Transit Security: 
Quality of Life Issues and Strategies

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Abstract

This thesis investigates the relationships between disorder, quality of life crimes and perception of transit systems. The transit security strategies and security background of five transit agencies WMATA, NYCT, BART, LACMTA, and Metrovias, are discussed. Based on the findings of the case studies, this research then develops policy recommendations in five areas related to security: Quality of Life Ordinances, Concessions, Management Options, CCTVs, and Design Issues. This thesis compares the case studies and analyzes the 1995 National Transit Database security data. Lastly, this research applies the policy recommendations for the five security areas to and suggests evaluation techniques for the Tren Urbano system in San Juan, Puerto Rico.

This thesis contributes to current transit security research by; evaluating specific policy approaches to transit security; analyzing the context in which transit agencies make decisions and evaluate transit security strategies; comparing transit agencies; and investigating the crime statistics of the National Transit Database.

The research demonstrates that transit agencies recognize the importance of preventing quality of life offenses and have developed many quality of life security strategies. The National Transit Database documents that heavy rail systems have higher rates of crime than transit systems as a whole. Findings from the database, the case studies, and the strategies suggest that transit agencies should develop a systematic approach to preventing quality of life transit security offenses, utilize techniques of community policing and the help of non-security personnel, develop enforcement mechanisms to combat quality of life offenses, continue to utilize design and technology tools, and create better mechanisms to evaluate quality of life security strategies and programs.
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This thesis examines the relationships between disorder, quality of life crime, and transit security. These relationships are investigated by examining current research and the security practices and policies of five transit agencies; WMATA, NYCT, BART, LACMTA and Metrovias. This thesis presents the management policies, design and technology strategies, and evaluation procedures for each of the case studies. Five key areas, Quality of Life Ordinances, Concessions, Management Options, CCTVs, and Design Issues that deal with quality of life transit security are discussed in this thesis as well. These five areas provide insight into complexity of transit security and form the basis of recommended approaches to transit agencies interested in improving security.

To gain an understanding of the actual crime and the relationships between more serious crime and the quality of life crime occurring on transit systems, this thesis examines data provided by the 1995 National Transit Database. The thesis then compares and evaluates the case study systems, based on data from the National Transit Database, the recommendations in the five key areas, and research from the case studies. Lastly this thesis provides transit security recommendations for the Tren Urbano system in San Juan, Puerto Rico.

1.1 Disorder, Quality of Life, and Transit Security

1.1.1 Quality of Life Crimes

In recent years many urban residents across the United States have had to face disorder and crime in their daily lives. One indication of this disorder is the vast number of "quality of life" offenses evident in the city. Quality of life offenses are defined as those crimes that disturb or disrupt citizens and increase their sense of discomfort and fear even though they do not physically threaten citizens. My definition of these offenses includes the following—disorderly conduct, homelessness/vagrancy, drunkenness, liquor law violations, smoking/eating, drinking/littering/loud
music, public urination, and graffiti. Quality of life crimes are signals of disorder and create the perception that the city and its transit system are not safe.

Urban transit systems, like the cities in which they are located, are affected by the disorder characterized by quality of life crime. In older cities, urban transit systems, especially those with subway or elevated routes, may be older structures which have suffered from prolonged underinvestment and lack of repair. The disrepair and age of the system and/or the use of the system by the homeless and vagrants, who are often found in America’s urban centers, contributes to the disorder of the system. Transit passengers can feel trapped while waiting on an underground platform or exposed while waiting on an elevated structure.

Nathan Glazer expresses the relationship between disorder, quality of life crimes and perception on transit eloquently:

While I do not find myself consciously making the connection between the graffiti-makers and criminals who occasionally rob, rape, assault, and murder passengers, the sense that all are part of one world of uncontrollable predators seems inescapable. Even if the graffitists are the least dangerous of these, their ever present markings serve to persuade the passenger, that indeed, the subway is a dangerous place—a mode of transportation to be used only when one has no alternative. The issue of graffiti is also one of reducing the ever-present sense of fear, of making the subway appear a less dangerous and unpleasant place to the possible user (1984, p. 210-211).

1.1.2 Perception and Disorder

Transit systems thus need to place emphasis on transit security, protecting people and property from other people on the transit system (Richards and Hoel, 1980, p. 2). Transit agencies focus on quality of life crimes as a method to maintain order and to increase passenger perception that transit is safe. In a transit system, the perception of danger is as important as the real rate of crime. If passengers perceive that the system is unsafe, they will be reluctant to use it and will choose to travel by other modes. Several studies demonstrate the importance that security (or perceived security) plays in ridership patterns and transit use.

1 Notice the difference between transit security and transit safety. The Federal Transit Administration defines security as freedom from intentional danger and safety as freedom from danger.
In the 1960's Paine et al conducted a transit study in Philadelphia and found that personal security was at the top of a list of 33 variables that influence the use of transit in Philadelphia (qtd. in Ingalls et al., 1994, Vol No. 1433, p. 201).

In a recent survey in which participants ranked objectives important in creating effective intermodal stations, Alan Horowitz found that Safety and Security Objectives ranked the highest (1995, p. 30).

In the 1970's Shellow et al. conducted a telephone survey of 1,556 persons in a particular city and found that transit security affected ridership especially rapid transit ridership. He writes 'But when it came to rapid transit, itself, 25 percent of those who do not use it and 30 percent of bus-only riders cited lack of security for not riding trains' (1974, Vol 487, p. 3).

Thrasher and Schnell also conducted a series of studies relating passenger perceptions to transit security and to transit ridership. They found that personal security was a factor in influencing travel behaviors (1974, Vol 487, p. 32). Both Stellow and Thrasher and Schnell found that time of travel greatly influenced passenger perceptions of security as many passengers did not want to travel at night.

Studies have also found that different transit users perceive the security of transit differently. Females and elderly (both groups which are a disproportionately high users of transit) feel more vulnerable when using transit and have a greater perceived risk and fear of transit. A recent study by G. Lynch and S. Atkins found that women would change their travel behavior to avoid an unsafe situation (qtd. in Hoel, 1992, Chapter 18, p. 509).

Wilson and Kelling argue that maintaining order and deterring quality of life crimes are essential in changing people's perception of whether an area is safe or not. Studies in Boston of public housing projects found that persons residing in projects that were disorderly had the most fear, although these areas did not have the highest crime rates (Wilson, 1983, p. 80). Similarly while many riders perceive transit systems to be unsafe, studies have demonstrated that transit systems are actually

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significantly safer than the surrounding city streets. In a study of a rapid transit system, robbery rates on transit were a $\frac{1}{3}$ of the rate occurring in the city as a whole (Shellow et al., 1974, p. 5).

Disorder and crime may also be linked in a very real sequence. This connection is often explained by the broken windows analogy—if one window in a building is left broken and unrepaired—the other windows will soon be broken. Similarly if panhandling and vagrancy go unchecked, so will robbery and other more serious crimes (Wilson & Kelling, 1981, p. 8). In addition, cracking down on disorder may prevent, or at least allow police to catch the perpetrators of, more serious crime. For example, transit agencies have found that that when they cracked down on lesser crime such as fare evasion, many of the fare evaders were also wanted for more serious crimes.

1.1.3 Community Policing and Physical Design

Two techniques have been developed as methods to fight disorder and improve passenger perception both on urban streets and in transit systems; one is community policing and the other is the use of physical design tools.

Community policing involves the use of police on foot patrol (instead of automobile patrol). In a study conducted by the Police Foundation in Washington, D.C. of neighborhood patrols in Newark, NJ, foot patrol did not reduce crime rates. But neighborhood residents felt safer and police were more satisfied with their job. Foot patrol allowed police officers to deal with the disorder of the neighborhood on a better level and to create rules to deal with disorderly people (Wilson & Kelling, 1981, p. 2).

Community policing allows police to better enforce the informal social controls of a neighborhood or area. Other research also advocates the use of citizens groups to maintain order. Kenney describes the role that the Guardian Angels and citizens advocacy groups played in maintaining order in the New York subway system (1984). Recent trends in the 1990’s continue to emphasize
community policing but also demonstrate the increased role of private security guards and community groups in maintaining order.²

Order maintenance and improving informal social networks may also be enhanced by physical design. The idea that the design of the physical environment can affect people’s actual and perceived security is not a new one. Jane Jacob’s historic book *The Death and Life of American Cities* expresses the importance of designing the street so that there are eyes on the street. Jacobs stresses the importance of having people (normal citizens) watch space to ensure security and mixing the use of public and private space. She writes:

> The basic requisite for such surveillance is a substantial quantity of stores and other public places sprinkled along the sidewalks of a district; enterprises and public places that are used by evening and night must be among them especially (1961, p. 36).

In 1972, Oscar Newman developed his defensible space theory in which he stated that some physical environments were less conducive to crime than others. He used four models towards which physical design should aim: Territorial spheres—in which people feel proprietary about their neighborhood and environment; natural surveillance—in which design strives to enable people to watch public and private space from many viewpoints; linkages—which enhance safety of an area by linking it to more communal uses; and peculiarity reduction, in which a given space can be fixed to fit in with the built environment. Defensible space theory works at strengthening the informal social networks so important to maintaining order (1973, p. 2).

Situation crime prevention is less dramatic than defensible space theory and has grown out of the field of environmental criminology. Situation crime prevention attempts to “reduce the opportunities for crime by increasing the effort that the offender must invest, increasing the risks he must take, and reducing the rewards” (Murray, 1995, p. 358).

² The America Department of Justice notes that in 1977 there were 900 residential patrols, in 1996 there are "several thousand." In 1970 the ratio of public to private police was 1.4:1 currently the ratio of public to private police is 1:3. *(The Economist, 1997, p. 21)*
A recent anthology *Preventing Mass Transit Crime* details several case studies in which transportation authorities implemented physical changes in transportation facilities to reduce crime (Clarke, 1996). In addition several manuals exist on design guidelines for transit security.³

1.1.4 Current Transit Strategies and Government Emphasis

Transit agencies have developed strategies to deal with quality of life crimes and with other crimes, based in part on community policing and physical design.⁴ A recent survey demonstrated that transit agencies spend most of their security resources on deterring quality of life crimes. These strategies refer to a myriad of practices, procedures, and policies used by the transit agency to deter crime. These strategies encompass the entire transit system and also agencies and resources outside the system. Labor and management practices as well as technological devices and physical design are important components of a systemwide transit security plan. Security plans and strategies vary by type of crime, transit agency and transit modes.


Due to the importance of transit security and quality of life crimes to transit use, the Federal Transit Administration (FTA) has also placed added emphasis on transit security. This emphasis includes improved transit security data and state oversight legislation. Beginning in 1995, transit agencies who receive federal funds are responsible for recording Part I and Part II transit crimes to the FTA using the Uniformed Code Reporting system. These data are now part of the National Transit Database.

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³ In 1976 the Southern California Association of Governments prepared a report entitled *Transit Safety and Security a design framework*. This manual provided for design guidelines and procedures in the follow areas—parking facility, park and rides, subway station designs. In addition Lester Hoel lists some architectural design factors in Chapter 18 of *Public Transportation*.

⁴ Transit crime encompasses a wide variety of crimes and includes a wide variety of transit strategies. The scope of transit crime includes general security issues (crimes and situations such as drunkenness, disorderly conduct, drug violations, homelessness and minor sex offenses), crimes against passengers (includes theft, physical assaults, sexual assault) crimes against the transit system (fare evasion, fare theft, suicide attempts, vandalism, trespassing and theft) crimes against the public (hostage situations, hijackings, and bomb threats) (Balog et al. 1994, pp. 89-139).
ISTEA which was enacted in December 18, 1991 added Section 28 to the Federal Transit Administration Act (FTA Act). The FTA was required to issue regulations to create a state oversight program for all defined rail fixed guideway systems (PennDOT RTSRP, 1995, p. 2).

As part of the state oversight program, the state oversight agency must develop and adopt a system safety program plan (SSPP) that at a minimum complies with the APTA manual for the Development of Rail Transit SSPP and includes a section which addresses the personal security of passengers and employers. The state oversight agency requires that the transit agency adopt a SSPP consistent with these minimum standards (PennDOT RTSRP, 1995, p. 5).

The FTA has not yet developed specifications or standards for the oversight agency to follow in creating security procedures but recommends two FTA documents, Transit Security Procedures Guide and Transit Systems Security Program Planning Guide. (PennDOT RTSRP, 1995, p. 7).

The Transit System Security Program Planning Guide explains the steps a transit agency should follow to develop a security program. This security program should follow a systems approach by developing security methods that encompass the entire transit system. The Transit Security Procedures Guide lists ways to prevent security incidents, describes the varying types of transit crime that occur and discusses methods and strategies to deal with each of these crimes. The philosophy behind both of these guides is that a security plan and preventative planning can help prevent transit crime and offenses.

1.2 Research Objective and Scope of Paper

Due to the importance of quality of life offenses, and the unique security attributes of rail systems, this research focuses specifically on the quality of life offenses in rail systems. This paper attempts to fill a gap in current research and transit agency practices by evaluating transit security practices, highlighting the context in which transit agencies make decisions, and presenting evaluation techniques used by the transit agencies. To date transit agencies and transit security research have not carefully examined the success or failure of quality of life transit security practices, nor has prior research effectively documented the context in which transit agencies make security
decisions. In addition, this paper unlike previous research efforts, analyzes crime statistics of the thirty largest transit agencies in the United States.

The purposes of this paper are:

- to explain the theoretical and practical importance of quality of life offenses and the connections of these offenses to passenger perception, and transit security;
- to analyze and compare the security programs of several transit agencies;
- to describe and evaluate the transit security strategies currently used by rail systems to deter quality of life offenses; and
- to apply these strategies and lessons to the Tren Urbano system in San Juan, Puerto Rico.

The hypothesis in this study is that transit agencies can increase the quality of life on their transit system and passengers’ perceived security of the system, by carefully implementing security policies and practices and by continually analyzing and evaluating these policies and practices.

To learn more about how to evaluate transit security strategies and issues, the practices of several case study agencies were analyzed. Chapter 2 highlights the security programs and strategies of these transit agencies and describes the context in which transit agencies make decisions about quality of life strategies. The case study agencies include: New York City Transit Authority, Bay Area Rapid Transit, Washington D.C. Metropolitan Transportation Authority, and Los Angeles County Metropolitan Transportation Authority. For each case study agency, this chapter presents the history of the transit agency; the security strategies (both physical decisions and management tools) and their program and strategy evaluation measures.

A case study on Buenos Aires is also included in this section. This case study provides insight into how transit systems in Latin America deal with security strategies. An understanding of Latin American security issues may facilitate recommendations for the Tren Urbano system, a rapid transit system currently in the early stages of construction in San Juan, Puerto Rico.

Chapter 3 analyzes five areas affecting quality of life security being utilized by the case study transit agencies: Quality of Life Ordinances, Concessions, Management Options, Closed Circuit TV, and
Design Issues. In each area the approaches used by each of the case studies are discussed and a recommended policy is suggested. The purpose of this chapter is to provide a greater understanding and context to transit security research, highlight important issues in transit security and to attack difficulty in transit security policy evaluation.

Chapter 4 discusses security data from the 1995 National Transit Database including a comparison of crime levels at the thirty largest transit agencies, crime levels on rail systems; and metropolitan crime rates. Chapter 4 then compares and evaluates the case studies by using a set of criteria. The criteria used to evaluate the case studies include: actual crime rates, passenger perceptions, actions on each of the five quality of life areas, and their overall transit security programs.  

Next Chapter 5 describes the Tren Urbano project in San Juan, Puerto Rico and the security concerns of the project. The Tren Urbano as a turnkey system offers challenges and opportunities for innovative security strategies and policies. The potential problems and opportunities of implementing a security program under a Design Build Operate and Maintain Contract are described. Chapter 5 also recommends several quality of life security strategies for the Tren Urbano system and suggests a process for the continuing evaluation of its security program. These recommendations are based on lessons learned from the case study agencies and also from an understanding of the Tren Urbano system.

Lastly Chapter 6 highlights the findings and limitations of this research and suggests areas for further study.

