structures, fare instruments and fare media design. This report is a synthesis of current practices at thirteen separate transit operations visited as part of this oversight. The synthesis presents apparent collectability and control issues facing transit operators in the management of historic fare structures, along with observations on control practices and measures which should be considered in the implementation of new revenue pricing structures, new fare instruments and operating standards.

### **PROJECT DESCRIPTION**

The intent of this oversight is to report on the state of current practice to effectively forecast financial requirements, in view of the ability to collect passenger fares and exercise revenue control procedures throughout the entire sales, collection and processing cycle. The oversight was conducted by visiting selected transit operations across the nation. Transit operations selected ranged in size and scope of services and included small and large operations and single and multi-modal operations. A comprehensive audit questionnaire booklet was developed for use during site visits. The questionnaire was designed to address all aspects of fare collection with an emphasis on revenue control. Site visits were conducted and observations recorded. Findings were examined and assessed across the range of operations visited. Emphasis was placed, both during the site visits, and in the assessments prepared afterwards, on how fares and revenue instruments were developed and how well the transit operator was able to collect and control revenues. Overall findings were assembled and form the basis of this oversight.

### **PROJECT PROCESS**

The initial task was formation of an Industry Revenue Working Group. This working group consisted of seven revenue managers from within the transit industry and represented a variety

of specialties related to the oversight topic. The working group provided advice on issues pertinent to the management of revenue and reviewed materials produced throughout this oversight.

Thirteen transit operations were selected for the oversight. These represent a spectrum of various transit environments - large multi-modal centers, mid-sized and small operations, operations providing commuter rail service as well as operations with unique or innovative service, fare structures or technologies. With the assistance of management from each of the selected operations, site data associated with revenue and budget development were obtained and reviewed. Site visits were scheduled and performed to discuss relevant revenue collection and control practices with on-site management and to facilitate an opportunity to observe revenue operations practices.

Observations and findings from each site visit were recorded, assembled and cross referenced among sites. Results were tabulated, correlated for consistency of interpretation and interpreted for relevancy. These results were shared with site managers to ensure accuracy and completeness of the observations. Results were also reviewed with the Industry Revenue Working Group.

The thirteen transit operators which are the source of the information in this oversight, while providing a representation of the range of transit operating environments, are a small number of the total transit operators in the United States. While the findings are indicative of current practice, the small sample does affect the statistical significance and this should be taken into account when using these findings.

### **REPORT ISSUES**

Within the context of the range of topics included in the subject of fare collection, the oversight focused on and examined two major concerns -

- 1) adequacy of internal control systems governing the collection and control of revenues at mass transit providers; and
- 2) impact of such collection conditions on revenue forecasting and fare structure and collection design.

To address the above cited concerns, information was developed following several specific lines of questioning. While a detailed set of almost 150 questions was prepared and used in the form of a site visit audit questionnaire, the list can be reduced to three basic questions. The three general questions are:

- Do transit operations maintain appropriate levels of internal control to protect revenue from loss during the sale and collection process?

- Do transit operations receive appropriate levels of accurate revenue data through the collection processes to allow evaluation of optimal revenue fare structures and collection design?
- Do transit operations develop new revenue fare structures and collection design reflecting appropriate levels of consideration gained from the collectability and controllability of established fare structures?

To respond to these questions, this oversight examined practices at a diverse assortment of transit operations located throughout the nation. Through development of a consistently applied questionnaire and examination of operator documents and revenue operation sites, responses were formulated to these questions on a site specific basis. These responses have been summarized to offer an industry-wide state of the practice and to bring attention to issues to be considered by operators in self-examination of their control systems.

### **SYSTEMIC CONTROL WEAKNESSES IDENTIFIED**

There is a need for transit managers to reassess currently used historic forms of acceptable payment in the context of current pricing and distribution environments. Instruments such as paper timed transfers issued by vehicle operators, which have minimal value under normal sale conditions, are, in fact, equivalent to a base fare value, if stolen, misused or sold inappropriately. A single packet of 50 transfer instruments holds the same revenue value as a monthly pass. Failure to place such instruments under control systems equal to those imposed on other fare instruments of similar revenue value, such as tokens or passes, exposes transit operations to large losses due to mishandling.

The need for transit operators, and specifically revenue managers, to apply more sensitivity to appropriate controls over the protection and control of data processing resources is indicated in this oversight. Access to a transit operation's revenue collection data is a potential source of significant exposure. As the nature of revenue collection proceeds toward more reliance on automated sales, collection and processing functions, heightened security of computer systems, software development and communication equipment will be essential for adequate protection of the operation's revenues. Data management controls, particularly in a cashless transaction environment, are equally important to revenue protection as the historic reliance on alarms, locks and key controls to protect coin and currency receipts.

Another area of significant control exposure exists within the revenue equipment maintenance arena. Procedures requiring strict management, review and oversight of access events, either in scheduled or repair activities, are essential to maintaining proper oversight into opportunities for mishandling of funds. Control over use and location of certain tools, keys and parts is also essential in limiting operator exposure to revenue loss.

It was observed that certain revenue instruments and fare structures may be uncontrollable or uncollectible thus exposing the transit operation to potential loss of revenue. The more common

sources of exposure include fare structures that are too complicated and revenue instruments which are flawed in design. Complexity tends to be a source of exposure to a transit operator due to the driver's inability to adequately recognize all the valid revenue instruments, know all the combinations of fares, and enforce the many rules and exceptions that apply. More fundamental, however, is the introduction of revenue instruments that are poorly designed and thus difficult for the driver to accurately recognize as valid or fare categories with rules that are unenforceable in practicality.

### **CONCLUSIONS**

Generally speaking, transit operators have great sensitivity to the need for control over functions associated with the collection of revenue. Except for those issues specifically identified in this oversight, transit operators generally maintain appropriate safeguards, operating policies and protocols to ensure the safe, complete collection of funds due for providing transit service.