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5 While this evaluation criteria is not ideal, Appendix 4 discusses problems and measures to evaluate quality of life security programs.
The chapter presents case studies of transit security in transit systems in the United States and Latin America. The objective of this chapter is to highlight the security practices and strategies used in the selected systems. The cases, WMATA (Washington D.C.), LACMTA (Los Angeles), NYCT (New York City), BART (Bay Area), and Metrovias (Buenos Aires) were selected for a combination of reasons. The cases are all rapid rail systems which are similar in some respects to Tren Urbano, systems where background data and security information are readily available, systems where agency personnel are interested in security research and willing to help, and systems with innovative security measures and techniques.

Interviews with key transit security personnel, surveys conducted by Boyd, Maier & Associates and IEI as part of other studies, and security data from the National Transit Database have all been used as information sources for the case studies. The interviews were conducted by telephone in response to an open-ended questionnaire sent out earlier (See Appendix 1). The Buenos Aires case study relies on written communication with the Chief of Security and thus follows a slightly different format.\footnote{Many thanks to Adam Roman who translated this written correspondence.}

For each case study, the background, the historical context of security, and the security strategies of the transit agencies are discussed. The security strategies include the design techniques, technology and equipment used by each case study agency, their policing and management strategies, and their security evaluation techniques.
2.1 Washington Metropolitan Area Transit Authority

2.1.1 Background

Created in 1968, The Washington Metropolitan Area Transit Authority (WMATA) provides public transportation for the District of Columbia, and several neighboring counties in Maryland and Virginia. The WMATA system consists of Metrorail, which began operating in 1976, and Metrobus, a bus network covering approximately 1,500 square miles. Metrorail is a heavy rail system with 74 stations, 89 miles of line and 764 rail cars. Nine more stations are currently under construction. The stations of Metrorail are a mix of elevated, subway, and at grade. Metrorail averages a weekday ridership of 508,000 trips.

2.1.2 History

Metrorail, unlike some of the older systems in the United States, had a dramatic concern for security from its inception. From the beginning of Metrorail’s operation, WMATA’s security program included an emphasis on policing and personnel practices and on advanced communication and technology packages. The pre-construction planning process at Metrorail included the future police chief and deputy police chief of the system (as well as architects, engineers and the Commission on Fine Arts.) The police chief and deputy police chief had many years of experience dealing with security and incorporated security principles into the design of the system (LaVigne, 1996, p.166).

Members of the planning team also inspected other transit agencies to derive transit security lessons which might be applicable. For example, due to the problems other transit agencies had with security in public toilets, no public toilets were built for the Metrorail system (Hanson, 1997).

2.1.3 Security Strategies

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<th>Table 2-1: WMATA Security Strategies</th>
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<tr>
<td><strong>Technology and Labor Practices</strong></td>
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<td>Communication System</td>
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<td>Closed Circuit TV</td>
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<tr>
<td>Call Boxes &amp; Hot Lines</td>
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<td>Zero Tolerance Policing</td>
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<tr>
<td>Station Attendants</td>
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<td>Aggressive Maintenance</td>
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Table 2-1 highlights the transit security strategies utilized by Metrorail.

**Design, Equipment, and Technology**

Metrorail’s security design followed principles now commonly known as Crime Prevention Through Environmental Design and Situational Crime Prevention (See Chapter 1) which were not widely recognized by security and design professionals at the time (LaVigne, 1996, p.166). These design strategies were incorporated throughout the entire Metro system and meshed principles of aesthetics and security. As all of the Metro stations are uniform in design (except for differences due to elevation) these design principles apply to all stations and include the following:

Metrorail stations are built with platforms over 600 feet long and as wide as 60 feet. On the platform area there are very few columns and there are high, free-standing, vaulted ceilings in underground stations. This design creates a wide-open space which makes passengers feel more secure and also allows passengers and station attendants to observe activity occurring throughout the platform area. This design does not leave many places for would-be criminals to hide. In addition, winding passage ways were eliminated; lengthy escalators and stairs were created instead to give passengers and stations managers long lines of sight. Graffiti resistant design and materials were used in the construction of the system. Walls were set-back and bars were installed to discourage graffiti. WMATA’s early lighting design were not a success because the lighting level was too low, but these policies were revamped in later stations (LaVigne, 1996, pp. 169-173).

Many of the design principles employed by WMATA have become standard in the construction of new transit systems and in the rehabilitation of stations in older systems.

WMATA utilizes technology and equipment to create a secure system. WMATA’s communication system facilitates communication between the train operator and central control. Passengers are able to contact station managers from the platforms and elevators, and operators from the end of each rail car. The operator, the station manager and central control all have the ability to broadcast
public announcements throughout the vehicle, system, or station area. Call boxes are located every 800 feet along the track, and there are between six and eight closed circuit TVs at every station (LaVigne, 1996, p. 174). Passengers can also report crimes to a police and fire department hotline.

**Management and Policing**

Most of WMATA's security force is focused on high visibility uniform patrols on Metrorail, although the police do also patrol Metrobus. A sworn police force of 286 officers patrols the system using a wide variety of policing tactics such as: random foot patrol, fixed posts, mobile patrol, canine patrol, community oriented policing, and school outreach and patrol (Interactive Elements Inc., 1996). The Metro Transit Police complete extensive training and a rigorous screening process as they are responsible for knowing federal, District of Columbia, Maryland, and Virginia law.

Metrorail's police practice a policy known as “zero tolerance policing” which aggressively targets quality of life offenses. For example, Metrorail’s police prevent panhandlers and vagrants from loitering on the system, and also fine individuals who eat, drink, or smoke on the system. Metro’s security personnel instituted this policy at system start-up, because they believed that cracking down on quality of life offenses would deter other types of offenses (Hanson, 1997).

Metrorail’s uniformed station attendants contribute to the security of the system by monitoring the activity of their station area. These attendants are located in kiosks at the entrances (exits) to stations and provide information to passengers, monitor the CCTVs throughout the station area, and broadcast events on the public address system.

**Metrorail’s Evaluation Techniques**

In general, Metrorail authorities are pleased with their security program, and as such do not spend a large amount of time on security strategy and program evaluation. While they do collect and analyze crime data, Chief Polly Hanson reports that there is not enough crime to determine statistical trends. However the police force analyzes the time of day in which crimes occur and number of crimes which occur on the system. WMATA has also gathered information that
demonstrates an inverse relationship between the number of crimes committed and the number of citations written on a given day. To understand crime, WMATA police analyze the print-outs from fare gates to determine the occurrence of fare fraud with respect to subsidies. The print outs will allow the WMATA police to understand what types and the amount of subsidies are being used at fare gates. They can match this information with the types and amount of subsidies they have distributed to qualified individuals and analyze whether individuals ineligible for fare subsidies are cheating the system.

Metrorail, like most transit agencies, does market research on passenger concerns and satisfaction including focus groups, surveys, and a mail-in survey. This market research however is not specifically geared towards security concerns. One interesting technique that Metrorail uses to evaluate passenger opinion of police activity is the practice of the police commander telephoning patrons who have recently filed a report and asking if they are satisfied with the service they received from the police (Hanson, 1996).

2.1.4 Issues Today

Metrorail’s early emphasis on security has created a security program that is still very similar to the original plan. Quality of life issues continue to be a dominant part of Metrorail’s security program due to the belief that cracking down on quality of life crime will prevent more serious crime from occurring. In fact one of the few changes that occurred in the twenty years of Metrorail’s security history has been a more stringent enforcement of quality of life offenses. Officers now have the ability to ticket individuals directly when they are caught eating, drinking, or smoking (Hanson, 1996). Police officers are also currently targeting juvenile offenders, as they are a major concern of the police.

In a recent survey Metrorail’s uniformed foot patrol listed its five major concerns as: fare evasion, disorderly youths, aggressive panhandlers, enforcement of the no smoking, eating, and drinking ordinances, and graffiti (Boyd, Maier & Associates, Transit System and Police Department Characterization, 1995).
2.2 New York City Transit

2.2.1 Background

New York City Transit is one of several agencies providing transit in the New York City Metropolitan Area, under the umbrella of the Metropolitan Transit Authority (MTA). NYCT is responsible for providing bus and subway service (and the Staten Island Railway) to the five boroughs of the city. NYCT operates 2,300 buses over approximately 230 routes and has the largest subway network in the country. The New York City subway serves four boroughs, has 714 track miles, and 469 stations and is also one of the oldest systems in the country, with the first portion being built in 1904.

2.2.2 History

NYCT historically has had many problems with security and perceived security on the subways. Before the late 1980's, the New York City subway was in a state of disrepair and neglect that affected the quality of life and security on the system. In the late 1970's and early 1980's, New York's subway system was infamous for its graffiti as few inches remained graffiti-free over the entire system. This graffiti was systematically removed in the 1980's and 1990's. The Guardian Angels, a citizen action group, reacting to the dismal conditions on the subway, was also created in the late 1970's to help patrol and prevent crime on the subway.

In 1990 New York City Transit developed a series of initiatives to combat quality of life crimes spearheaded by William Bratton, who was chief of the New York City Transit Police. The program took a long time to fully develop and implement, due in part to the depth of the problems in the 1970's and early 1980's. In 1988 NYCT tried to implement a program to attack quality of life issues on the subway. This program did not get into gear because an unfavorable court decision, Young v. New York City Transit Authority, which prevented the transit agency from tackling panhandling and begging on the system (Kelling & Cole, 1996, p. 126). In addition the 1988 program was too limited in scope and did not attack all the issues needed to improve quality of life on the subway. A successful appeal to the Young decision occurred in 1990 enabling NYCT to be more aggressive in attacking quality of life offenses and to remove the homeless from the subway. Much of the
problem of deterring quality of life crime in New York City was not in determining strategies, but in developing enforcement and implementation mechanisms for these strategies (Weiss, 1997).

The quality of life initiatives launched by the transit agency were applied more broadly to New York City in 1994 when William Bratton, became Chief of Police for the City of New York under Mayor Giuliani. At this time the NYCT Police were merged with the New York Police Department (NYPD). Consequently the transit division of the New York Police began to, and still follows, the same policies and practices as the New York Police Department. Management practices in the NYPD (and thus the transit police) were also improved by the installation of a system-wide computer based method of crime data analysis, and by stricter recruitment standards (Anderson, 1997, p. 47).

These new initiatives have been hailed by many to be successful and provide powerful evidence of the importance of quality of life crime in deterring more serious crime. Felonies including murder, rape, robbery, assault, burglary, grand larceny, and auto theft in the city have declined 39 percent since 1993 (Kraus, 1996, p. A1). For example, 984 homicides occurred in 1996 in the city of New York, down 57 percent from the 1990 figure. While this evidence seems to suggest that attacking quality of life crime prevents more serious crime from occurring, criminologists and theorists also point to other causes. Other indicators to explain the decline of crime in New York City, include the stabilization of the crack epidemic; a changing drug market that results in reduced crime; and the decline of crime-age prone groups as part of the population (Anderson, 1997, p. 47).

2.2.3 Security Strategies

Table 2-2 summarizes the security practices of New York which will be discussed in more detail in this section.

<table>
<thead>
<tr>
<th>Table 2-2: NYCT Security Strategies</th>
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<tbody>
<tr>
<td><strong>Technology and Labor Practices</strong></td>
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<tr>
<td>Merged with NYPD</td>
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<tr>
<td>Station Manager</td>
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<tr>
<td>Systemwide Approach</td>
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<tr>
<td>Attack on Quality of Life Offenses</td>
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<tr>
<td>Strong Maintenance Efforts</td>
</tr>
<tr>
<td>Extensive Market Research</td>
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</tbody>
</table>
Technology, Equipment and Design on the New York Subway

The physical security features of the New York City subway differ from line to line and station to station due to the history and nature of the system. The age and massive size of the system make the option of installing modern security equipment in all the stations prohibitive. For example, the possibility of installing call boxes in all stations was found to be extremely costly. Instead NYCT contracted out to NYNEX to install more telephones in the stations (Weiss, 1997).

Closed circuit televisions do not exist in every station, however the “talk back” system is installed in about seventy stations. In this system a passenger in need of help activates a signal which notifies the token clerk that there is a problem and focuses closed circuit televisions in the problem area. The token clerk can then answer questions and/or contact the transit police if necessary. Closed circuit televisions are also used in special cases to track known criminals.

The NYCT has focused energy and resources on issues of station design and re-design. For example, NYCT investigated station paint color and found that light and bright colors are less intimidating to patrons than dark colors. The NYCT also closed certain station exits and entrances and created better lines of sight by closing cul de sacs. An interesting example for station design and closing off exits and entrances occurred in Brooklyn when the NYCT closed a tunnel between a subway and a shopping center. This tunnel was hardly used except in rainy weather. NYCT found that crime at that station decreased 50% and that purse snatching at the shopping center went down 25%. The closing of the passageway had cut off the criminal’s escape route from the subway station and from the shopping center (Weiss, 1997). Based on focus groups and market research, the NYCT found that larger waiting areas and clear signage also improved passengers’ perception of security.

Management and Policing

In 1990, New York City Transit implemented a series of initiatives to combat quality of life crimes on the subway system which is still largely followed today. Ten strategies were identified to deal with
quality of life issues, including cracking down on graffiti and fare evasion; enhanced communications, programs and services for homelessness; and phasing out hot dog vendors.

NYCT staff also recognized that improved security had to come about in a holistic manner and include employees from the entire system. In the 1990 effort, everyone at the transit agency from motor operators, to token collectors, to maintenance staff were involved in the initiatives to combat quality of life crimes. Upper management supported this initiative and were essential in spreading the word that preventing quality of life crime was everybody’s concern. Upper management held weekly meetings on these issues, and William Bratton delivered radio addresses to the public to communicate the importance of preventing quality of life crime (Weiss, 1997).

Strategies in combating quality of life crime, included removing the homeless from the subway and referring them to shelters. As part of the HOPE program, the homeless were given free passage on buses that ran to shelters. Homelessness was and still is a major concern for the transit authority and its patrons.

NYCT also created the position of station manager to oversee the running of each station by keeping order, being highly visible to patrons, insisting that passengers follow the subway rules, ensuring proper maintenance and cleaning of spills. Only large stations had their own station manager, but many smaller stations had part-time oversight of the station area (Kelling and Cole, 1996, p. 135).

The transit authority also instituted a huge initiative to remove graffiti as soon as it occurred and cracked down on fare evasion. When arresting people for fare evasion, the NYCT found that many of the offenders had also committed other crimes, such as carrying guns without a license and pickpocketing. The transit police were aggressive in attacking crime and made over 2,000 felony arrests between July 1990 and 1993. The transit police also stopped vehicles and did searches (Weiss, 1997).

The transit authority worked with school groups and garnered community support for their attacks on quality of life offenses and as a result had overwhelming public support. Community groups,
Business Improvement Districts, and community boards played an essential role in preventing quality of life offenses and working with the NYCT police and NY police (Weiss, 1997). The transit agency also recognized those employees who did a good job at deterring quality of life offenses.

**NYCT's Security Evaluation Techniques**

New York City Transit and the Metropolitan Transit Authority have more advanced techniques for market research security evaluation than any of the other case study systems. The amount and type of market research conducted by New York City Transit is extremely comprehensive, including:

*Annual Attitude Surveys:* The MTA tracks attitudes and perceptions of passengers in an annual survey of a random sample of 12,000 passengers. Passenger’s perceptions of security are included in this survey (Wentworth, 1996).

*Transportation Panels:* A diary of the travel behavior of passengers is tracked monthly and these passengers are asked some general questions on security (Wentworth, 1996).

*Station Design Studies:* Passengers are asked to evaluate stations before and after rehabilitation and community groups are asked for their input and design suggestions before station rehabilitation occurs (Wentworth, 1996).

*Policing Studies:* Using pamphlets, the transit authority has also done a series of studies on the visibility of policemen. First, when the NYCT had a non-uniformed person handing out pamphlets, the passengers surveyed could not remember what the person who handed them pamphlets looked like. Next, when a uniformed police officer handed out pamphlets, passenger surveyed were able to identify that a police officer handed them the pamphlets. Third when a police officer was standing still, passengers surveyed did not remember seeing him, and finally when the police officer was actively handing out pamphlets, passengers remembered seeing him (Weiss, 1997).

NYCT also investigated the use of closed circuit tvs (CCTVs). Initially they had people watching CCTVs in a special area, but they found that after a few seconds the people watching the monitors...
zoned out the activity on the monitors. After that experiment, NYCT, instituted the “talk back”
system (described above) which is extremely effective in high crime areas while still using closed
circuit television to identify wanted criminals (Weiss, 1997).

2.2.4 Issues Today

Although the 1990 initiative to attack quality of life crimes in the subway has been successful in
decreasing crime, security remains a serious problem. Wally Wentworth, who conducts market
research for NYCT states, "Security is the number one barrier to off-peak ridership in our system."
Market research efforts have demonstrated that security is still a concern and transit officials are
looking for ways to improve passenger perceptions. Most recently transit officials are working on
conducting a study that would investigate how installing technology like automated vending
machines and having no fare collectors would influence patrons’ perceptions of security.
2.3 Bay Area Rapid Transit

2.3.1 Background

Bay Area Rapid Transit (BART) serves the San Francisco and Oakland area with heavy rail and bus service. The BART system commenced operation in 1972 and has four rail lines, several express bus routes, large parking lots (with over 26,000 total parking spots) and a current annual ridership of about 79 million. BART is also currently undergoing a system expansion, including an extension to the airport. BART is only one of many transit agencies in the Bay Area others including: Muni which operates light rail, and bus service in San Francisco; AC Transit which offers bus service in the Alameda Corridor; and Caltrain which provides commuter rail service from San Francisco to Gilroy via Santa Cruz.

2.3.2 History

The BART Police department was created in 1969 when the system was being built, because of the difficulty of developing uniform police practices and techniques among the sixteen different municipalities of the BART system. BART police began to implement their system of direct reporting, the predecessor to the current zone policing, in 1984. BART Transit Police have also developed a long range plan which includes the goals and objectives of the department, along with its mission statement and history.

2.3.3 Security Strategies

Table 2-3 summarizes the technology, labor and design practices currently in use by the BART system. These practices are discussed below.

<table>
<thead>
<tr>
<th>Table 2-3: BART Security Strategies</th>
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<tbody>
<tr>
<td>Technology and Labor Practices</td>
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<tr>
<td>Communications System</td>
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<tr>
<td>Call boxes and CCTV at Parking</td>
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<tr>
<td>Areas and (occasionally) in vehicles</td>
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<tr>
<td>Zone Policing</td>
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<tr>
<td>Attention to Quality of Life</td>
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<tr>
<td>Offenses</td>
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<tr>
<td>Community Service Attendants</td>
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<tr>
<td>Community Partnerships</td>
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<tr>
<td>Strong Maintenance Efforts</td>
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</tbody>
</table>
Technology, Equipment and Design at BART

BART, like most transit agencies, uses communication systems and equipment to deter crime. BART has an “Attendant Call Intercom” at the end of each car providing access to the Train Operator. Emergency phones, marked with a Blue light, providing a direct line to BART control are located in the Transbay tube, Berkeley Hills tunnel and subway areas. As part of their Security Enhancement program, BART is in the process of changing the lighting in the parking areas from mercury vapor to high pressure sodium (which is a yellow-orange color). BART is also in the process of installing cellular call boxes at parking lots. While much of the BART system was built only a few years before the construction of WMATA, the construction process did not emphasize the techniques of crime prevention through environmental design. Currently however the police have input into the design techniques used in the rehabilitation of old stations and in new stations.

BART does not have closed circuit televisions throughout most of the system, however they are used in about three fourths of the parking structures (Joe, 1996). These closed circuit televisions are monitored by the community service assistants in the parking garages. BART also places CCTVs in the rail vehicles in which graffiti is occurring. If at the end of the day, a vehicle returns to the maintenance yards with graffiti on it, a closed circuit tv is placed on that vehicle route to identify those individuals who are committing graffiti(Gee, 1997).

Management and Policing

BART currently has a sworn police force of 155 officers and a 45 person civilian staff of dispatchers, supervisors, clerks, revenue protection guards, and parking structure attendants(BART, Long Range Plan). The BART Transit Police must complete a training process that meets the Peace Officer Standards and Training of California.

The BART Transit Police currently employ a practice known as “zone policing”. This policy, instituted in 1994, created zone facilities at 4 station areas, to which transit police report to at the start and end of their duty, rather than to headquarters. A computerized system is (or will be) in place that will connect these zone precincts to headquarters(BART, Long Range Plan). Officers
are stationed at a zone for at least six months and then may choose to relocate to another zone. Many officers do not choose to relocate, because they are close to home and/or have knowledge of the area and the constituents (Gee, 1997). This practice has greatly reduced the travel time for police officers, allows police officers to gain better knowledge of the community, creates a significant police presence at the zone facilities, and provides better access to the transit police for community groups and members (Joe, 1996).

BART's police force attacks quality of life crimes such as eating, drinking, smoking, on the system and also works on issues of homelessness and vagrancy. The transit police work with a group of social service providers and city social workers in a program known as MATRIX to refer transients to shelters and social welfare agencies.

BART police also conduct the following types of patrol: random foot patrol, train/bus patrol, mobile response patrol, and canine patrol (Interactive Elements Inc., 1996). BART has phased out most of its undercover patrols and replaced them with more uniformed and visible patrols. This shift occurred because undercover policemen did very little to deter quality of life crimes; customers complained that they did not see enough policemen; and BART's policing strategy stems from a belief that uniformed visible police officers serve to deter crime (Gee, 1997).

Another policing strategy that is currently under development is a new classification of police officers, known as community assistants. These community assistants do not have police powers, but are able to watch for quality of life offenses, monitor closed circuit TV's at parking lots, assist passengers to their cars at parking lots, and provide a potential labor pool for BART's transit police force (BART, Long Range Plan).

BART's maintenance force also conducts routine maintenance to clear the system of graffiti, and system services and custodians are encouraged to be in touch with the police (Joe, 1996). In addition, upper management takes a proactive role in security and passenger concerns. The previous general manager of the system used to hold weekly meetings where he would meet and talk with patrons and discuss their concerns.
BART also does extensive community outreach and uses partnerships with other groups to help improve the security of its transit areas. BART received a $150,000 Community Block Grant to work in partnerships with other groups. For example, BART police jointly operate police kiosks with the San Francisco and University of California Police. The BART police helped supply radios and uniforms to the University of Berkeley's police department. Berkeley's Police department escorts patrons from BART stations near Berkeley's campus. The MATRIX program and zone policing (described above) also require BART to work closely with other agencies and community groups (Joe, 1996).

**BART's Evaluation Techniques**

The development of a Security Enhancement Program and a long range plan of goals and objectives by the BART Transit Police has enabled them to develop a process by which they can evaluate their security program and procedures.

BART transit police conduct market research on a regular basis to evaluate passenger perceptions of security. In 1995, the BART transit police completed a crime perception survey. The purpose of this survey was: to create a baseline for follow-up surveys (the next survey is scheduled for 1997); to evaluate current patron perceptions of BART security; and to evaluate security by geographic location, age group and time of travel (Crime Perception Survey Highlights, 1995). BART transit police telephoned riders who filled out the 1992 Passenger Profile and asked them questions about their perceptions of security on the vehicle and at their normal exit and entry stations. These questions were pre-tested and developed with input from several departments and with the help of a market research consultant. BART completed 1,364 questionnaires which included the responses of 160 elderly as well as 307 night riders. Surveys were weighted to match the 1992 Passenger Profile survey.

The BART transit police track Calls For Service from patrons, station attendants, or anyone else who calls about a Quality of Life violation. They also track officer initiated contacts with the
homeless and vagrant population. A crime analyst inputs and analyzes these and other crime
statistics in a database and publishes monthly reports on crime trends.

2.3.4 Issues Today

BART has spent the last three years conducting a $4.5 million Security Enhancement Program,
funded by the Board of Directors with three primary goals:

- Decentralizing the police force using “zone policing”
- Improving lighting at stations (especially those with parking)
- Installing call boxes at parking lots

To date BART has been fairly successful in implementing these short term goals; zone policing has
been implemented, improved lighting has been installed, and call boxes will soon be placed in
parking lots (Gee, 1997). The success of these short term solutions on the perceived and actual
security of the BART system have yet to be determined.
2.4 Los Angeles County Metropolitan Transportation Authority

2.4.1 Background

The Los Angeles County Metropolitan Transportation Authority (LACMTA) is a regional agency that was created in 1993 by the merger of two government agencies the Los Angeles County Transportation Commission and the Southern California Rapid Transit District. LACMTA oversees the regional bus and rail operations, the planning and construction of a countywide rail system, and coordinates transportation programs in the region. The regional bus system, Metrobus operates more than 2,300 buses for 1.2 million riders. Since the 1980’s LACMTA has commenced construction of a rail system with the Green, Red, and Blue Lines. Metro Red Line, which opened in January 1993, is a 4.4 mile heavy rail line that serves downtown Los Angeles and 5.8 million riders annually; the Metro Blue Line, which opened in 1990, is a 22 mile long light rail line between Los Angeles and Long Beach; and the Metro Green Line, opened in late 1995, is a 20-mile 14-station light rail line, from Norwalk to El Segundo. LACMTA is continuing to expand this system with Red Line extensions to North Hollywood and to Whitter Atlantic and a Blue line extension from Union Station to Sierra Madre Villa.

2.4.2 History

When the Blue Line in Los Angeles commenced operation in 1990, LACMTA placed a huge emphasis on transit security and hired many security guards. Prior to the Blue Line’s construction, a committee with representatives from the law enforcement agencies in the area, transit police and consultants met to discuss the security issues of the Blue Line and implemented many physical design and security measures. As the Blue Line was the first line to be constructed, the Green and Red Lines followed similar security concepts. The first year security costs of the Blue Line services was $12 million, and the sheriff’s department which was in charge of the transit policing at this time, utilized 136 positions, a 123 of these sworn deputy personnel for the line (Hubaud, 1992, p. 313). This ratio of personnel to riders was approximately one deputy per every 75 to 150 riders. (At the time the countywide ratio was one officer to 500 inhabitants). Similarly when the Red Line opened in 1993, there were 45 officers patrolling the Red Line at a cost of $3.8 million a year. This amount
is one officer for every 75 passengers in rush hour, and one officer for every 35 off peak passengers (Rofe, 1993, p. A-3). Due to these extreme and costly security measures, LACMTA received a fair amount of negative press.

In 1994 the MTA won the contract to operate security services from the sheriff’s office and in the last two years, the personnel working the Blue Line have decreased dramatically. Currently on the Blue Line, in both the a.m. and p.m. shifts 2 sergeants and eighteen officers patrol the area—with more officers in the high crime areas (Conte, 1997). Moreover, there are plans for the Los Angeles Police Department and the Los Angeles County Sheriff’s Department to gain joint control over the policing of the bus and rail systems. The MTA’s police would merge with these two forces, but the MTA would still finance the operations (Lichtblau and Simon, 1996, p. B1).

2.4.3 Security Strategies

Table 2-4 summarizes LACMTA’s security policies and strategies.

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<tr>
<th>Table 2-4: LACMTA Security Strategies</th>
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<tr>
<td>Technology and Labor Practices</td>
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<td>Communications System</td>
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<td>Closed Circuit TV</td>
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<td>Call Boxes</td>
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<tr>
<td>Sensors</td>
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<tr>
<td>Attention to Quality of Life Offenses</td>
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<tr>
<td>Matching number of police at specific stations to crime rates at station</td>
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<td>Physical Design Characteristics</td>
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<td>Barrier Free System</td>
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<td>Fencing</td>
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<tr>
<td>Adequate Lighting</td>
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<tr>
<td>Graffiti Resistant Design &amp; Materials</td>
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</table>

Design, Equipment and Technology:

As the rail system of Los Angeles is newly constructed, the system uses modern construction and equipment including; closed circuit tv, emergency telephones at each station, intercoms on the train, and graffiti and vandalism resistant materials. LACMTA also installed a facility intrusion detection system, with sensors that are monitored at the central control facility by control personnel. Landscaping is designed to create long lines of sight and does not provide anywhere for would-be
criminals to hide; fences have also been installed along the right of way (Hubaud, 1992, pp. 312-319).

One of the security problems facing the system is that it is barrier free: tickets are purchased from self-service machines and there is no barrier between paid and unpaid areas (Conte, 1997). Without a barrier between passengers and non passengers, it can be harder for the police to patrol an area and to protect the passengers from would-be offenders.

Policing and Management

LACMTA currently has the largest transit police force in the country with about 425 sworn transit police, 80 contracted security and 59 MTA security guards (Interactive Elements Inc., 1996). The MTA contracts out with private security personnel to guard the Park & Rides. The “sworn transit” police force has faced budget cuts and reductions in the last couple of years. Police utilize a mixture of random foot patrol, uniformed patrol, mobile patrol responding, and special project units to combat crime (Interactive Elements Inc., 1996). The transit police enforce the quality of life regulations, that are spelled out in the penal code of California.

None of the rail lines in Los Angeles utilize a fare collector at the station or a station manager. For all three lines, the police force carries out the fare inspection duties; thus the only personnel visible on the platform area are the MTA police. Personnel at a control center monitor the closed circuit televisions off-site and notify police when they observe a disturbance on the monitor.

LACMTA’s Evaluation Techniques

LACMTA tracks crime trends over each three month time period. If increasing crime trends are noted at a certain station or area, then more officers are deployed in that area until crime decreases. Of course, more officers deployed in one area results in fewer officers being deployed elsewhere. All incidents are reported in an incident report; a data entry clerk enters the reports in a computer system, and a crime analyst analyzes the monthly reports by tracking crimes occurring by stations, platforms, and type.
These reports also track the number of police inspections for proper payment of fare. For example, in October 1994, the transit police inspected approximately 305,718 passengers or 33.5% of the monthly ridership for proper payment of fare. They issued approximately 571 fare related citations for this month (LACMTA, 1994, p. 1).

LACMTA also recently completed a major cost study on their security and policing program.

2.4.4 Issues Today

LACMTA like many transit agencies is concerned with car theft, trespassing, fare evasion, vandalism, and graffiti. In a recent survey LACMTA ranked the following offenses as most important in terms of police/security time and resources on the rail system: assaults on passengers, fare evasion, vandalism, smoking, eating, loud music, and trespassing (Boyd, Maier & Associates, Transit System and Police Department Characterization, 1995).
2.5 Metrovias’

2.5.1 Background

The SUBTE system serves the metropolitan area of Buenos Aires, Argentina with six subway lines and one commuter rail line. In 1993, Metrovias was awarded a concession to operate the subway system of Buenos Aires as the only privatized subway system in South America. In 1993, the government of Argentina also privatized the commuter rail systems, and the rail freight network (Carbajo and Estache, 1996, p. 1). Since the creation of Metrovias, average train headways have decreased to less than three minutes and annual ridership has increased 30 to 40% to 190 million/year (McKay, 1996, p. 3).

2.5.2 Privatization effects on Metrovias’ security program

The privatization of Argentina’s subways greatly impacted the security program and operations of the system. The private operators brought in new operating practices and personnel. Currently Metrovias operates with two types of security forces which work closely together; a private security force of twenty five people and a public police force. The Argentinean state and Metrovias signed a licensed contract that reserves the right of the state to control the public security of the subway system (Guitian, 1997).

Privatization also influences the philosophy of the transit system managers towards transit security. The current Chief of Security, Roberto Guitian believes that a private company has a more restrictive situation on budgeting than a public agency due to its concern with tangible profits. He explains the paradox of security and budgeting; "If the security program is efficient, and the incidents of crime are very low, they [the managers] ask themselves, 'If there are so few crimes, why am I spending so much?' If the security program reflects many incidents of crime, they [the managers] ask themselves, 'Why do I spend so much money if the security program does not work?'" (1997).

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7 Due to the fact that the research for Buenos Aires, Argentina was conducted via written correspondence instead of phone interview, the amount and type of information I obtained was different from that of the United States case studies. Thus this case study differs in content and style from those for the United States.
Before privatization, the Subway Supervisors controlled and managed the police who patrolled the subway. According to Guitian, this system did not work effectively because many of the supervisors were ex-military and ex policemen, and the police resented their control. In 1995 with the installation of private police/guard forces, Guitian restructured the system, introduced the concept of security programs, and reduced the number of guards required.