Revenue data is generally a prime component of budget development for transit operators. While the processes used for forecasting purposes range from rather simple to extremely complex, the overall observation indicates that the systems used are appropriate for the respective operation.

While collectability and control of revenue may impact accuracy or adequacy of revenue forecasting and fare structure formulation practices, these issues do not usually receive great weight in decisions related to establishment of the fare structures.

In reviewing industry practices in providing controls over revenue collection processes, as well as the interface between the collection function and fare structure formulation and fare instrument design, several areas of concern were identified. While the conditions described could potentially expose a transit operation to loss or inaccuracy in revenue areas, materiality of such practices may be *de minimis* in the context of the total operation. However, absence of suitable controls or relaxation of control practices present opportunities for loss which can be significant at certain operations.

The oversight identified several areas on which the industry should focus attention to enhance internal control requirements in revenue management. These areas involve processes and activities related to certain high volume fare instruments - such as paper timed transfers; computer system management activities; and oversight of revenue maintenance environments.

Size, complexity and scale of the transit operation were identified in the oversight as primary factors in determining the suitability of control and collectability methods for a specific operation. Control procedures and practices adopted must be appropriate to the operation and to the level of anticipated revenue loss recovery or cost to recover lost revenue information.

Control and collectability measures do have a cost. Depending on the measures, these may include hiring additional personnel, increasing duties and responsibility for existing staff, capital expenditures and ongoing operating and maintenance cost.

While it is good management practice to minimize revenue loss, the cost of improving existing or introducing new control practices must be evaluated against the estimated revenue loss recovery in the case of revenue handling and the cost of information recovery in the case of computer-based revenue processing and record keeping. Further, some measures, because of capital cost and personnel requirements are feasible only in larger operations where economies of scale can be realized. At very small transit operations, the cost of even the simplest formalized procedures may exceed the estimated lost revenue recovery or cost to recover lost information. These considerations should be taken into account by transit operators in selecting and implementing control procedures.

## General Findings

The specific questions used for the site visits provide a convenient framework for presentation of the general findings. There were five primary areas of interest:

1. Financial planning,
2. General management approach,
3. Sales and collection,
4. Revenue processing,
5. Special situations.

Questions were grouped corresponding to specific aspects in each of the five areas. Overall, forty-three primary questions were arranged into thirteen groups, with two or more groups in each of the five areas.

The thirteen sites visited, while representing a wide spectrum of transit operations with respect to modal service, size, fare structure and fare payment instruments, comprise only a small fraction of all transit operations in the United States. While the findings presented provide an insight into the current state of the practice, the small sample does affect the statistical significance and this must be taken into account when evaluating these findings.

### FINANCIAL PLANNING

Financial planning refers to use of fare information in developing operating budgets and revenue generating fare structures. The oversight revealed fare revenues are a critical component in preparing operating budgets, in terms of expected income and estimated operating costs for the service levels based on the projected ridership.

The importance of revenue information in the budgeting process is clearly shown in Table 1. All transit operators visited in the oversight indicated fare payment revenue is a key component of their budgeting process. This is not a static process limited to existing fare structures. Forecasting revenue impacts of fare and fare structure changes is a major element in evaluation of the effects of proposed changes on operating budgets. All operators carried out revenue forecasting in one manner or

<b>BUDGET DEVELOPMENT</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Are passenger revenue forecasts used in the development of operating budgets?</i>	100%	0%	0%
<i>Are appropriate methods used to forecast passenger revenues in the development of operating budgets?</i>	100%	0%	0%

**TABLE 1**

another and with minor exception, employed methods appropriate to their particular operational and accuracy requirements. Table 2 presents the two questions on the financial planning implications of changes in fare levels and structures.

Feedback on actual revenues is viewed as an important step in the budgeting process. Reliability of revenue forecasts directly affects the integrity and validity of the budgeting process. Monitoring actual fare payment revenue and comparison with forecasts is carried out at all operations using methods appropriate for the level of fare structure complexity and accuracy requirements in place at the specific operation. This is shown in Table 3.

<b>FARE POLICY</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Are forecasts made to assess the revenue impacts of fare changes?</i>	100%	0%	0%
<i>Are appropriate methods used to forecast the revenue impacts of fare changes?</i>	92%	8%	0%

**TABLE 2**

<b>REVENUE MONITORING</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Are appropriate methods used to monitor actual versus budgeted passenger revenues?</i>	100%	0%	0%

**TABLE 3**

**GENERAL MANAGEMENT APPROACH**

The general management approach encompasses two broad areas, 1.) personnel and organizational aspects and 2.) physical and procedural practices. The manner in which transit operators approach revenue control conveys the importance placed on these practices and enhances employee awareness of the importance management places on control of revenue through the entire sales, collection and processing cycle.

Three aspects of overall revenue management of interest were; control programs, personnel

<b>REVENUE MANAGEMENT</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Does the property maintain definitive programs and processes adequate to manage and maintain internal control practices throughout the revenue cycle?</i>	100%	0%	0%
<i>Do organizational structures involving revenue management tasks provide adequate segregation of duties?</i>	85%	15%	0%
<i>Do personnel management practices and training practices reflect the unique nature of revenue functions in areas such as security and accuracy?</i>	100%	0%	0%

**TABLE 4**

assignment and training. All transit operations visited placed high priority on these aspects and with minor exception had appropriate practices in place. This is summarized in Table 4. Scale of the transit operation has a bearing on the ability of the operator to fully carry out the desired practices. A case in point are small operations with small staffing levels where it is often impractical to segregate duties.