2.5.3 Security Features at Metrovias

Currently Metrovias is undergoing physical and technical renovation. The first part of the subway system was created in 1913, but maintenance efforts were largely abandoned in the 1960s. New investment in these stations focuses on installing underground stores in the stations and equipping the stations so that they can be evacuated in emergencies. In addition to replacing the older red telephones in the system, Metrovias is installing a fiber optic circuit that will permit direct communication between fixed telephone lines and portable radio-electric equipment. The fiber optic circuit will also be able to transmit images via a CCTV network, which was installed in 1995. Automatic ticket machines will be installed, but like the Washington D.C. Metro, Metrovias will continue to utilize a station manager to control the station, centralize maintenance and cleanup requests, and supervise passenger interaction (Guitian, 1997).

Uniformed security guards are responsible for enforcing the law and internal policies of Metrovias. They contact police when needed. Recently these uniformed security guards have been given the power to enforce "quality of life" laws designed to discourage activities such as smoking, drug use, and littering. However while acting in a drunken manner is prohibited, alcohol is allowed due to the fact that there are bars and cafeterias in the transit stations that legally sell alcohol (Guitian, 1997).

The supervisors and the local police are dressed in plainclothes and deal with minor infractions in the metro system. A "prevention squadron" of plain clothes local police prevent minor infractions of the system such as homelessness and unauthorized salesmen.

Metrovias faces crimes and offenses similar to agencies within the United States. The three top criminal offenses that face Metrovias are: being held up and robbed; breaking, entering and
vandalism; and burglary (of items). Metrovias’ three top minor offenses include fare evasion, panhandling, and littering (Guitian, 1997).

<table>
<thead>
<tr>
<th>Table 2-5: Metrovias Security Strategies</th>
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<tbody>
<tr>
<td><strong>Similarity to U.S. Case Studies</strong></td>
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<tr>
<td>• Uniformed and Plainclothes security personnel</td>
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<tr>
<td>• Resources allocated to similar types of offenses</td>
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<tr>
<td>• Modern technology (i.e. use of CCTV, and automatic ticket gates.)</td>
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<tr>
<td>• Concern for Quality of Life Offenses</td>
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<tr>
<td><strong>Differences with U.S. Case Studies</strong></td>
</tr>
<tr>
<td>• Privatized Franchise Operator</td>
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<tr>
<td>• Concessions serving alcohol allowed in the stations.</td>
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</table>

Table 2-5 demonstrates that Metrovias shares many security concerns and strategies with its United States counterparts. Two major differences between Metrovias and the transit agencies in the United States are the use of concessions and privatization. The use of concessions by Metrovias illustrates an important cultural difference between the United States and Latin America and is discussed in more detail in the next chapter. The fact that Metrovias is a private franchise operator does affect its security program and the way in which the security personnel interact with the public police force. Metrovias’ security program and operations have benefited from privatization of the transit system and the case study offers insight into the way in which the franchising of a system can influence transit security.  

8 Chapter 5 discusses some of the issues of contracting out and the role of the private and public sectors in the construction and management of the Tren Urbano system in San Juan.
All of the case study agencies have made decisions about the use of several important quality of life strategies. This chapter highlights five important areas for potential quality of life security strategies: Ordinances Regulating Quality of Life Crime, Concessions, Management Options, Closed Circuit Televisions, and Design Issues. These areas were selected because they are important to transit agencies and quality of life security. Each area is discussed below; first in terms of the various approaches the case study agencies have taken towards each area; and then an approach is recommended.

3.1 Ordinances Regulating Quality of Life Crimes

Legislative mandates that define and prohibit certain offenses, such as smoking and drinking on transit systems are known as “quality of life ordinances”. Many transit systems in the United States have ordinances that regulate quality of life offenses commonly including: disorderly conduct, homelessness/vagrancy, drunkenness, liquor law violations, smoking/eating/drinking/littering/loud music, public urination, fare evasion, and graffiti. This section describes the creation and content of these ordinances and discusses the role they play in transit security.

Creating the Ordinance

Quality of Life Ordinances can be created in two ways. In the first and most common case, the state creates a section in the state code (usually the penal or criminal code) that applies specifically to infractions on public transportation systems. For example, California's penal code refers to “Acts committed on facilities or vehicles of public or subsidized public transportation systems”. (A public transportation system is defined in the Public Utilities Code). The Public Utilities Code or Motor Vehicle Code may create distinctions between cities or types of transit (for example, Pennsylvania's

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9 California's Penal Code Part 1, Title 2, Chapter 2 § 640
motor vehicle code refers to class 1 and class 2 cities) so regulations do not to apply to all transit systems in the state (Korach, 1997).

When the quality of life ordinance is incorporated into the penal code, the transit agency does not have the legislative ability to create laws regulating quality of life offenses and is governed by the state. Almost all transit agencies in the United States are state entities as they often cross numerous jurisdictions within a state. The transit agency does not have the capacity to offer due process to those who have committed a quality of life infraction, so an outside body (such as a state court) is needed to adjudicate these proceedings (Korach, 1997).

Of the case study systems, both BART and LACMTA are subject to certain provisions in California's penal code. WMATA is subject to two different portions of the District of Columbia's code: Title 44, Railroads and Other Carriers, Chapter 2, Street Railways and Bus Lines of the D.C. Code, and Title 22 Criminal Offenses, Chapter 33A Panhandling Control. (See Appendix 2 for California's Penal Code applicable to quality of life offenses, and Appendix 3 for the sections of the D.C. Code regulating behavior in the Washington D.C. system.)

In other cases, such as New York City Transit (and the Manhattan and Bronx Surface Transit Operating Authority), the state legislature has created a provision, Sections 1203-a(3) and 1204-5a of the Public Authorities Law that provides the transit authority “with power to make rules governing the conduct and safety of the public in the use and operations of the transit facilities of those authorities.” These rules are documented in New York City Transit's Rules of Conduct.

In the New York City case, the transit agency can create specific rules, modify these rules as they see fit, and is responsible for adjudicating fines and penalties. A Transit Adjudication Bureau regulates the “application, implementation, and modification of these fine and penalty schedules.” (NYCT, p. 5).
Content

All of the ordinances and codes applicable to the case study systems regulate activities such as eating, drinking, smoking, graffiti, urinating on the system, skateboarding or rollerblading, blocking free movement in the system, disorderly conduct, and more. (See Appendices 2 and 3 for codes and the offenses they regulate). However, due to differences in the political climate of a state or region, or to differences in state constitutions, the ordinances used by the transit agencies to regulate quality of life offenses differ in degree and specificity. As legal battles are being constantly fought, these codes need to be carefully crafted, so that they do not deny the homeless or other groups their first amendment rights.

For example, the sections of the penal code regulating quality of life violations on transit agencies in California do not refer to panhandling or vagrancy. In contrast Title 22: Criminal Offenses, Chapter 33A: Panhandling Control of the D.C. code states “No person may ask, beg, or solicit alms in any public transportation vehicle; or at any bus, train, or subway station or stop. “ The New York City Transit Rules of Conduct includes a similar provision—“No person shall panhandle or beg upon any facility or conveyance.”

The penalties that these codes decree generally include a fine or community service. These penalties also differ in strength from state to state. For example, in New York City a fine between $25 and $100 per violation is imposed on violators. In contrast, in California, the penal code stipulates that the penalty for violating these offenses includes a fine that cannot exceed $250 and “community service not to exceed 30 days.”

Implications for Security

The case study transit agencies (WMATA, NYCT, LACMTA, and BART) all use quality of life ordinances to punish those individuals who commit quality of life violations. For example, WMATA, which utilizes a policy of “zero tolerance policing”, relies on ordinances to give teeth to this policy and writes a large number of citations each month. Without these ordinances and the ability to ticket violators, transit agencies would have difficulty enforcing the regulations preventing quality of
life offenses. These codes also set a standard for acceptable forms of behavior in public space and work towards creating a sense of order that make citizens feel more secure on public transit.

3.2 Concessions

Concessions are places in the vicinity of the station area where items such as flowers, food, and newspapers are sold. In recent years transit agencies have also added services like automatic teller machines and Federal Express mini centers to these areas. These concessions can be located in four different areas;

1. Directly outside the station area on the street level.

2. In large intermodal stations that serve as mixed-used commercial developments. Many transit agencies may have restaurants, food courts, shops, and day care centers in larger intermodal stations (such as Union Station in Washington D.C.). At these stations mixed used commercial activity is usually separate from the waiting and platform area for rapid rail.

3. Large stations with concessions in the station and mezzanine area, but not on the platform or in the paid area, and

4. Concessions at the platform level.

All of the case study agencies have concessions directly outside the station area and in large intermodal stations. Many transit agencies do, in fact, believe that concessions in these areas can create a sense of place and deter crime. For example, when the Port Authority of New York and New Jersey began to renovate their crime ridden bus terminal, they decided to invest strategically in retail activity, and actively recruited chain retailers so that patrons would feel more secure (Felson et al, 1996, pp. 34-38).

Transit agencies are divided on whether concessions in the station area and on the platforms deter quality of life crime and improve passenger perceptions of transit security. Several transit agencies expressed the concern that concessions result in increased litter and contribute to the disorder of
the transit system. Transit agencies crack down on quality of life crime because they are trying to prevent this disorder. Transit agencies also stated the concern that allowing concessions which sell food in the station area would be counterproductive to quality of life regulations that prohibit eating and drinking in the stations or on the train. One transit security person believed that the activity of concessionaires would not improve people's perceptions of security and that the presence of uniformed personnel would be more effective in improving passenger's perceptions of security.

Table 3-1 summarizes the concession policies of the case study agencies.

<table>
<thead>
<tr>
<th>Table 3-1; The Use of Concessions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NYCT</strong></td>
</tr>
<tr>
<td>Phased out hot dog vendors beginning in 1990; still allow “newspaper stands” in platform areas.</td>
</tr>
<tr>
<td><strong>WMATA</strong></td>
</tr>
<tr>
<td>Does not allow concessions in the station area believing that they have a detrimental effect on quality of life in the station. Is now considering introducing concessions for financial reasons only.</td>
</tr>
<tr>
<td><strong>BART</strong></td>
</tr>
<tr>
<td>Hot dog stands only form of concessions; except in a few stations with ATM, FedEx areas.</td>
</tr>
<tr>
<td><strong>LACMTA</strong></td>
</tr>
<tr>
<td>Does not allow concessions at all; but does have food courts upstairs such as at Union Station.</td>
</tr>
<tr>
<td><strong>Metrovias</strong></td>
</tr>
<tr>
<td>Large number of concessions in the station areas; including cafeterias and bars that sell alcohol; current capital investment program underway to create new and renovated spaces for concessionaires and stores.</td>
</tr>
</tbody>
</table>

NYCT, one of the case study agencies which allows limited concessions, conducted market research on the effects of concessions on passengers perceptions of security. They found that concessions made people feel more secure, because the concessions brought extra activity to the station area and led to more eyes watching the station. Concession owners and operators have a vested interest in keeping the stations secure. However when NYCT commenced its initiatives to prevent quality of life crime in 1990's, they phased out hot dog vendors due to the belief that these stands increased litter and increased crime. Currently, NYCT allows concessions, such as newspaper stands, but does not allow hot dog vendors on the platform level.
NYCT is currently trying to increase the number of concessions in the stations for economic reasons, but stated that concessions need a fair volume of traffic to be economically viable. Similarly, Washington Metro, which has never allowed concessions in the stations due to the belief that concessions create litter and other quality of life crimes, is investigating installing them to generate revenue.

Metrovias, in contrast to the case studies in the United States, has a large number of concessions throughout the system including cafes and restaurants that sell alcohol. They are currently improving areas in the station for concessions and shops.

There is a large difference between allowing concessionaire activity in the station mezzanine area and in the platform area especially if there is a barrier between paid and unpaid areas. If concessions are located in the station and mezzanine area, the concessionaires and the transit agency can keep the area clean by installing trash cans and hiring maintenance workers to clean up the area, especially during rush hour. While these procedures to control litter can also work at the platform level, if passengers are eating and drinking on the platform level, they will eat and drink in the vehicle. Eating and drinking in the vehicles are more likely to result in litter in the vehicle. Allowing concessions in the platform area also results in increased need for maintenance and cleaning of the vehicles. In addition, the location of concessions on the platform level and mezzanine level need to be carefully designated so as not to impede the flow of passenger traffic and to create accidents between passengers.

Assuming that the concessions are in the appropriate physical location, the following strategies can minimize the disorder of concessions:

- Develop a no littering campaign
- Utilize vigilant maintenance in the platform and station areas to clean up litter; install plenty of trash receptacles
- Fine individuals who litter

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10 An observation at Government Center Station in Boston demonstrated that the concessions at the platform level did contribute to many people eating and drinking on the platform area and in the vehicles. However, a cleaner on duty, many trash cans, and Bostonians willingness to use the trash cans contributed to a clean and non-littered platform area.
To achieve some of the financial and security benefits of concessions, transit agencies should:

- Require that the concessionaires both on the mezzanine and platform level contribute to the clean up of the station area.
- Require that concessionaires be open during off peak hours to obtain the security benefits of the concessionaires
- Utilize chain retailers to make passengers feel more secure.
- Train the concessionaires on the correct response to different types of security problems, including whom to alert and contact if they notice a security problem.

If these policies are implemented, then concessions in the platform area and mezzanine level can contribute both to the security and comfort of the passenger and to the financial well being of the transit agency.

3.3 Management Options

Different types of personnel perform various functions to ensure a secure transit system. Some of these personnel are directly responsible for the security of the system, such as transit police or security guards, while other “non-security” personnel such as maintenance crews work to improve the quality of life in the system and to remove disorder. This distinction can become blurred as agencies use a hybrid of positions and options to maintain order in the system. Table 3-2 describes the various types of personnel utilized by transit agencies to maintain an orderly and secure system:

<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>Type of Security Personnel</th>
<th>Type of Non Security Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>LACMTA</td>
<td>Sworn MTA transit police force Contracted Security Guards In-House Security Guards</td>
<td>Maintenance workers</td>
</tr>
<tr>
<td>WMATA</td>
<td>Sworn Transit Police force</td>
<td>Station Agent Maintenance Workers</td>
</tr>
<tr>
<td>BART</td>
<td>Sworn Transit Police Community Service Assistants</td>
<td>Maintenance Workers Station Agent</td>
</tr>
<tr>
<td>NYCT</td>
<td>NYPD</td>
<td>Station Manager Token Clerk Maintenance Workers</td>
</tr>
<tr>
<td>Metrovias</td>
<td>Security Guards in conjunction with local transit police</td>
<td>Maintenance Workers</td>
</tr>
</tbody>
</table>
Security Personnel

There are several types of transit security personnel. Sworn transit police have police powers to arrest, have received the same training as state police, and have been authorized by state and local governments. These sworn transit police are managed and funded by the transit agency. Transit agencies can also contract out the security of the transit system to the local police force or municipality. In this situation the transit agency may (or may not) be paying the local police force for this service, but would not actually be managing the police force. These management decisions are not static however; both Los Angeles and New York City have switched between using a local police force and a transit police force. Contracting out to a local police force or relying on a local police force is a process that can become complicated if there are many different municipalities and police forces in the jurisdiction of the transit agency.

Transit security agencies can also contract out to private security guards. In this instance the security guards serve many of the same functions as police but do not have police powers. These security guards may be given extended powers to detain and fine individuals. For example Metro Dade Transit Authority in Miami (Florida) uses the Wackenhut Security forces to patrol their transit system. These security guards have to contact the local police and work in partnership with them when more serious crimes and incidents occur. (Again, coordination with local police may become difficult when many municipalities are involved). Most transit agencies also utilize security guards to monitor facilities such as maintenance centers and administrative offices of the transit agency.

Another hybrid option is to create positions like BART's community service assistants to advise patrons, monitor closed circuit televisions and contact the transit police if necessary. They may also provide a potential labor pool for future transit police.

In situations where the operations of the transit agency may be privatized (see Metrovias and Chapter 5: Strategies for San Juan.), the private contractor may utilize its own private security force which will work in partnership with the transportation authority's public police force. The authorities' public police force may or may not be the same as the local public police force.
Non-Security Personnel

At many transit agencies station agents can serve many security functions; they can monitor the closed circuit tv within the station control booth, direct patrons and offer them information, and supervise maintenance efforts within the station. Some of these responsibilities are filled in different agencies by a token clerk or by a station manager. Systems like New York City which do not have automated fare collection may have token clerks who are responsible for overseeing fare collection activities and a station manager responsible for overseeing and maintaining order in the station. The station manager position does not always have to be full time and may be used only in large stations. However the station agent sitting in a booth serves a different role to deter crime than a security personnel who is actively patrolling an area to prevent crime.

Maintenance workers who rigorously clean graffiti as soon as it occurs as well as remove litter and trash from the station area also serve to promote order in the system. Operators of the vehicles and the doormen (utilized by some transit agencies to make sure that vehicle doors do not shut on passengers) also help create a secure transit system, and may be especially important in maintaining vehicle security. Other agency employees, such as supervisors, can also affect the security practices and policies of the transit agency. Community groups may also patrol the system or work with the transit agency to “Adopt a Station” to help maintain and create order in the system.

Types of Policing

Security personnel may perform different types of policing activities, from undercover policing to uniformed patrol. To prevent quality of life crimes, it is important that security personnel concentrate on order maintenance by making sure that the station is orderly, that quality of life ordinances are obeyed, and that crimes like fare evasion do not occur. Transit agencies should emphasize “community policing” in which security personnel are assigned to patrol on foot certain stations and gain knowledge of a certain area and individuals. Community policing in transit agencies also requires training transit security personnel in ways to deal with the homeless. The homeless and programs to refer the homeless to shelters are often important issues for many

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11 A TCRP study currently underway is investigating the effectiveness of uniformed vs. non-uniformed security personnel
transit agencies. This type of community policing has worked very effectively in San Francisco. Security personnel should be in uniform as a visible presence to deter quality of life crimes. The security personnel monitoring the station area should have the power to fine and detain individuals who violate quality of life ordinances.

The central issue in deciding which type of security management and personnel to utilize is cost effectiveness. Studies have demonstrated that extra police do deter crime, but the cost for this deterred crime may be extremely high. Privatized security guards are often cheaper than "sworn transit police" because transit police require extensive and lengthy training and security guards do not.

Security guards may also have the ability to fulfill other functions such as providing information to passengers, ensuring the system is maintained, and monitoring CCTVs. Conversely station agents may be able to provide some of the security functions of the security guards. However there is a distinction between the two roles as defined here. Station agents are usually located in one station, provide information at a set place, and monitor CCTVs in their areas. The security guard is more likely to patrol a wider and more diverse area in the system to crack down on quality of life offenses. The training for these two positions differ as well. Due to the importance of creating the perception and the reality of a secure transit environment and lack of research in this area, the following recommendations have thus separated these functions into two separate positions.

The following are suggestions for an effective quality of life security management strategy for a transit agency:

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12 For example, a study entitled The Impact of Police Activity and Crimes: Robberies in the New York City Subway System investigated the ability of increased police to deter subway robberies. In April 1965, Robert Wagner increased the transit police force from 1200 to 3100 men. These extra transit police patrolled the subway from 8:00p.m. to 4:00a.m. and robberies during these evening hours decreased and remained at a decreased level for the eight years of the study. As robberies increased at other times of the day, the authors demonstrated that the extra patrol contributed to the decrease in robberies during the evening hours. The cost of this extra police patrol was expensive at $35,000 per deterred felony in 1974. (Chaiken et al.).

13 Potentially these two positions could be linked with station agents serving as a labor pool for security guards. This approach is similar to BART use of "community service assistants" as a hiring pool for their police force.
• Utilize private security guards who are trained carefully to maintain order—including methods on how to refer the homeless to shelters. These private security guards should be uniformed, patrol the station areas on foot, become familiar with transit passengers and residents of the neighborhood, and have the ability of detain individuals until police arrive and to fine and ticket individuals who commit quality of life offenses.

• These private security guards should work in close partnership with the local police, the station agent, community groups, social workers, and maintenance personnel to create a secure transit environment.

• Transit agencies should utilize station agents to manage the station area by monitoring the closed circuit televisions, providing information to patrons, and ensuring maintenance of the system.

• Maintenance workers should provide aggressive maintenance to create a clean graffiti-free system.

3.4 Closed Circuit Televisions

Most transit agencies in the United States use closed circuit television (CCTV) in one form or another, as do many other companies and agencies concerned about security. Closed circuit televisions can record or transmit visual images from one location to another and transit agencies use them to monitor transit station areas or other facilities.

Transit agencies and criminal experts have different philosophies about the rationale for and the importance of CCTV. CCTV might serve simply as a deterrent. Individuals aware of the CCTV may be fearful that someone is watching them and may be deterred from committing an offense. In addition, other people may feel safer knowing that CCTVs are installed and someone could be watching the environment for criminal activity. However one study asked men and women to describe their changes in perception at a transit station due to the installation of a CCTV. In general men felt somewhat less secure, because it raised the issue of security which they had not
previously thought about. In contrast, women felt safer as a result of the CCTV installation (Richards and Hoel, 1980 pp. 34-36).

Table 3-3 describes the use of CCTV by the case study agencies:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYCT</td>
<td>Limited use of CCTV with the call back system in high crime areas, and videotapes for wanted criminals.</td>
</tr>
<tr>
<td>WMATA</td>
<td>CCTV in many locations throughout the station area; monitored by the station manger. (Cameras at each platform, elevators, exits and entrances—six to eight cameras in each station).</td>
</tr>
<tr>
<td>BART</td>
<td>Currently installing CCTV in parking areas only. CCTV watched by community service attendants. Limited use of covert CCTVs on vehicles traversing routes where graffiti occurs to attempt to catch graffiti artists.</td>
</tr>
<tr>
<td>LACMTA</td>
<td>Many CCTVs located throughout station area; monitored by personnel in a central control center. (Cameras located on the platform, by the fare vending machines, and in other designated areas).</td>
</tr>
<tr>
<td>Metrovias</td>
<td>Installing CCTVs in 1995; CCTV will be able transmit images via new fiber-optic network currently underdevelopment.</td>
</tr>
</tbody>
</table>

Often transit agencies install CCTV in a station area and then monitor the result either at the station booth or at a remote control center. Several monitors may display the transmissions of the camera simultaneously, or a single monitor may randomly or systematically rotate the transmissions of different cameras in a station area. Transit agencies may record the transmissions of the cameras on video recorders or have personnel monitor the events as they occur. The recorded events can then be used to apprehend criminals.

The number of cameras installed in a station area can range up to six or eight cameras depending on the transit agency and the type of stations. Most of the newer transit systems have a complete network of cameras in the station area. For example Washington D.C. has cameras located in the platform area, by the ticket vending machines, and by the exits and entrances to the stations. In
contrast some of the older systems like NYCT and BART have decided to only install CCTVs in a few strategic locations, such as parking lots or isolated stations.

The way in which personnel monitor the CCTV also varies from transit agency to transit agency. In the Washington Metro station agents are responsible for observing the CCTV monitors. While monitoring the CCTVs is not their only responsibility, the station agents use CCTVs to deter quality of life crimes. When the station managers observe (via the CCTV) passengers eating or drinking in the platform or waiting areas, they make public announcements to stop it. This same type of public announcement may not be possible when the personnel monitoring the CCTVs are located in a centralized remote area. For example in the Los Angeles transit system, personnel in a central control room monitor the CCTVs and notify police when a disturbance occurs. (The station managers in DC also notify the police when a disturbance occurs.) When personnel in a control center are solely responsible for watching numerous CCTVs over the system, there is a danger that these personnel become oblivious to the activity on the monitors. New York City Transit Authority conducted a very limited experiment, in which they installed CCTVs in selected areas, and had personnel monitor them in a remote location. They found that after a few seconds the personnel did not have the ability to focus on the activity occurring on the monitors.

NYCT does not have CCTVs in every station, however it has installed the “talk back” system in about seventy stations, either in isolated or high crime locations. In this system a passenger in need of help activates a signal which notifies the token clerk that there is a problem. The signal focuses the camera on the problem area. The token clerk can observe via the monitor the activity in the problem area, answer questions and/or contact the transit police if necessary. NYCT also uses closed circuit cameras in special cases to identify and track known criminals.

Like New York City Transit, BART only uses CCTVs occasionally. They have recently installed CCTVs in parking lots where community service attendants monitor them. BART’s use of the CCTVs resulted in a legal settlement in which BART must now post a disclaimer under the CCTV
that the CTTV does not actually prevent crime from occurring and that the CCTV may not be able to stop the crime.

BART also uses covert CCTV. Unlike overt CCTV where the offender is aware of its existence, transit agencies use covert CCTV so that the offender will be unaware that he/she is being monitored. Covert CCTV can record offenders in action, and the VCR recording can be used to identify and prosecute criminals. BART places CCTVs in rail vehicles that have been subject to graffiti. If at the end of the day, a vehicle returns to the maintenance yards with graffiti on it, a camera is placed on that vehicle route to monitor for perpetrators (Gee, 1997).

CCTV involves both capital and operating costs. The capital costs of installing a closed circuit system vary, depending on the type and amount of equipment and cameras utilized. In general however these capital costs are relatively low. Installing a single black and white CCTV with recording capability and monitor costs about $1500. A subsystem of about eight color stationary cameras with a monitor for each camera costs about $14,000 to install. The price to connect each of these subsystems to the main operating control center ranges between $3,000-$8,000.

Operating costs for the system include the personnel to monitor the CCTVs, both at the station and off-site. The CCTVs also need to be inspected at least once a year for preventative maintenance.

If a transit agency decides to install a CCTV system, they should install an extensive network of cameras. Each additional camera has a relatively low capital cost and individuals can observe more than one monitor at a time.

However the transit agency should realize that CCTV is not the key to crime prevention. They must realize that monitoring the CCTV can be expensive and potentially ineffective as those monitoring the CCTV will have difficulty staying alert and focused. A more effective approach involves a targeted use of CCTVs, where a passenger alarm will alert the station agent to focus on the monitor displaying the troubled area. The station agent can then provide information or summon security for help. Another effective approach is for the station agent to monitor the CCTV
occasionally to deter individuals from committing quality of life crimes, but not to rely on the CCTV
to stop all crime occurring in the station area.

3.5 Design Issues

Station design strategies include using several physical design tools to make passengers feel more
secure and to deter crime. All of the case study agencies utilized physical design strategies to
create more secure areas. Table 3-4 lists the design strategies utilized by the case study agencies.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Platforms</td>
<td>WMATA</td>
</tr>
<tr>
<td>High Ceilings</td>
<td>WMATA</td>
</tr>
<tr>
<td>No Winding Passage Ways (where possible)</td>
<td>WMATA, LACMTA</td>
</tr>
<tr>
<td>Long lines of sight</td>
<td>WMATA, LACMTA</td>
</tr>
<tr>
<td>No hidden nooks or crannies</td>
<td>WMATA, LACMTA</td>
</tr>
<tr>
<td>No Public Bathrooms</td>
<td>WMATA</td>
</tr>
<tr>
<td>Graffiti Resistant Design &amp; Materials</td>
<td>WMATA, NYCT, LACMTA</td>
</tr>
<tr>
<td>Division between paid and unpaid areas</td>
<td>WMATA, NYCT, BART</td>
</tr>
<tr>
<td>Closed cul de sacs and ability to close exit and entrances with grills</td>
<td>NYCT</td>
</tr>
<tr>
<td>Attention to Lighting</td>
<td>WMATA, BART, LACMTA,</td>
</tr>
<tr>
<td>New Mercury Vapor Lighting</td>
<td>BART</td>
</tr>
<tr>
<td>Police input into new and rehabilitated stations.</td>
<td>NYCT, BART</td>
</tr>
<tr>
<td>Community input into rehabilitated stations</td>
<td>NYCT</td>
</tr>
<tr>
<td>Off peak waiting areas</td>
<td>NYCT</td>
</tr>
<tr>
<td>Landscaping</td>
<td>LACMTA</td>
</tr>
<tr>
<td>Fencing</td>
<td>LACMTA</td>
</tr>
</tbody>
</table>

The list includes most of the design strategies recommended in transit security design manuals.
Most of these strategies are not controversial among transit security experts and design
professionals. In fact, the transit systems that have not implemented all of the design techniques
above are older systems which were constructed without concern about security. Almost all new
systems are constructed with these physical design principles in mind.
Another component of physical design and security involves the connections between the transit station and its larger community. To make transit passengers feel safe when traveling to and from the station it is important that the transit station be effectively physically integrated into the neighborhood community. The design of the station area should also take into account security during intermodal transfers and connections, especially park and ride lots which are often subject to crime.
Chapter 4

Evaluation and Comparison of the Case Study Systems

This chapter analyzes security data derived from the 1995 National Transit Database and evaluates and compares the case studies using this data and information from the key strategy areas.

Section 4.1 presents some important themes and insights to be gained from the security data in the National Transit Database. First the type and limitations of the data are discussed. Then the section presents the crime levels for the thirty largest transit systems, analyzes rail crime rates, and compares transit crime levels with metropolitan area crime levels. Lastly the statistical relationships between different types of crime occurring on the transit system are presented.

Section 4.2 presents an evaluation of the case studies based on data from the National Transit Database and from their actions with respect to each of the five areas discussed in Chapter 3. Table 4-6 summarizes the security programs of the case study agencies using 7 elements: actual crime data (where available) passenger perception, and each of the 5 quality of life areas discussed in Chapter 3. Then for each case study system, these elements are discussed in more depth.

4.1 National Transit Database: Themes and Results

In 1995, the federal government recognizing the need for transit agencies to collect security data by type of crime, by mode, by victim, and by location in the transit system required that this data be reported and included in the National Transit Database. As the data were required for the first time in 1995, they are just now available, may be subject to reporting errors, and do not yet allow for time series analyses.14 The way in which the Federal Transit Administration categorizes crime in the National Transit Database follows the Uniformed Crime Reporting (UCR) standards set up by the

14 Historically, transit agencies have needed time to adjust to the reporting requirements of the Federal Transit Administration and data from the early years are often subject to more reporting errors.
Federal Bureau of Investigation. State and local police forces also utilize UCR standards which categorize crime into Part I or Part II Crimes.

Part I Crime includes both violent and property crime:

- Violent crime includes homicide, forcible rape, robbery, aggravated assault.
- Property crime includes burglary, larceny theft, motor vehicle theft, and arson.

Part II crimes are minor crimes and include:

- Other assaults, vandalism, sex offenses, drug abuse violations, driving under the influence, drunkenness, disorderly conduct, fare evasion and violation of curfew and loitering laws.

Part II crimes are measured by the number of arrests made by the transit agency. In contrast, Part I crimes are measured by the number of crime reports the transit agency receives. This difference in measurement of Part I and Part II crimes is important. More Part II arrests may not mean more Part II crime on the system, but rather may reflect a transit agency with a more vigilant approach to Part II crimes.