Effective revenue control is to a large degree a function of the physical and operational practices put in place by the transit operator. This starts with the place control practices are given in the design and operation of the stages in the revenue cycle. Areas of specific concern are security, fare instrument control and procedures for detecting and addressing theft. As shown in Table 5, transit operators recognize the importance of procedural and physical practices targeted specifically to minimize misappropriation of revenues. With minor exception, operators are making a full and good faith effort to have appropriate practices in place.

<b>REVENUE CONTROL</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Is revenue control still a consideration in all designs and procedures related to revenue?</i>	100%	0%	0%
<i>Does the property employ appropriate, effective methods for detecting and addressing potential misappropriation of funds?</i>	100%	0%	0%
<i>Are revenue sensitive areas and equipment adequately secured and controlled?</i>	85%	15%	0%
<i>Is the production, distribution and management of revenue instruments adequately controlled?</i>	100%	0%	0%

**TABLE 5**

Again, where deficiencies exist, they are more reflective of the scale of the operation rather than lack of awareness of the need for that particular practice.

**SALES AND COLLECTION**

Sales of fare instruments and the collection of fare payment are the two major activities in "collecting" the money. Sales can be made off the vehicle at sales outlets maintained by the operator, at those operated by outside vendors, and at vending machines located both on and off the transit route or station. Off vehicle sales are primarily daily, weekly and monthly passes, tokens and various forms of single rider prepayment instruments. Onboard fare collection, a point of sale transaction, covers both the direct payment of the ride being purchased and the advanced sale of a future ride, principally transfer to another route for continuation of the trip. Onboard fare collection at some operations may also include sales of advanced payment instruments such as multi-ride passes. An integral part of "collecting" the money is verifying proper fares are being charged, collected revenue is not "lost" and fares are not being evaded.

Principal concerns in sales are controlling the inventory of fare payment instruments, minimizing revenue loss from off vehicle sales, maintaining the security and reliability of fare instrument vending

and revenue collection equipment, and minimizing loss from onboard sales activities. As evidenced in Table 6, there is a distinct difference in control effectiveness between onboard sales activities and those conducted at off vehicle sales locations. Where transit operators use off vehicle sales, controls appear adequate for fare instrument inventory and for minimizing revenue loss

The opposite is found for onboard sales activity. Nearly one third of operations visited with onboard sales reported not having adequate control procedures to protect revenues for loss. This contrast is not surprising and reflects the difficulty in monitoring onboard sales and fare collection activities on a continuing basis.

A number of factors come in to play. One is controlling for misappropriation or theft by vehicle operators. The second is verifying the assessment and collection of the correct fare. Complex and multi-zone fare structures are often difficult for vehicle operators, whose primary responsibilities are safety and schedule adherence, and increase the opportunity for revenue loss. A third component is the accuracy and reliability of the onboard revenue collection and recording equipment.

Given the cost and logistics of monitoring a high percentage of onboard collection transactions, this will continue to be a control problem. The primary emphasis is on control procedures to keep revenue loss within a maximum acceptable percent of estimated total revenue. Procedures aimed at zero loss would be costly and logistically difficult to implement.

Overall, security and procedure controls appear adequate to protect against robbery and unauthorized access to revenue sensitive areas with respect to sales activities. Two of the thirteen operations visited do not use cash

SALES			
Question	Yes	No	N/A
<i>Are appropriate levels of security and oversight in place to protect personnel from robbery or unauthorized access to revenue sensitive areas?</i>	70%	15%	15%
<i>Are appropriate levels of security and oversight in place at sales locations to protect and secure revenue instruments and receipts from theft and misappropriation?</i>	92%	0%	8%
<i>Are appropriate transaction reconciliation and oversight functions in place?</i>	92%	0%	8%
<i>Are selection, operations and oversight of external sales outlets adequate to secure property revenues?</i>	92%	0%	8%
<i>Are controls governing the access, operation and maintenance of instrument sales equipment adequate to secure property revenues?</i>	62%	0%	38%
<i>Are procedures governing the property's involvement in transit use subsidy programs (e.g. - Transit Chek) adequate to protect the property's revenues?</i>	85%	0%	15%
<i>Are procedures governing onboard sales activities adequate to protect the property's revenues from loss due to theft, misappropriation or continuous transaction error?</i>	54%	31%	15%

TABLE 6

payment forms, utilizing credit card sales and processing contracted to private third parties. Inadequacies are present at about 20 percent of operations where cash transactions are used.

At those transit operations where equipment is used for revenue handling and vending fare instruments, all have adequate controls and procedures related to operations and maintenance in place to secure revenues.

An important insight shown from the findings summarized in Table 6, is that fare structures and fare payment instruments used at some operations eliminate the need for certain control procedures. The N/A (not applicable) responses reflect the use of cashless fare structures and payment schemes at those operations. An inference is that as more operators can and do adopt certain cashless fare structure and payment schemes, the form and manner of control procedures will change.

The degree to which the collected revenues are controlled is presented in Table 7. Two distinct patterns emerge. On the one hand, adequate overall control procedures appear to be in place. However, at specific levels or for certain functions, deficiencies are present. These include lack of control over access to revenue and gaps in oversight in one or more of the collection and processing activities.

Again, the fare structure and payment instruments had an effect on control procedures. At one operation, cashless payment handled by a third party contractor eliminated the need for specific control measures.

<b>REVENUE COLLECTION</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Is access to revenue controlled in an appropriate fashion?</i>	85%	8%	7%
<i>Are collection and processing activities subject to appropriate levels of oversight and control?</i>	69%	23%	8%
<i>Do adequate controls exist to address fare evasion events?</i>	100%	0%	0%
<i>Are collection remittances monitored and controlled adequately?</i>	100%	0%	0%
<i>Are collection procedures and controls adequate to avoid misappropriation or theft?</i>	100%	0%	0%

**TABLE 7**

Control procedures aimed at fare evasion were observed to be adequate.

### **REVENUE PROCESSING**

Handling and processing of collected revenues include retrieval and reconciliation of cash, and verification and reconciliation of cashless payment instrument transactions. Most transit operators rely on computer-based systems for some or all of their revenue processing steps, maintaining revenue records and generating management reports used for control practices, financial reporting and operating budget preparation. As fare structures and payment based on cashless fare instruments become more common, computer systems security, reliability and disaster event handling will become

increasingly important control issues. A third factor in revenue processing is the maintenance of revenue equipment.

Revenue processing consists of activities starting with the retrieval of collected cash from fareboxes, off vehicle sales locations and fare instrument vending machines through counting and reconciliation to bank deposits. Adequacies of control procedures at the various steps are presented in Table 8. At those transit operations where cash fares are handled, with one exception, control procedures were found adequate on transport of revenue receipts, counting of receipts, and accuracy and reconciliation. The major control deficiency was inadequate security and controls in the cash processing center. Approximately 30 percent of operators handling cash were found to have less than adequate practices.

Use of cashless fare structures and payment media dictate relevant control practices. The N/A responses shown in Table 8 provide a measure of what practices could be eliminated when cashless fare systems are employed. However, introduction of cashless fare systems will likely require new or modifications to existing control practices, particularly for computer hardware and software.

Revenue control concerns of computer systems are primarily security breaches, hardware and software failure and usefulness of

<b>REVENUE PROCESSING</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Are procedures used to transport revenue receipts adequately secured, monitored and controlled?</i>	85%	0%	15%
<i>Are procedures employed to process and count receipts adequately controlled?</i>	92%	0%	8%
<i>Is the cash processing center environment thoroughly secured and controlled?</i>	62%	23%	15%
<i>Are controls in place to ensure the accuracy and reliability of cash counting systems?</i>	85%	0%	15%
<i>Are processing results subjected to adequate levels of review and reconciliation to sales and collection support services?</i>	92%	0%	8%
<i>Does the property maintain adequate and continuing control over contracted transport and processing operations?</i>	62%	0%	38%

**TABLE 8**

<b>REVENUE SYSTEM DESIGN and OPERATION</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Are computer systems and resources - hardware and software adequately protected against physical risk?</i>	62%	31%	7%
<i>Are computer systems and resources - hardware and software adequately protected against risk of security exposures?</i>	77%	15%	8%
<i>Do systems provide appropriate levels of data for control and management of revenue transactions?</i>	77%	15%	8%

**TABLE 9**

data for management and control practices. This area is the weakest overall in adequacy of control practices. Depending on the specific issue, inadequate practices were present at 20 to 30 percent of transit operations visited. Deficiencies were evenly represented across the different size of operations, a possible reflection on management computer sophistication rather than scale of operation. These findings are present in Table 9.

Adequacy of computer and systems control practices will gain in relative importance as cashless fare payment systems are introduced. Computer-based processing will become a major activity in tracking and reconciling cashless transactions from third party sales outlets and presentation of the fare media at time of transit trip.

An aspect of revenue process control to minimize loss is the control of the revenue equipment. High level of maintenance lessens inaccurate recording of fares and malfunctions which leads to bypassing recorded collection of fare payment.

Another focus of maintenance is to minimize the likelihood of tampering for the purpose of theft. Lastly, the way in which maintenance is carried out is itself subject to control to minimize loss due to theft by maintenance and processing personnel. In general, control practices and protocols were found to be adequate. However, major deficiencies were found in restricting unauthorized access to equipment and performing revenue equipment maintenance under inadequate supervisory control. Nearly 50 percent of operations visited were found to not adequately monitor access to revenue equipment. Inadequate supervision of maintenance activities occurred at almost one fourth of the operations. Results are summarized in Table 10.

<b>REVENUE EQUIPMENT MAINTENANCE</b>			
<i>Question</i>	<i>Yes</i>	<i>No</i>	<i>N/A</i>
<i>Do maintenance protocols provide appropriate levels of control and performance reliability?</i>	100%	0%	0%
<i>Are on-site maintenance activities formed under controlled conditions?</i>	77%	23%	0%
<i>Are shop maintenance activities performed under controlled conditions?</i>	85%	0%	15%
<i>Is equipment access monitored and controlled?</i>	54%	46%	0%
<i>Is the use, condition, and location of revenue sensitive equipment secured, controlled and monitored?</i>	85%	15%	0%

**TABLE 10**

**SPECIAL SITUATIONS**

Three areas of special interest were use of smart cards, proof of payments systems and control of revenue aspects of contracted operations. The first two are of interest because of the movement toward cashless and alternative electronic fare payment instruments and use of field procedures

to validate proper fare payment. The latter is of interest as there is increased use of private contractors, "privatization," as an approach to reduce operating cost.

Revenue controls over private operations are uneven. The importance of the need for adequate controls is reflected in the fact they are specifically called for in the contract between the transit operator and the private contractor providing the service.

In practice, inadequacies were found in the control practices employed by the private operators and the ability of the transit operators to exercise oversight on the private operators' revenue operations. Results are presented in Table 11.

PRIVATE OPERATIONS			
Question	Yes	No	N/A
<i>Do related contractual arrangements specifically address revenue control procedures and protocols?</i>	77%	0%	23%
<i>Are reporting arrangements adequate to allow thorough oversight and control of revenue?</i>	46%	15%	39%
<i>Are contractor revenue collection and control practices adequate?</i>	54%	8%	34%

TABLE 11

Smart cards or a cashless equivalent were in use at two of the thirteen operations. At these two operations, primary controls on misuse and revenue transaction were viewed as adequate for the operation. This is shown in Table 12. The N/A responses primarily indicate smart cards or a cashless equivalent were not in use at those operations.