Table 4-1 presents the total number of violent crimes, total number of Part I crimes, total number of Part II crimes, and the violent crime rate at the thirty largest transit agencies in the United States. The violent crime rate per million trips was calculated by dividing the annual number of violent crimes on the system by the annual number of passengers trips on the system. The median violent crime rate for the thirty agencies is 1.275 crimes per million passenger trips and the standard deviation is .897. Two agencies, Minneapolis St. Paul MCTO and BART, have significantly higher crime rates than the other agencies. This range in reported crime rates among transit agencies can be influenced by the following factors:
<table>
<thead>
<tr>
<th>Rank</th>
<th>Transit Agency</th>
<th>Total Violent Crimes</th>
<th>Total Part I Crimes</th>
<th>Total Part II Crimes</th>
<th>Total Crimes</th>
<th>Annual Unlinked Passenger Trips (in Million Unlinked 000's)</th>
<th>Violent Crime Per Million Unlinked Annual Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minneapolis-St. Paul MCTO</td>
<td>244</td>
<td>338</td>
<td>5135</td>
<td>5473</td>
<td>61109.9</td>
<td>3.99</td>
</tr>
<tr>
<td>2</td>
<td>San Francisco BART</td>
<td>242</td>
<td>3452</td>
<td>7389</td>
<td>10841</td>
<td>78673.6</td>
<td>3.08</td>
</tr>
<tr>
<td>3</td>
<td>Portland Tri-Met</td>
<td>124</td>
<td>488</td>
<td>16459</td>
<td>16947</td>
<td>64537.7</td>
<td>1.92</td>
</tr>
<tr>
<td>4</td>
<td>Port Authority-PATH</td>
<td>127</td>
<td>242</td>
<td>613</td>
<td>855</td>
<td>108468.2</td>
<td>1.85</td>
</tr>
<tr>
<td>5</td>
<td>Baltimore-MTA</td>
<td>201</td>
<td>493</td>
<td>179</td>
<td>672</td>
<td>108468.2</td>
<td>1.85</td>
</tr>
<tr>
<td>6</td>
<td>Oakland-AC Transit</td>
<td>107</td>
<td>186</td>
<td>347</td>
<td>533</td>
<td>61943.4</td>
<td>1.73</td>
</tr>
<tr>
<td>7</td>
<td>NY-MTA-Metro North</td>
<td>106</td>
<td>1117</td>
<td>496</td>
<td>1613</td>
<td>62649.8</td>
<td>1.69</td>
</tr>
<tr>
<td>8</td>
<td>Chicago-RTA-CTA</td>
<td>742</td>
<td>2262</td>
<td>12969</td>
<td>15231</td>
<td>442226.2</td>
<td>1.68</td>
</tr>
<tr>
<td>9</td>
<td>LA-OCTA</td>
<td>70</td>
<td>94</td>
<td>521</td>
<td>615</td>
<td>42187.6</td>
<td>1.66</td>
</tr>
<tr>
<td>10</td>
<td>LA-LACMTA</td>
<td>532</td>
<td>989</td>
<td>14483</td>
<td>15472</td>
<td>363318</td>
<td>1.46</td>
</tr>
<tr>
<td>11</td>
<td>Boston-MBTA</td>
<td>447</td>
<td>926</td>
<td>7093</td>
<td>8019</td>
<td>321885.4</td>
<td>1.39</td>
</tr>
<tr>
<td>12</td>
<td>Denver -RTD</td>
<td>93</td>
<td>141</td>
<td>353</td>
<td>494</td>
<td>67132.6</td>
<td>1.39</td>
</tr>
<tr>
<td>13</td>
<td>Philadelphia-SEPTA</td>
<td>421</td>
<td>1067</td>
<td>1192</td>
<td>2259</td>
<td>322248.4</td>
<td>1.31</td>
</tr>
<tr>
<td>14</td>
<td>Cleveland-RTA</td>
<td>72</td>
<td>182</td>
<td>146</td>
<td>328</td>
<td>58289.7</td>
<td>1.24</td>
</tr>
<tr>
<td>15</td>
<td>Miami-MDTA</td>
<td>91</td>
<td>417</td>
<td>8</td>
<td>425</td>
<td>80839.2</td>
<td>1.13</td>
</tr>
<tr>
<td>16</td>
<td>Atlanta-MARTA</td>
<td>161</td>
<td>1127</td>
<td>2128</td>
<td>3255</td>
<td>143674.6</td>
<td>1.12</td>
</tr>
<tr>
<td>17</td>
<td>Dallas-DART</td>
<td>50</td>
<td>253</td>
<td>1290</td>
<td>1543</td>
<td>44692.5</td>
<td>1.12</td>
</tr>
<tr>
<td>18</td>
<td>Pittsburgh-PAT</td>
<td>68</td>
<td>266</td>
<td>504</td>
<td>770</td>
<td>73549.2</td>
<td>0.92</td>
</tr>
<tr>
<td>19</td>
<td>New Jersey-NJTC</td>
<td>162</td>
<td>977</td>
<td>738</td>
<td>1715</td>
<td>188871.1</td>
<td>0.86</td>
</tr>
<tr>
<td>20</td>
<td>San Francisco-Muni</td>
<td>179</td>
<td>877</td>
<td>788</td>
<td>1665</td>
<td>216408.2</td>
<td>0.83</td>
</tr>
<tr>
<td>21</td>
<td>Washington-WMATA</td>
<td>184</td>
<td>1226</td>
<td>865</td>
<td>2091</td>
<td>345012.3</td>
<td>0.53</td>
</tr>
<tr>
<td>22</td>
<td>NY-MTA-LIRR</td>
<td>52</td>
<td>524</td>
<td>765</td>
<td>1289</td>
<td>97736.0</td>
<td>0.53</td>
</tr>
<tr>
<td>23</td>
<td>Chicago-RTA-Metra</td>
<td>28</td>
<td>290</td>
<td>299</td>
<td>589</td>
<td>64534.0</td>
<td>0.43</td>
</tr>
<tr>
<td>24</td>
<td>Houston-Metro</td>
<td>26</td>
<td>145</td>
<td>543</td>
<td>688</td>
<td>80457.2</td>
<td>0.32</td>
</tr>
<tr>
<td>25</td>
<td>Seattle-Metro</td>
<td>22</td>
<td>157</td>
<td>2310</td>
<td>2467</td>
<td>83503.4</td>
<td>0.26</td>
</tr>
<tr>
<td>26</td>
<td>Washington State</td>
<td>0</td>
<td>11</td>
<td>1</td>
<td>12</td>
<td>13354.4</td>
<td>0.00</td>
</tr>
</tbody>
</table>

1 Thirty largest transit agencies as defined by the 1994 National Transit Database. Due to lack of security data, New York City Transit Authority, Honolulu, New York Department of Transportation, and Santa Clara Transit Authority are not included.
2 Data from the 1995 National Transit Database
3 Violent Crimes include the following: Homicide, Forcible Rape, Robbery, Aggravated Assault
4 Violent Crimes and the following offenses: Larceny/Theft, Motor Vehicle Theft, Arson
5 Part II Crimes include Other assaults, vandalism, sex offenses, drug abuse violations, driving under the influence, drunkenness, disorderly conduct, fare evasion and violation of curfew and loitering laws.
Thus knowledge of a transit agency’s violent crime rate is not enough to indicate the effectiveness of a transit agency’s security policies and practices. More detailed statistical trend analysis and research is necessary to understand how these factors affect transit agency crime levels.

Table 4-2 presents the heavy rail crime rates for ten rail systems and demonstrates that the rate of violent crime occurring on heavy rail systems is higher than the rate of violent crime occurring on the overall system (See Figure 4-1). In contrast to the median system crime rate of 1.275 crimes per million passenger trip, the median crime rate for rail systems was 3.17 crimes per million passenger trip. Transit agencies also spend a disproportionate percentage of their resources arresting offenders of Part II crimes on heavy rail. In 1995, the percentage of Part II arrests that occurred on heavy rail were disproportionately higher than the percentage of heavy rail trips (See Figure 4-2).

Table 4-3 compares the crime rates of five transit agencies to the rate of crime in the metropolitan area. The units of measurement are different; transit agency crime rate is measured per million passenger trips, and metropolitan area crime rate is measured per 100,000 inhabitants. This difference in measurement makes it impossible to generalize about the crime rates in transit

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15 Researchers have done some work to determine why transit agency crime rates may be higher on rapid transit than on buses—underreporting of bus crime to the transit agency especially when walking or waiting for the bus is considered to be a primary factor. See the SEMCOG study 1979 and 1981 and Levine and Wachs, 1984 for more details.
### Table 4-2: Heavy Rail Crime Rates for Selected Transit Agencies in the United States

<table>
<thead>
<tr>
<th>Rank</th>
<th>Transit Agency</th>
<th>Total Violent Crimes</th>
<th>Total Part I Crimes</th>
<th>Total Part II Offense (Arrests)</th>
<th>Total Crimes</th>
<th>Annual Unlinked Passenger Trips</th>
<th>Violent Crime Per Million Unlinked Heavy Rail Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cleveland-RTA</td>
<td>49</td>
<td>98</td>
<td>56</td>
<td>154</td>
<td>6,949,400</td>
<td>7.05</td>
</tr>
<tr>
<td>2</td>
<td>Baltimore-MTA</td>
<td>54</td>
<td>253</td>
<td>46</td>
<td>299</td>
<td>10,556,500</td>
<td>5.12</td>
</tr>
<tr>
<td>3</td>
<td>Philadelphia SEPTA</td>
<td>394</td>
<td>914</td>
<td>1086</td>
<td>2000</td>
<td>86,611,300</td>
<td>4.55</td>
</tr>
<tr>
<td>4</td>
<td>Chicago-CTA</td>
<td>449</td>
<td>1608</td>
<td>12539</td>
<td>14147</td>
<td>135,461,600</td>
<td>3.31</td>
</tr>
<tr>
<td>5</td>
<td>San Francisco BART</td>
<td>242</td>
<td>3452</td>
<td>7389</td>
<td>10841</td>
<td>76,331,500</td>
<td>3.17</td>
</tr>
<tr>
<td>6</td>
<td>LA-LACMTA</td>
<td>44</td>
<td>268</td>
<td>0</td>
<td>268</td>
<td>14,204,000</td>
<td>3.10</td>
</tr>
<tr>
<td>7</td>
<td>Boston-MBTA</td>
<td>291</td>
<td>378</td>
<td>3491</td>
<td>3869</td>
<td>113,490,200</td>
<td>2.56</td>
</tr>
<tr>
<td>8</td>
<td>LA-LACMTA</td>
<td>13</td>
<td>24</td>
<td>1385</td>
<td>1409</td>
<td>5,887,700</td>
<td>2.21</td>
</tr>
<tr>
<td>9</td>
<td>Atlanta-MARTA</td>
<td>144</td>
<td>1046</td>
<td>1719</td>
<td>2765</td>
<td>70,351,000</td>
<td>2.05</td>
</tr>
<tr>
<td>10</td>
<td>Port Authority-PATH</td>
<td>127</td>
<td>242</td>
<td>613</td>
<td>855</td>
<td>64,734,200</td>
<td>1.96</td>
</tr>
<tr>
<td>11</td>
<td>Washington D.C.-WMATA</td>
<td>133</td>
<td>1108</td>
<td>745</td>
<td>1853</td>
<td>198,380,100</td>
<td>0.67</td>
</tr>
</tbody>
</table>

### Table 4-3: Comparison of Violent Crime on the Transit System With Violent Crime in the Metropolitan Area

<table>
<thead>
<tr>
<th>Transit Agency &amp; Metropolitan Area</th>
<th>All Modes Total Violent Crimes</th>
<th>Annual Unlinked Passenger Trips</th>
<th>Violent Crime Per Million Unlinked Annual Trips</th>
<th>Violent Crime Per 100,000 Inhabitants Metropolitan Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMATA, Washington D.C.</td>
<td>184</td>
<td>345,012,300</td>
<td>0.53</td>
<td>716.4</td>
</tr>
<tr>
<td>BART, San Francisco</td>
<td>242</td>
<td>78,673,600</td>
<td>3.08</td>
<td>884.3</td>
</tr>
<tr>
<td>LACMTA, Los Angeles</td>
<td>532</td>
<td>363,318,000</td>
<td>1.46</td>
<td>1422.6</td>
</tr>
<tr>
<td>SEPTA, Philadelphia</td>
<td>421</td>
<td>322,248,400</td>
<td>1.31</td>
<td>662.2</td>
</tr>
<tr>
<td>MBTA, Boston</td>
<td>447</td>
<td>321,885,400</td>
<td>1.39</td>
<td>644.6</td>
</tr>
</tbody>
</table>

1. Violent Crimes include the following: Homicide, Forcible Rape, Robbery, Aggravated Assault
2. Data from 1995 National Transit Database
3. 1995 FBI Crime Index Data, except for SEPTA which uses 1993 FBI Crime Index Data
Figure 4-1: Comparison of 1995 Violent Crime Rates on Heavy Rail and on the Entire Transit System

<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>Violent Crime Per Million Heavy Rail Trips</th>
<th>Violent Crime Per Million Trips Systemwide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleveland RTA</td>
<td>7.0</td>
<td>7.0</td>
</tr>
<tr>
<td>Baltimore MTA</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Philadelphia SEPTA</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Chicago CTA</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>San Francisco BART</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Miami-Dade MTD</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Boston MBTA</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>LA LACTMA</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Port Authority PATH</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Atlanta MARTA</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Washington D.C.</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Figure 4-2: Part II Arrests at Transit Agencies in 1995

<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>% of Total Part II Arrests that occurred on Heavy Rail</th>
<th>% of Total Trips taken on Heavy Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleveland RTA</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Baltimore MTA</td>
<td>90%</td>
<td>90%</td>
</tr>
<tr>
<td>Philadelphia SEPTA</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>Chicago CTA</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>San Francisco BART</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Miami-MD</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Boston MBTA</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>LA LACTMA</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>Port Authority PATH</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Atlanta MARTA</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Washington WMATA</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

64
agencies as compared to the crime rate on metropolitan streets. These data are included in order to provide additional information about crime rates within the transit agencies' metropolitan areas.

Due to the emphasis that transit agencies place on heavy rail and the importance of quality of life crime on heavy rail systems, a scatterplot was created to investigate whether there is a correlation between the rate of Part I crimes reported to occur on the system and the rate of Part II arrests made by the transit agency. As Part II arrests are closely linked to quality of life offenses, more Part II arrests may be a result of transit agencies cracking down on the disorder of the system. Does this cracking down on disorder result in decreasing the amount serious crimes in the transit system?

As Figure 4-3 demonstrates, there is no systematic relationship between the rate of Part II Arrests occurring on the system and the rate of Part I Crimes reported on the system. The lack of an inverse linear relationship between Part I Crimes and Part II crimes does not necessarily mean that no link between disorder and crime exists. Several reasons can contribute to the results in Figure 4-3. This chart does not measure the same agency, before or after a crack down occurred, but instead presents a cross sectional analysis for thirty different agencies at the same point in time. Moreover, transit agencies which are more prone to Part I crimes may be more prone to Part II crimes due to external factors, such as city characteristics, the age of the system, etc.

In addition Figure 4-3 illustrates that most of the transit agencies are clustered in the lower left hand corner of the graph with a low rate of Part II arrests. However there are a few outliers which demonstrate that there is a large variance in the amount of Part II Arrests. Part of this variance may be explained by the way in which transit agencies crack down on fare evasion. For example, most of the Part II Arrests at BART and LACMTA were due to emphasis on fare evasion. As Tables 4-4 and 4-5 illustrate, the variation in the rate of Part II arrests per passenger trip decreases when fare evasion is not included as a Part II offense.
Table 4-4: Part II Arrest Rates at Selected Transit Agencies\(^1,2\)

<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>All Modes Total Part II Crimes</th>
<th>Annual Unlinked Passenger Trips</th>
<th>Part II Crime Per Million Unlinked Annual Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMATA</td>
<td>865</td>
<td>345,012,300</td>
<td>2.51</td>
</tr>
<tr>
<td>BART(^3)</td>
<td>7389</td>
<td>78,673,600</td>
<td>93.92</td>
</tr>
<tr>
<td>LACMTA(^4)</td>
<td>14483</td>
<td>363,318,000</td>
<td>39.86</td>
</tr>
<tr>
<td>SEPTA</td>
<td>1192</td>
<td>322,248,400</td>
<td>3.70</td>
</tr>
<tr>
<td>MBTA</td>
<td>7093</td>
<td>321,885,400</td>
<td>22.04</td>
</tr>
</tbody>
</table>

\(^1\) Part II Crimes include the following: Other Assaults, Vandalism, Sex Offenses, Drug Abuse Violations, Driving Under the Influence, Drunkenness, Disorderly Conduct, Trespassing, Fare Evasion, Curfew and Loitering Laws

\(^2\) Data from the 1995 National Transit Database

\(^3\) 93\% of BART's Part II Offenses are for Fare Evasion

\(^4\) 87\% of LACMTA's Part II Offenses are for Fare Evasion

Table 4-5: Part II Arrest Rates (without fare evasion) at Selected Transit Agencies\(^1,2\)

<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>All Modes Total Part II Arrests without Fare evasion</th>
<th>Annual Unlinked Passenger Trips</th>
<th>Part II Arrests w/out Fare Evasion Per Million Unlinked Annual Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMATA</td>
<td>773</td>
<td>345,012,300</td>
<td>2.24</td>
</tr>
<tr>
<td>BART(^3)</td>
<td>1297</td>
<td>78,673,600</td>
<td>16.49</td>
</tr>
<tr>
<td>LACMTA(^4)</td>
<td>4921</td>
<td>363,318,000</td>
<td>13.54</td>
</tr>
<tr>
<td>SEPTA</td>
<td>928</td>
<td>322,248,400</td>
<td>2.88</td>
</tr>
<tr>
<td>MBTA</td>
<td>6996</td>
<td>321,885,400</td>
<td>21.73</td>
</tr>
</tbody>
</table>

\(^1\) Part II Crimes include the following: Other Assaults, Vandalism, Sex Offenses, Drug Abuse Violations, Driving Under the Influence, Drunkenness, Disorderly Conduct, Trespassing, Fare Evasion, Curfew and Loitering Laws

\(^2\) Data from the 1995 National Transit Database

Figure 4-4 illustrates that there is no significant systematic relationship between the rate of property crime and the rate of violent crime among transit agencies in the United States. In general the graph displays a clustering of points in the lower left hand portion and demonstrates that transit agencies have similar rates of property crime but differing rates of violent crime. In addition, the figure illustrates that there are outliers with high rates of violent crime and one agency with a high rate of property crime and violent crime.
Figure 4-3: The Relationship between Part I and Part II Crimes (for the thirty largest U.S. Transit Agencies)

Figure 4-4: The Relationship between Property Crime and Violent Crime (for the thirty largest U.S. Transit Agencies)
4.2 Evaluation of the Case Studies

This section briefly evaluates each of the case studies and explains how the system’s crime statistics compare with other transit agencies, discusses the results of passenger perception surveys that the transit agencies have collected, comments on the actions of the transit agencies in each of the five key areas where appropriate, and explains the overall transit security program for the system. As each of the case study agencies use different measures to assess passenger perception (as evidenced in Table 4-6), these results are not directly comparable. Crime statistics and approaches to each of the five areas may also differ due to the nature and design of the system. In general, however, all of the five case study agencies have worked hard to create a secure transit system and passengers have favorable (or improved) perceptions of security on the system.