SMART CARDS			
Question	Yes	No	N/A
<i>Are controls governing smart card instruments adequate to protect against misuse or theft?</i>	15%	0%	85%
<i>Are banking transactions adequately reconciled to control revenue transactions?</i>	8%	0%	92%

TABLE 12

Proof of payment systems are employed where fare instruments are sold off vehicle and user self validation or cancellation is required. Off vehicle payment instruments may range from single fare tickets dispensed by fare vending machines to a prepaid multi-ride instrument sold over the telephone and paid by credit card. Proof of payment control issues are similar in both cases. These come down to fare evasion, under payment for the actual trip being taken and use of outdated or

PROOF OF PAYMENT SYSTEMS			
Question	Yes	No	N/A
<i>Are inspection processes adequately applied to ensure complete collection of revenues due?</i>	23%	15%	62%
<i>Are inspection team activities adequately monitored and controlled?</i>	23%	15%	62%

TABLE 13

previously canceled fare instruments. Proof of payment systems were in use at five of the thirteen operations. The specific control practice issues addressed the inspection activities. One focuses on the process, the second on the inspectors. Where proof of payment systems are in use, deficiencies were present at 40 percent of the operations as shown in Table 13.

Proof of payment control issues are of particular interest because self validating fare payment systems are often introduced with new operations such as light rail. With possible increasing use of fare payment structures which rely on proof of payment, development and implementation of adequate controls will grow in importance.

## Detailed Findings and Recommendations

The body of this report attempts to address the three general questions, identified in the summary, which have driven the investigation undertaken in this oversight. These three questions have served as the primary focus of this oversight of fare collection practices.

### **INTERNAL CONTROL DEFINED**

At the center of fare collection practices is the recognition of the need for sound internal control. Any form of financial transaction contains certain steps and components which equip the producer or service provider with protections against loss of funds. The transit industry is no exception and may be one of the more difficult industries in which to maintain sound internal control. As defined in a statement of accounting standards:

*Internal Control comprises the plan of organization and all of the coordinate methods and measures adopted within a business to safeguard its assets, check the accuracy of its accounting data, promote operational efficiency, and encourage adherence to prescribed managerial policies...a "system" of internal control extends beyond those matters which relate directly to the functions of the accounting and financial departments*

Internal control procedures should govern practices in the transit industry from the formulation of fare structures and the design of revenue instruments, through the collection of revenue into the farebox, turnstile or ticket vending machine, through the consolidation, sorting, counting and transporting of revenue receipts, and include the deposit of revenue into the bank. Procedures should cover traditional historic payment instruments, electronic payment instruments and computer systems operations. These should encompass procedures to assure proper reconciliation and to produce management information used to assess service performance and to make service adjustment decisions.

### **FINDINGS**

This oversight reviewed and assessed the state of the practice of internal control in fare collection practices in the industry. The three basic questions which guided the oversight are presented below followed by the key findings.

#### **1. Do transit operations maintain appropriate levels of internal controls to protect revenue from loss during the sale and collection process?**

In general, the review revealed most operations are highly sensitive to the importance of internal controls for the protection of their revenue streams. While this concern is pervasive, the actual installation of control systems can be improved at most sites, in different areas of the operation.

Generally, the oversight of the thirteen sample sites indicates the various weaknesses in control systems expose some portion of revenues to the chance for theft, misappropriation or loss through various means.

In the course of the oversight of sample transit operations, several systemic control weaknesses have been identified which appear to exist at a majority of operations, regardless of size of operational environment. To the extent these conditions exist, a transit operation may be unable to achieve the maximum financial benefits from related fare structures and fare instruments. Such reduced results can be caused by misunderstanding of complex collection protocols, misappropriation of collected proceeds or mishandling of revenue instruments.

Several control weaknesses have been identified at the majority of operations visited. These systemic flaws in the protection of moneys due the transit operator are, to a large extent, the result of fare structure formulation and fare instrument and collection design decisions. Among control weaknesses consistently identified were the following:

- At many operations, onboard sale instruments, including paper timed transfer and "Day Pass" instruments are virtually uncontrolled. In most instances, the instruments are not inventoried, sales are not reported and use is not validated. The exposure of this weakness could be significant in light of the volume of instruments produced and allocated for sale. The value of the instrument is equivalent to a base fare, therefore exposing the operations to losses similar to that which would be experienced if a similar quantity of cash sales were lost due to mishandling or theft.
- Computer-based revenue data systems are not protected against physical damage, system failure, unauthorized access or mishandling of data. Many operations have not instituted basic system control protocols such as backup processes, virus protection, communication system controls, disaster recovery plans or frequent access event analysis. Some transit operations are wholly reliant on continuing involvement by system vendors for issues related to maintenance and report generation, with manufacturers retaining access long after systems have "gone live". Exposures in this area will become ever greater as the industry moves further toward cashless sales and access transactions.
- Maintenance practices require greater control systems to monitor access, equipment use and operational knowledge of revenue equipment. As operations become more reliant on machines to sell and collect revenue, the maintenance practices used in operating such units should become more sensitive to control. All accesses to machines should be carefully controlled and monitored against assignments and expected activities. All parts and tools associated with upkeep of equipment should be cataloged, assigned and monitored to preclude unauthorized uses or applications of the devices.

Some specific revenue practices which expose transit operations to potential loss or diminished financial results are described below.

**Sales & Distribution**

*Transfer Instruments* - The storage, allocation, sale and collection of paper timed transfer instruments are usually uncontrolled. Use of paper, time-controlled transfer instruments is generally subjected to few controls, with even basic applications of inventory, sales and collection reconciliations not evident in practice.

The value of a transfer document is not limited to the cost of purchase. Instead, the instrument's worth is valued at the maximum price of transport received upon presentation. In most instances, the value of a transfer slip is equal to at least one full base fare. If these instruments are mishandled, the loss to the operator can be equivalent to the loss of a like number of tickets, or tokens. In fact, a single standard booklet of fifty paper transfer slips holds a value in excess of many monthly passes sold by transit operators.

The primary control applied to the use of transfer stock is placement of a preprinted validity date on each instrument. While this practice may mitigate the occurrence of patron misuse by date, the absence of stronger controls on the issuance and collection of such instruments continues to allow misuse on the authorized date, as well as potential acceptance on other than valid dates.

Several operations have identified specific instances of significant loss attributable to misuse and improper handling of transfers. In addition to patron submissions of expired instruments, transit operators have apprehended persons selling instruments for use in boarding without fare payment. In several cases, the identified losses to the transit operation have been valued in excess of \$1 million.

Transfer stock should be subjected to the same level of controls as were observed at virtually every site in the management of other forms of fare media. Transfer printer activities should be monitored. Transfer stock should be inventoried and secured upon delivery from the producer. Stock allocations to drivers should be recorded, and unsold stock returned for recording, as well. Allocation records, returns and sales should be reconciled on a daily basis, by driver, in the same fashion as a cashier or sales agent's activities are cleared at the end of a shift in most cases. Collected stock and unused stock should be incorporated into the reconciliation process, secured and destroyed or reallocated, if practical.

Certainly, the cost of installing such control features into the transfer process is significant. However, operators should carefully examine the continued use of this form of instrument in light of the potential exposure to loss created by a virtually uncontrolled instrument. An alternative approach to transfer instruments may include reductions in base fare to levels consistent with the volume of transfer activity existing on the system. Properly modeled, many passengers may enjoy a lower fare, while the operator earns more revenue through the enhancement of controls on receipt of proper fares.

*User Activated Multi-ride Instruments* - Some levels of control weaknesses were indicated in the use of certain multi-ride instruments, such as tourist "Day Passes". Often used by transit operators as a marketing tool to encourage transit use by visitors, the Day Pass can expose the operator to loss through passenger fraud in failure to activate the instrument's validity period.

A user activated multi-ride instrument allows the holder to receive unrestricted travel for a period of days indicated by the pass. Unlike a standard multi-ride pass, which is either preprinted with a specific time frame for usage, identified by color, design, and printed data, or subject to value reduction by revenue system equipment, a user activated instrument is activated by the patron noting the first day of use upon the initiation of travel.

The vehicle operator must ascertain the validity of the instrument in terms of the initial date, the number of days authorized and the propriety of activation. Failure to monitor these factors can provide an opportunity for boarding without activation, allowing patrons to continue to travel without restriction until confronted by a vehicle operator or inspector.

While the instrument design facilitates travel by the customer, the collectability and controllability are difficult to maintain. Unless activated immediately upon purchase for the valid period of days, the holder of the pass can forego activation by drivers through hand manipulation or swift boarding. The driver has little capability to force activation without assistance or confrontation. Accordingly, transit operators can experience circumstances in which the user activated multi-ride passes may be used for multiple days prior to capture or activation.

Transit operators have attempted to minimize risk of misuse of these instruments through limits on availability. In the instance of multi-ride instruments tailored for regional tourists, transit operators sometimes limit availability to sites frequented by the tourist trade. While the stock inventory controls are generally stronger than those employed with paper transfer slips, the activation and confirmation of the instrument's valid period are somewhat uncontrollable.

It may be noted that at certain operations the transfer has been replaced with a machine issued Day Pass. The Day Pass is issued from the farebox and is marked clearly as valid only on the day of issue. It is priced at about 225% of the base fare making it a bargain for patrons making three or more trips in a day. The Day Pass overcomes most of the control problems associated with transfers but not all. The transit operator can better track issuances since every Day Pass issued is automatically recorded. A primary control problem with the machine issued Day Pass is that patrons may pass the Day Pass from one person to another throughout the day.

### **Collection**

Movement and access controls at farebox vault pulling (emptying) locations are often a source of potential exposure. The farebox vaults are removed from the bus by transportation personnel, who have free access to the entire bus storage and maintenance areas. In some cases, vaults are placed inside a storage area with no observation or oversight from other parties, such as the driver, supervisory or security personnel. In the absence of time controls to monitor the time the vehicle arrives at the farebox vault removal location and the time the farebox vault is removed, inexplicable delays can exist. These delays often go undetected and present an opportunity for various personnel to steal from these vaults.

### **Processing**

Most operations exhibit heightened sensitivity to the need for activity and movement control within the revenue processing centers. However, control enhancements can also be considered at all

locations. Access control to revenue processing areas was less than adequate at one of the sites. At that operation, due to chronic staff limitations, revenue processing and bus radio dispatching duties would often be conducted simultaneously by the same individual. In addition, while revenue sensitive duties were separated organizationally, in practice, given vacations, sick days and other circumstances, revenue processing activities were routinely done by the same individual. These types of problems may prove to be relatively common at small transit operations.

### **Equipment & Maintenance**

One step in the revenue collection process in which a large loss exposure exists is the maintenance cycle. During maintenance activities, employees can have access to cash receipts with minimal levels of direct oversight. Although systems may exist to prevent unauthorized access to funds, the transit operation remains exposed to an unusually high risk since maintenance employees enjoy a level of knowledge of the equipment's features and flaws which can allow dishonest persons to take advantage of unexpected weaknesses in the control structure. Accordingly, it is imperative for transit operators to install a series of compensating controls through the maintenance process to preclude access or to identify unauthorized access to funds.

Major areas of control weakness identified were:

- Inadequate control of revenue equipment access events,
- Inadequate control of security devices, such as farebox keys,
- Inadequate control of spare parts and equipment inventory.