While this assessment strategy for the case studies is not ideal, it does recognize that transit agencies often do not collect the security data needed to conduct a comprehensive analysis of existing or alternative security programs or policies. The deficiency in program and policy evaluation occurs, in part, because data collection is time consuming, expensive, and may not be a priority for the transit agency. In contrast, an ideal assessment strategy would analyze the ability of the transit agency to achieve the following five objectives:

1) Reducing Actual Crime
2) Improving Passenger Perception
3) Maintaining System Wide Employee Support
4) Encouraging Broad Community Support
5) Achieving High Cost Effectiveness.

An analysis of each of these objectives would enable transit agencies to evaluate a security program or strategy. Appendix 4 describes techniques and problems in evaluating each of these objectives.
Table 4-6 compares the crime statistics, passenger perceptions, security costs per passenger, and actions in the five quality of life security areas of each of the case studies. Each of the agencies received either a minus, zero, or a plus for their actions in each of the five quality of life security areas. In general if the agencies followed a well thought out approach that appears to be effective, they received a plus. If their strategies were not as well thought out they received a zero. Finally if the agencies had a strategy that was not carefully constructed, appeared to be ineffective, or did not have enough resources to deal adequately with the problem they received a minus. Tables 4-6, 4-7 and 4-8 present the security costs of the transit agencies. In Table 4-6 two cost numbers are calculated:

\[
\text{Total Security Cost Per Passenger Trip: } \frac{\text{Total Number of Passenger Trips}}{\text{Total cost of security}}
\]

\[
\text{Rail Security Cost Per Passenger Trip: } \frac{\text{Total Number of Heavy + Light Rail}}{\text{Total cost of security}}
\]

The rail security cost numbers make the worst case assumption that all of the transit agency’s security costs are due to the agency’s rail system. This rail cost was calculated in the absence of disaggregated cost data from the transit agencies. While transit agencies do spend money on bus security it is not uncommon for transit agencies to focus a large percentage of their resources on rail security. Note that these security costs include only security personnel and do not include the costs of station agents and maintenance workers who also fulfill security functions.

Tables 4-7 and 4-8 also present the total amount the case study agencies are spending on transit security. Annual personnel security costs range from $8 million to $33 million. Table 4-7 assumes that the security budget is spread evenly throughout the transit agency. Table 4-8 assumes that the security budget is concentrated on light and heavy rail. Again Table 4-8 serves as an upper bound of rail security expenditures, as actual data on rail security costs were not available. Two other agencies, MBTA and SEPTA have been added for comparison purposes. The tables also calculate the percentage of operating budget the transit agencies spend on transit security. This percentage ranges from 1% to 7% in Table 4-7 and from 6% to 70% in Table 4-8.
<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>Actual Heavy Rail Crime Rate in 1995</th>
<th>Total Security Cost per Passenger Trip</th>
<th>Rail Security Cost per Passenger Trip</th>
<th>Passenger Perception</th>
<th>Ordinances</th>
<th>CCTV</th>
<th>Concessions</th>
<th>Management</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMATA</td>
<td>.65 per million passenger trips</td>
<td>.06</td>
<td>.11</td>
<td>Not a concern in survey</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>NYCT</td>
<td>Decreased significantly in last few years</td>
<td>N/A</td>
<td>N/A</td>
<td>Security #1 deterrent to off-peak ridership</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>BART</td>
<td>3.17 per million passenger trips</td>
<td>.21</td>
<td>.22</td>
<td>57% of riders felt crime on BART had stayed the same, 23% felt crime had increased</td>
<td>0</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>LACMTA</td>
<td>2.38 per million passenger trips</td>
<td>.10</td>
<td>1.95</td>
<td>In the latest survey 75% of all passengers satisfied with security on the system</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Metrovia</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
<td>+</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

---

16 Assumes a worst case scenario by putting all of the security budget towards light and heavy rail
### Table 4-7: Security Costs at Selected Transit Agencies

<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>Budget-Security Personnel</th>
<th>Budget -Security Equipment</th>
<th>Operating Budget</th>
<th>Security as % of Operating Budget</th>
<th>Annual Unlinked Passenger Trips</th>
<th>Security Cost Per Annual Unlinked Passenger Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMATA</td>
<td>$ 21,266,200</td>
<td>$ 919,200</td>
<td>$677,321,233</td>
<td>3%</td>
<td>345,012,300</td>
<td>$ 0.06</td>
</tr>
<tr>
<td>BART</td>
<td>$ 16,000,000</td>
<td>$ 575,000</td>
<td>$217,425,724</td>
<td>7%</td>
<td>78,673,600</td>
<td>$ 0.21</td>
</tr>
<tr>
<td>LACMTA</td>
<td>$ 33,000,000</td>
<td>$ 2,000,000</td>
<td>$717,418,906</td>
<td>5%</td>
<td>363,318,000</td>
<td>$ 0.10</td>
</tr>
<tr>
<td>SEPTA</td>
<td>$ 12,210,175</td>
<td>$ 110,000</td>
<td>$659,252,795</td>
<td>2%</td>
<td>322,248,400</td>
<td>$ 0.04</td>
</tr>
<tr>
<td>MBTA</td>
<td>$ 8,480,372</td>
<td>$ 633,372</td>
<td>$742,149,248</td>
<td>1%</td>
<td>321,885,400</td>
<td>$ 0.03</td>
</tr>
</tbody>
</table>

1 Data from 1996 TRB Survey
2 Data from 1995 National Transit Database

### Table 4-8: Heavy and Light Rail Security Costs at Selected Transit Agencies

<table>
<thead>
<tr>
<th>Transit Agency</th>
<th>Budget-Security Personnel</th>
<th>Budget -Security Equipment</th>
<th>Operating Budget (Light &amp; Heavy Rail)</th>
<th>Security as % of Light and Heavy Rail Budget</th>
<th>Annual Passenger Trips on Heavy + Light Rail</th>
<th>Security Cost Per Annual Unlinked Passenger Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMATA</td>
<td>$ 21,266,200</td>
<td>$ 919,200</td>
<td>$341,426,200</td>
<td>6%</td>
<td>198,380,100</td>
<td>$ 0.11</td>
</tr>
<tr>
<td>BART</td>
<td>$ 16,000,000</td>
<td>$ 575,000</td>
<td>$211,042,600</td>
<td>8%</td>
<td>76,331,500</td>
<td>$ 0.22</td>
</tr>
<tr>
<td>LACMTA</td>
<td>$ 33,000,000</td>
<td>$ 2,000,000</td>
<td>$50,053,700</td>
<td>70%</td>
<td>17,914,300</td>
<td>$ 1.95</td>
</tr>
<tr>
<td>SEPTA</td>
<td>$ 12,210,175</td>
<td>$ 110,000</td>
<td>$168,194,600</td>
<td>7%</td>
<td>124,676,800</td>
<td>$ 0.10</td>
</tr>
<tr>
<td>MBTA</td>
<td>$ 8,480,372</td>
<td>$ 633,372</td>
<td>$155,836,000</td>
<td>6%</td>
<td>185,009,300</td>
<td>$ 0.05</td>
</tr>
</tbody>
</table>

1 Data from 1996 TRB Survey
2 Data from 1995 National Transit Database
3 Assumes all security budget goes towards heavy and light rail
Metrorail has one of the most successful transit security programs in the country as it has one of the lowest crime rates of any subway system in the nation. Nancy LaVigne compared the crime rates of Metro to the crime rates of three other systems and found that Metrorail's mean crime rate at 1.7 per million riders is significantly lower than the subway crime rates of Boston, Atlanta and Chicago.  

The 1995 National Transit Database illustrates that Metrorail had the lowest violent crime rate in comparison to other heavy rail systems and WMATA had one of the lowest violent crime rates in comparison to other large transit agencies (See Tables 4-1 and 4-2). In 1995 over 50% of WMATA's violent crime occurred in the station area (Table 4-9). However 73% of WMATA's property crime in 1995 occurred at other transit property, which is explained in part by the parking spaces and commuter parking lots in the WMATA system. WMATA had a low number of Part II Arrests compared to other transit agencies and to the number of Part I Arrests occurring in the system. In 1995, 88.7% of the victims of violent and property crime were passengers.

<table>
<thead>
<tr>
<th>Type of Crime</th>
<th>In Station</th>
<th>In-Vehicle</th>
<th>Other Transit Property</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent Crime</td>
<td>74</td>
<td>19</td>
<td>40</td>
<td>133</td>
</tr>
<tr>
<td>Property Crime</td>
<td>169</td>
<td>91</td>
<td>715</td>
<td>975</td>
</tr>
<tr>
<td>Part II Crime</td>
<td>613</td>
<td>40</td>
<td>92</td>
<td>745</td>
</tr>
<tr>
<td><strong>Total Crime</strong></td>
<td><strong>856</strong></td>
<td><strong>150</strong></td>
<td><strong>847</strong></td>
<td><strong>1853</strong></td>
</tr>
</tbody>
</table>

*Data from 1995 National Transit Database

<table>
<thead>
<tr>
<th>Type of Crime</th>
<th>Patrons</th>
<th>Employees</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent Crime</td>
<td>121</td>
<td>12</td>
<td>0</td>
<td>133</td>
</tr>
<tr>
<td>Property Crime</td>
<td>862</td>
<td>92</td>
<td>21</td>
<td>975</td>
</tr>
<tr>
<td>Part II Crime</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>745</td>
</tr>
<tr>
<td><strong>Total Crime</strong></td>
<td><strong>983</strong></td>
<td><strong>104</strong></td>
<td><strong>21</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Data from 1995 National Transit Database

17 There is speculation that WMATA's low crime rate is due to the low levels of crime in the neighborhoods traveled by WMATA. This type of analysis was not the focus of this paper. However Nancy LaVigne did an analysis that compared crime on Metrorail before and after the opening of the Green Line, which serves neighborhoods with lower income and higher unemployment than the other Metrorail lines. She found that crime rates did not change dramatically with the opening of the Green Line.

18 Heavy rail refers to subway and elevated systems, as does not include light rail or commuter rail statistics.
Metrorail passengers do not consider security a problem. The new General Manager recently had passengers fill out survey cards to indicate their concerns about the system and passengers did not list security as a major concern (Hanson, 1997).

WMATA spent $22 million on security in 1995. These security costs are in line with other transit agencies. To repeat WMATA’s major security policies include the following:

<table>
<thead>
<tr>
<th>Table 4-11: WMATA Security Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology and Labor Practices</strong></td>
</tr>
<tr>
<td>• Communications System</td>
</tr>
<tr>
<td>• Closed Circuit TV</td>
</tr>
<tr>
<td>• Call Boxes &amp; Hot Lines</td>
</tr>
<tr>
<td>• Zero Tolerance Policing</td>
</tr>
<tr>
<td>• Station Attendants</td>
</tr>
<tr>
<td>• Aggressive Maintenance</td>
</tr>
<tr>
<td><strong>Physical Design Characteristics</strong></td>
</tr>
<tr>
<td>• Long Platforms</td>
</tr>
<tr>
<td>• High Ceilings</td>
</tr>
<tr>
<td>• No Winding Passage Ways (where possible)</td>
</tr>
<tr>
<td>• No Public Bathrooms</td>
</tr>
<tr>
<td>• Graffiti Resistant Design &amp; Materials</td>
</tr>
<tr>
<td>• Attention to Lighting</td>
</tr>
</tbody>
</table>

In summary, WMATA has an overall transit security program that is very effective based on a combination of strategies that work well together.

4.2.2 NYCT

The merger of the transit police and the NYPD makes it impossible to separate the techniques and practices of the transit police from those of the New York City police, and to analyze the costs of transit security and transit crime separately. Thus NYCT crime statistics were not part of the 1995 National Transit Database.

The New York City and the New York Transit authority have both experienced massive decreases in crime since quality of life initiatives were launched. Between 1990 and 1995, robberies and felonies on the New York City Subway decreased 75% and 64% respectively (Kelling & Coles, 1996, p. 164).
Security on the NYCT subway during off peak hours still remains a serious concern for many passengers although this fact does not mean that NYCT security policies have not been successful. Without comparisons to passenger perceptions before the quality of life initiatives were launched, NYCT cannot measure improvements in passenger perceptions. NYCT realizes that security is still a problem however and is continually developing policies to make people feel safer on the subway during off peak hours.

Table 4-12 recaps NYCT's major security strategies:

<table>
<thead>
<tr>
<th>Technology and Labor Practices</th>
<th>Physical Design Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merged with NYPD</td>
<td>Community Input to Rehabilitation of old stations</td>
</tr>
<tr>
<td>Station Manager</td>
<td>Ability to close cul de sacs and selected exits and entrances</td>
</tr>
<tr>
<td>Systemwide Approach</td>
<td></td>
</tr>
<tr>
<td>Attack on Quality of Life Offenses</td>
<td></td>
</tr>
<tr>
<td>Strong Maintenance Efforts</td>
<td></td>
</tr>
<tr>
<td>Extensive Market Research</td>
<td></td>
</tr>
</tbody>
</table>

NYCT has well thought out policies in each of the five quality of life areas discussed in the previous chapter. Given the limitations they face due to the size, age, and complexity of the system, NYCT has managed to develop successful strategies and policies that suit their needs. Overall, NYCT has managed to develop a security package that works satisfactorily.

4.2.3 BART

In 1995 compared to crime rates at other rail transit agencies, BART ranked in the middle with a violent crime rate of 3.17 violent crimes per million unlinked passenger trips (see Table 4-2). BART's large amount of property crime (a total of 3,210) is due in part to the large number of parking spaces (and stolen cars) in the system. BART ranked second of the twenty-six agencies in total rate of violent crime occurring in the system overall (see Table 4-1).
Table 4-13: BART Crime by Type and Location

<table>
<thead>
<tr>
<th>Type of Crime</th>
<th>In Station</th>
<th>In-Vehicle</th>
<th>Other Transit Property</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent Crime</td>
<td>127</td>
<td>32</td>
<td>83</td>
<td>242</td>
</tr>
<tr>
<td>Property Crime</td>
<td>583</td>
<td>278</td>
<td>2349</td>
<td>3210</td>
</tr>
<tr>
<td>Part II Crime</td>
<td>6895</td>
<td>226</td>
<td>266</td>
<td>7389</td>
</tr>
<tr>
<td><strong>Total Crime</strong></td>
<td><strong>7605</strong></td>
<td><strong>538</strong></td>
<td><strong>2698</strong></td>
<td><strong>10841</strong></td>
</tr>
</tbody>
</table>

1 Data from 1995 National Transit Database

Over 50% of BART’s violent crime occurred in the station area (Table 4-13). However 73% of BART’s property crime in 1995 occurred at other transit property, which is explained in part by the large number of parking spaces and commuter parking lots in the BART’s system. Approximately 29% of the property crime occurring in BART’s parking lots is due to motor vehicle theft. BART also had a large number of Part II Arrests, a large percentage (93%) of these arrests were for fare evasion. In 1995 almost all (98.5%) victims of violent and property crime were passengers (Table 4-14).