The level of risk is highest in the case of units which do not produce data of adequate accuracy to allow direct and complete reconciliation of sales to cash received. Most ticket vending machines provide such data quality. With this form of equipment, the risk of experiencing undetected theft is minimal, as long as the transit operator performs complete reconciliations on a frequent basis. However, most operators rely primarily on farebox collection as the source of revenue receipts.

Accuracy and reliability of farebox data collection experienced at most of the visited sites were inadequate to assure control of revenues received. Often fareboxes do not report accurate counts of moneys received. Access to farebox vaults is recorded only in few instances, and in those cases, access events are not reconciled against authorized or scheduled access. Bypass events are not often recorded and therefore cannot be reviewed to detect such events or analyze associated trends.

*Key Control* - Among the prime tenants of maintenance control should be a strictly policed key control policy, under which NO keys to equipment are held by persons other than a limited number of specially trained employees, whose actions are closely monitored.

Operating supervisors and field personnel should not have access to any section of the farebox, even to free jams. While such access may be deemed essential to continued unfettered operation of the vehicle, widespread distribution of keys negates any ability to control access to boxes. Instances have occurred in which supervisors have found methods to "fish" moneys out of the farebox base, remove protective shutters and access cash in other innovative ways.

Other methods of enhancing control within the maintenance arena can include such processes as monitoring and controlling the frequency of key breakages. A key break can certainly occur under normal conditions, however, a trend toward frequent breakage can potentially be indicative of improper usage, attempts at duplication or other unauthorized actions.

Keys assigned to individuals should be kept on welded key rings, precluding quick and easy duplication of keys. Electronic key systems should be reset and changed with random frequency.

*Access Control* - Jammed fareboxes should be taken out of service immediately, or shifted to "bypass" upon receipt of specific authorization. Assigned maintenance personnel should be granted specific permission to access the farebox vault for service in a controlled manner. The event of a jammed farebox and bypass activation should be carefully recorded and monitored by management to detect trends in terms of frequency by route, by operator or by farebox. Such trend analysis should then be used to establish a corrective action plan to preclude overuse of the uncontrolled bypass system.

Another method to improve control over equipment maintenance is to completely schedule all maintenance activities, assigning personnel and related keys, parts and tools to conform with the needs of the scheduled events. All equipment access events should be reviewed against scheduled events in order to ensure the propriety of events.

Through restrictive allocation of keys, special tools and parts to an as-needed basis, the ability to illicitly tamper with revenue equipment can be minimized.

Activity scheduling provides additional benefits to revenue operations. Greater reliance on scheduled preventive or rehabilitative maintenance can improve reliability and longevity of equipment. In addition, safety and security of maintenance personnel can be monitored with knowledge of scheduled whereabouts in field locations.

*Parts Control* - Reliability of revenue equipment relies on ready access to necessary spare parts and repair tools. However, due to the nature of the equipment, access to such support materials requires greater control over inventory and assignment of spare parts and special tools. Operators should maintain strict protocols related to assignment of tools, such as "teardrop" devices or audit devices which permit access to vault areas of revenue equipment.

Furthermore, assignment of spare parts, such as coin mechanisms, bill transports, data chips as well as spare vaults and other collection devices should be carefully monitored and assigned, with control records of such unit assignments thoroughly maintained. Such levels of control are warranted to preclude misuse of parts or data. Knowledgeable persons with uncontrolled access to necessary parts and equipment, who desire to misappropriate funds, can develop methods to circumvent standard processing and recording streams, thereby accessing revenues with minimal chance of detection.

While many transit operators record serial numbers of important spare parts at the time of acquisition, the time and effort required to continuously track the whereabouts of each unit throughout its normal service life frequently causes such practices to be discontinued.

### **Computer-based Systems**

With transit operators relying more heavily on automated sales and collection equipment for revenue handling, the need to establish care in the "backstop" of the support systems becomes paramount. As the riding public becomes more accepting of cashless transactions at the farebox, the transit operator's revenue stream will increasingly take the form of data, rather than currency and coin. Accordingly, greater care in treatment and protection of data sources, storage and production will be needed in the industry.

The site visits identified a wide spectrum of attention and experience in this area. While some operators have effected great levels of caution in providing physical protection and access control to their systems, others have not provided even basic protections against danger to the revenue systems which support their entire financial backbone.

*Physical Damage Protection* - Loss of revenue related computer equipment and data due to physical harm is a real and persistent threat. The site visits identified many transit operations had little if any protection in place against physical damage to computer systems and data. This problem was not limited to larger or smaller transit systems. The degree of protection against physical damage appeared more related to the degree of computer savvy possessed by management. Fire suppression systems were observed only at a minority of operations. Separate protected cabling for revenue processing systems should be implemented. Where personal computers are used for revenue processing functions, guards against the physical removal of the equipment should be in place.

*Access Control* - Source codes and sensitive program code should be subject to security and confidentiality protocols to preclude unauthorized alterations to source code or other key programs. Data report generation should be controlled to ensure information is readily available only to authorized persons.

This level of care should also extend to monitoring the security of communication linkages and access to systems - electronically and physically. Physical protection of the systems should be maintained at the highest level of care, with provisions for proper environmental protection, as well as security provisions for entry to core systems equipment facilities. Access to revenue sensitive programs and data should be controlled by appropriate levels of software security mechanisms.

*Data Loss Protection* - Among basic protocols which should be in place at transit operations to protect revenue data are defined procedures for disaster recovery in the event of equipment failure, fire, or other major calamity. Such disaster planning should define issues such as the form, location and protocols for transferring operations to off-site processing centers, notification protocols and acquisition of necessary equipment to operate revenue systems in an emergency.

Other basic disciplines for controlling revenue data systems should include provision for automated, frequent, thorough backup of data, off-site storage of backup data, frequent password changes and reconciliation of all access attempts to authorized actions. Employees involved in design, installation and operation of data systems should be subjected to background checks.

**2. Do transit operations receive appropriate levels of accurate revenue data through the collection processes to allow evaluation of optimal revenue fare structures and collection design?**

Transit operators rely on field data to ascertain productivity of their fare policies. Ridership estimates, together with actual funds collected comprise the primary information sources used in evaluating the efficacy of fare structures.

Throughout the years, transit operators have often obtained ridership data through use of onboard or stationery "spotters" - persons assigned to watch vehicle movements and note passenger loads. Similar manual counting methods have used data accumulated from vehicle operators, transportation supervisors, manual counter mechanisms, and in some instances, treadle counts on the vehicles.

Accurate information on revenue data collection has historically been more difficult to accomplish. In the street vehicle arena, some data has been accumulated through use of registering fareboxes. However, reliability of this equipment has been suspect, at best, with operators frequently accepting data variations of more than 7% above actual receipts as an acceptable norm in computing revenue. Therefore, the accuracy of revenue collected in the form of currency and coinage, is questionable.

Implementation of fare systems which include instruments such as weekly or monthly "flash" passes, which are not collected, further complicate the compilation of accurate revenue data. Day passes and paper transfers, instruments which are typically not reconciled to sales, also provide poor indicators of a fare structure's success.

Only through use of statistical variation analysis can a transit operator develop some level of confidence in revenue fare structure and collection design evaluation. The collectability and controllability of the revenue are secondary factors in such analysis.

**3. Do transit operations develop new revenue fare structures and collection design reflecting appropriate levels of consideration gained from the collectability and controllability of established fare structures?**

Marketing benefits associated with a particular fare instrument class must be evaluated in the context of protecting the operation's revenue receipts, particularly as such protection is affected by the design and implementation of fare media and collection practices. The level of revenue generation expected from a particular fare structure can only be achieved through careful assessment of operating issues associated with the actual collection and control of the media's issuance and usage.

Historic practice at some transit operations is largely responsible for continuation of certain fare structures, fare instruments and collection procedures, rather than the need to control revenue collections for fiscal reasons. In general, fare structure formulation appears to be primarily driven by requirements such as predefined operating ratios mandated by statute or regulation, rather than by issues associated with the control of revenue receipts.

In the development of revenue fare structures, the standard practice of transit operators appears to address the issues of collectability and controllability to some extent. However, when weighed against other factors, these issues play only a small part of the process.

Often, in an effort to reach out to a larger audience, transit operators provide the public with fare instrument types and options which cannot be readily controlled. Due to the need for extensive distribution and ready access to the instruments, the ability to manage inventory and sales is sometimes disregarded as a matter of excessive cost for items perceived to have little individual value. Unfortunately, the volume of instruments such as "Day Passes" or paper timed transfers create loss exposures equal to or greater than more well controlled, higher value instruments, such as monthly passes.

In fact, in the case of widely distributed, low value paper transfers, experience has revealed that transit employees have been apprehended in the process of selling such instruments to the public. Another commonly observed practice, especially where the transfer is free, is for a patron to ask for the transfer upon boarding the bus and then post it on the bus shelter, bus stop or hand it to a stranger when alighting for someone else to use. This is a modern day play on Robin Hood which has a potentially significant adverse revenue impact for many transit operations.

Collection and validation of fare instruments are generally considered a secondary responsibility of vehicle operators. When fare structures contain provisions for methods such as multi-zone rides, the system is highly dependent on the vehicle operator to monitor rider fares throughout the course of a journey. In light of the secondary nature of fare collection among the operators' responsibilities, the prime functions being the safe and timely operation of the vehicle, zone charges may not be uniformly collectible.

## Further Direction

This oversight has endeavored to examine and review fare collection practices at thirteen transit operations of varying size and service type and to glean therefrom a sense of the state of the practice in the industry. Through this effort, several areas have been identified which may warrant further investigation and examination. Of note are several topics related to fare structure formulation and fare collections which, due to the lack of industry literature, should be identified for further investigation. The primary subject areas recommended for further investigation are identified below.

*Longitudinal Review* - The industry might benefit from a longitudinal review of fare collection practices at the thirteen sites which were the basis of this oversight. A longitudinal review would permit an assessment of general and specific conditions at these transit operations over time. The impact of various changes in fare structures and revenue collection practices could be monitored and measured. Such an assessment may produce an excellent body of information and further the understanding of the fare structure formulation and fare collection functions.

*Internal Control Workbook* - A major finding is that many in the transit industry, even those engaged in or responsible for some part of the revenue control function, desired and in some cases required additional understanding of the internal control function within the transit operation. It is believed that the transit industry would benefit from a workbook (in either text or interactive computer format) to allow operators to self-assess their fare collection and revenue control practices. The workbook, as it is envisioned, would facilitate the evaluation of general and specific practices and suggest further information and references on topics of interest and for areas where the operation was evaluated to be less than adequate.

*Cost of Collections* - An attempt was made to assemble information about the cost of revenue collection activities from the transit operations visited. This effort identified a lack of information at most transit operations about the cost to collect and process revenue. A better understanding of the cost of collections for general and specific revenue control functions and revenue instruments would prove to be very useful to the industry in making management decisions regarding fare structure formulation, instrument design and collection control practices. By gaining a better understanding of the cost of collection functions, transit operators may be able to become more cost effective in producing and processing revenue.

*Fare Policy Formulation* - It became apparent that at many operations, the decision to adopt a fare structure or a revenue instrument had less to do with operational considerations or matters of controllability and collectability than with attempts to reach a new market or reach some political consensus. This should be carried out in two parts. One part would focus on how fares structures and fare instruments are actually developed and adopted. The second part would look at the actual ridership, revenue and cost of collection impacts of the adopted fare structures and fare instruments.