Table 4-14: BART Crime by Type and Victim

<table>
<thead>
<tr>
<th>Type of Crime</th>
<th>Patrons</th>
<th>Employees</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent Crime</td>
<td>241</td>
<td>1</td>
<td>0</td>
<td>242</td>
</tr>
<tr>
<td>Property Crime</td>
<td>1926</td>
<td>22</td>
<td>10</td>
<td>1958</td>
</tr>
<tr>
<td>Part II Crime</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>7389</td>
</tr>
<tr>
<td><strong>Total Crime</strong></td>
<td><strong>2167</strong></td>
<td><strong>23</strong></td>
<td><strong>10</strong></td>
<td><strong>7389</strong></td>
</tr>
</tbody>
</table>

1 Data from 1995 National Transit Database

The 1995 Crime Perception Survey Highlights conducted by BART include the following:

57% of the surveyed riders felt that crime on the BART system stayed the same, 23% felt that crime had increased, and 5% felt that crime on BART had decreased.

Most customers felt very/somewhat safe using BART, but they felt less safe in parking lots or outside the stations. Women and night riders are somewhat less likely to feel very safe on the trains than men. For example, 22% of those using bus stops/waiting areas felt somewhat/very at risk, 30% of the night riders felt somewhat/very at risk, and 22% of those using parking lots/garages felt somewhat/very at risk.
While 90% of all BART rider felt very/somewhat safe when on BART in the daylight areas; this percentage dropped to 40% after dark. Interestingly BART riders felt safer in their neighborhoods at night (73% of those surveyed felt very/somewhat safe) than on the system.

In 1995 BART spent $65 million or 7% of its operating budget on security. Even assuming that other transit agencies spend all their security budget for security on heavy and light rail, BART still outspends all the other transit agencies, except for LACMTA. (See Tables 4-7 and 4-8).

Table 4-15 repeats BART’s major security policies.

<table>
<thead>
<tr>
<th>Table 4-15: BART Security Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology and Labor Practices</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>• Communications System</td>
</tr>
<tr>
<td>• Call boxes and CCTV at Parking</td>
</tr>
<tr>
<td>Areas and (occasionally) in</td>
</tr>
<tr>
<td>vehicles</td>
</tr>
<tr>
<td>• Zone Policing</td>
</tr>
<tr>
<td>• Attention to Quality of Life</td>
</tr>
<tr>
<td>• Offenses</td>
</tr>
<tr>
<td>• Community Service Attendants</td>
</tr>
<tr>
<td>• Community Partnerships</td>
</tr>
<tr>
<td>• Strong Maintenance Efforts</td>
</tr>
</tbody>
</table>

The physical design and structure of the BART system may help in part to explain the higher crime rates of the BART system and passenger perceptions of security. Higher crime rates exist both on heavy rail and in large commuter parking lots. These factors, however, do not completely explain the high crime rate, high rate of security spending and the mixed passenger perceptions of security on the system. Furthermore transit agencies need to develop security practices and policies that match the problems and physical design of their system. BART in the past two years has continued to implement security improvements to enhance the security of the BART system, especially at their Park and Ride lots. Unfortunately, the crime statistics for 1996 and 1997 are not available and the latest survey is almost two years old. These statistics might shed light on whether BART’s security enhancement program has been effective.
4.2.4 LACMTA

In comparison to other heavy rail systems, Los Angeles has a relatively low crime rate of 2.56 violent crime per million heavy rail trips. While the total number of crimes occurring on the Red Line in 1995 was low, (only 13), the Red Line does not travel very far or carry many passengers (See Table 4-2). In comparison with other large transit systems, Los Angeles has a relatively high crime rate per million unlinked annual passenger trips (See Table 4-1). However the high crime rate of the Los Angeles metropolitan area and the alignment of the Red and Blue Lines through some of LA's most crime ridden neighborhoods may contribute to this higher crime rate (See Table 4-3).

Table 4-16: LACMTA's Heavy Rail System Crime by Type and Location

<table>
<thead>
<tr>
<th>Type of Crime</th>
<th>In Station</th>
<th>In-Vehicle</th>
<th>Other Transit Property</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent Crime</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Property Crime</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Part II Arrests</td>
<td>1100</td>
<td>285</td>
<td>0</td>
<td>1385</td>
</tr>
<tr>
<td><strong>Total Crime</strong></td>
<td><strong>1117</strong></td>
<td><strong>291</strong></td>
<td><strong>1</strong></td>
<td><strong>1408</strong></td>
</tr>
</tbody>
</table>

Data from 1995 National Transit Database

Table 4-16 demonstrates that a high percentage (77%) of LACMTA's heavy rail crime occurred in the station area, with less crime occurring in the vehicle or on other transit property. The small amount of Part I crime which occurs predominantly in the station area is due to the fact that the Red Line is only 4.4 miles long and does not have any large commuter parking lots. Los Angeles has a large number of Part II Arrests; most for fare evasion.

Like most transit agencies, LACMTA also conducts market research and customer satisfaction surveys; the latest survey conducted in July 1995, showed that 75% of passengers were satisfied with safety on the system (Conte, 1997).

Transit security spending at LACMTA for 1996 totaled $35 million. This amount is 5% of LACMTA's operating budget and in line with the percentage of security spending at other transit agencies (Table 4-7). However this amount was 70% of the 1995 operating expenses for heavy
rail and light rail. (Table 4-8). While LACMTA is certainly not spending all of its security budget on heavy and light rail, the RTD completed a study in which it estimated that $1.25 is spent on security for each Blue Line rider but only 3c is spent on security for each bus passenger (Zamichon, 1992, p. B3).

Table 4-17 summarizes LACMTA’s major security strategies.

<table>
<thead>
<tr>
<th>Technology and Labor Practices</th>
<th>Physical Design Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Communications System</td>
<td>• Barrier Free System</td>
</tr>
<tr>
<td>• Closed Circuit TV</td>
<td>• Landscaping</td>
</tr>
<tr>
<td>• Call Boxes</td>
<td>• Fencing</td>
</tr>
<tr>
<td>• Sensors</td>
<td>• Adequate Lighting</td>
</tr>
<tr>
<td>• Attention to Quality of Life</td>
<td>• Graffiti Resistant Design &amp;</td>
</tr>
<tr>
<td>Offenses</td>
<td>Materials</td>
</tr>
<tr>
<td>• Matching number of police at</td>
<td></td>
</tr>
<tr>
<td>specific stations to crime</td>
<td></td>
</tr>
<tr>
<td>rates at station</td>
<td></td>
</tr>
</tbody>
</table>

Los Angeles’ approach to security is different from some of the other transit agencies as it relies heavily on the use of police forces and does not utilize other personnel in the station area. While security costs incorporate a significantly larger percentage of LACMTA’s rail operating costs than security costs at other transit agencies, LACMTA’s total operating costs for light and heavy rail are also significantly lower than other transit agencies. The crime statistics and passenger perception surveys demonstrate that the security package on the LACMTA system does not necessarily lead to higher rates of crime.

4.2.5 Metrovias

Newspaper articles about the Metrovias system demonstrate a general consensus that crime has been reduced over time. Unfortunately, not enough information is available to evaluate and compare the Metrovias system to the other case studies. Available information suggests that security on the Metrovías system has improved since privatization and that the overall package of security is effective.
Chapter 5 discusses transit security in the context of San Juan, Puerto Rico. First an understanding of crime and security in San Juan with respect to the Tren Urbano system is presented. Then Section 5.2 explains the way in which Tren Urbano’s procurement strategy affects the design and development of its security program. The third section compares the contract requirements of the Tren Urbano with my recommendations for quality of life security strategies. Lastly an evaluation process for the Tren Urbano system is suggested and conclusions on Tren Urbano’s security program are drawn.

5.1 Understanding the San Juan Metropolitan Area

The population of the San Juan Metropolitan Area (SJMA) of Puerto Rico is about 1.1 million people, and the region is facing severe problems of traffic congestion and suburban sprawl. Due to the difficulty of traveling in the region and the desire for urban revitalization of the San Juan Metropolitan area, policy makers and governmental officials have decided to invest in the construction of “Tren Urbano”. Phase I of Tren Urbano is currently under construction and will consist of 11.8 mile heavy rail line that extends from Bayamon (an outlying municipality) to Sagrado Corazon in San Juan. It is hoped that there will be subsequent expansions to create a comprehensive rail system including Carolina, the airport, and Old San Juan.

Building a transit system in Puerto Rico raises many security concerns for potential transit travelers as the SJMA faces problems in crime and security. Crime and crime prevention in Puerto Rico and San Juan are serious issues that receive serious political attention. For example, the recently elected mayor of San Juan, Sila Maria Calderon, focused on crime in the 1996 election and promised to increase the San Juan police force from 800 to 1,000 officers (Associated Press, 1997, p. M4). Governor Rossello, the governor of Puerto Rico, spent his first four years of office (1992-1996) combating the problem of crime, and he is continuing these initiatives in his second term. He conducted many sweeps of public housing projects to clear out drug dealers. The governor also increased the police force of Puerto Rico from 10,500 officers to 17,400 officers—the second largest
force in the United States and police funding has consequently increased from $265 million to $434 million (Curtis and Leusner, 1996, p. A1).

In addition, in 1996, Puerto Rico had one of the highest homicide rates in the United States. Most of the 869 homicides in 1996 occurred in the San Juan Metropolitan Area and were drug related. Puerto Rico serves as a route for heroin and cocaine leaving South America to enter the United States. While other types of crime in Puerto Rico have declined in the past four years, the number of homicides has not decreased (Associated Press, 1997, p. A4).

Due in part to the high rate of drug trafficking and the resulting crime, San Juan has developed into an urban landscape of gated communities and highly visible police. Henry Pierson Curtis and Jim Leusner write, “Steels fences and razor wires separate once-gracious neighborhoods from the street. Iron bars guard most doors and windows … Wrought iron window grilles are traditional to Puerto Rican architecture but not the new steel bars, security systems and gated communities appearing everywhere.” (1996, p.A1)

Public opinion surveys and focus groups have demonstrated the concern that residents of San Juan and Puerto Rico feel towards crime and security. Drug shoot-outs and homicides attract widespread attention on radio talks show and in newspapers. In addition in series of interviews conducted in Puerto Rico, residents cited drugs and crime as the primary factors causing Puerto Rico’s middle class residents to move to the mainland United States (Curtis and Leusner, 1996, p. A1).

Not surprisingly, Alan Hoffman who conducted focus groups on the perception of transit in San Juan, found many participants expressing concern about security when traveling. He writes, “There can be no question that the fear of assault is one of the primary motivating factors influencing decisions as to urban form, transportation choice, and even choice of activities within the San Juan Metropolitan Area (1996, p. 93).”
As part of these focus groups, Hoffman also asked participants "What makes a place feel safe?"
He received similar responses from all of the different groups he interviewed. Factors essential to
feeling safe include:

- Plenty of people in the area
- Well lit
- Clean
- Many escape routes
- Police; other guards

He also showed participants photographs of a subway and elevated stations and participants
voiced their security concerns such as "Fear" and "Unsafe if only a few people". One participant
mentioned the possibility of concessions as enhancing the area—"Well, if they put shopping there. (1996, pp. 85-87)."

Community security concerns for Tren Urbano gathered by questionnaires and public meetings at
various station sites include the following:

- Drug Dealing and Gang Activities
- Assault and Battery
- Armed Robbery
- Arson
- Petty theft
- Stalking or Harassment of Patrons and Staff
- Vagrancy and Solicitation
- Use of Facilities by Transients
- Lost Revenue due to Fare Evasion
- Vandalism of Facilities and Vehicles
- Riding motorcycles or horses in guideway
- Flight from illegal activities

Source: Carlos Campillo, Security, Tren Urbano Office

These concerns demonstrate that security and security planning must play an important role in the
design and construction of Tren Urbano.
5.2 Procurement Strategy for Tren Urbano

This section will discuss the role that the procurement strategy will play in the security design and operations of the Tren Urbano system.

The Tren Urbano system, like all transit systems, needs to address the security concerns of its passengers in the physical design as well as in items of labor and management policies to create a secure transit system. However, the Tren Urbano system is being designed and constructed, and will be operated in a different manner from most transit systems in the United States. As an “FTA Turnkey Demonstration Project” the final design, construction and operation of the Tren Urbano system is being contracted out to a consortium. This consortium will finish designing the system, construct, and operate the system for five years (minimum) under the supervision of the government, in this case the Puerto Rico Highway and Transportation Authority (PRHTA). The PRHTA has created a Tren Urbano office and a group of consultants, the General Management, Architecture and Engineering Consultants (GMAEC) to represent the government in this process. The PRHTA awarded the primary contract for the Tren Urbano system to the Seimens Transportation Partnership Puerto Rico, S.E.

The Tren Urbano system is a split turnkey, because while one franchise group, Seimens, is in charge of much of the systems work (the vehicles, the yards, shops, two stations, and the operations of the system), much of the civil engineering work has been "split" into six other contracts. The role of the Seimens consortium is defined in a very detailed and extensive document know as the Systems and Test Track Turnkey (STTT) contract.

The use of a split turnkey method has some larger implications for transit security and management. The government of Puerto Rico decided on a turnkey approach in part because they wanted to speed up the delivery process of the system. The turnkey process has succeeded in accomplishing this goal as the time between the approval of the Final Environmental Impact Statement and the awarding of the STTT contract was less than one year. In addition, turnkey contracts allow for an integrated systems approach and delivery of the design and operation of the
system. This approach should create a strong relationship between the physical design of the system and the security operations of the system.

The STTT contract was supposed to be based on 30% of the design and leave final design decisions in play. Some of the physical designs have been developed past 30% as a method to demonstrate the level of quality required by the contractor. These physical specifications can be changed by negotiations between the contractor and the government. To achieve a synergy between design decisions and security operations the contractor and the Authority need to engage in an iterative process. Furthermore, for the security design initiatives to be effective, the smaller civil contracts need to coordinate their work with the STTT contract to ensure that these security designs are being implemented consistently.

In addition, there appears to be no direct incentive in the contract for the contractor to promote security once the system is in operation. While security manuals will be necessary before revenue operations begin, there is no penalty for not ensuring the security of the system. Other factors, such as on-time performance standards, may result in a penalty if they are not met.

However, the STTT contract does emphasize the use of security measures and the importance of security throughout the contract. The STTT contract does not have one specific section devoted to security and quality of life issues. Instead, the contract states in Contract Book III Section 12.4-1, "... security considerations will be integrated into all aspects of the design, equipment selection, architectural concepts, procedures, and operations."

Throughout various portions of the contract, the physical design components and the technology and equipment used for security are described in great detail, and the contract alludes to certain types of security management. However, many of the management decisions will be decided in security manuals that do not need to be submitted until one year prior to revenue service (expected to begin in 2001). These security manuals will detail the deployment structures, staffing levels, coordination between the "sworn police" force and local police, and dispatching.
Thus the following section highlights each of the major security decisions facing Tren Urbano and draws information from differing parts of the contract.

5.3 Quality of Life Security Strategies for Tren Urbano

This section discusses the five key security areas and strategies for the Tren Urbano system, Quality of Life Ordinances, Concessions, CCTVs, Management Options and Design Issues. The contract requirements to the franchise on the design and management of these security issues are described and then contrasted and compared to my earlier recommended security strategies. Other quality of life issues important to the Tren Urbano system, such as intermodal security, will be discussed in the last portion of this section.

5.3.1 Quality of Life Ordinances

Contract Requirements: The current contract does not allude to ordinances to regulate quality of life crimes. In addition, as the Tren Urbano system is the only rail system in the Commonwealth of Puerto Rico, it is unlikely that the Commonwealth has an ordinance regulating “quality of life offenses” on public transportation systems.19

My recommendations: I would recommend that the Tren Urbano office and the GMAEC work with the Commonwealth to introduce a provision into the Penal Code of the Commonwealth that would define and regulate “quality of life offenses” on public transit systems. I would recommend this method rather than the codes used by New York, due to the administrative capability and resources needed within the transportation authority to administer and adjudicate the legislative and enforcement process.

Obviously the content and force behind this code would need to be carefully tailored to match the needs of Tren Urbano and Puerto Rico, but these ordinances provide a valuable standard for behavior on public transit and an important method to enforce these standards. I would recommend that this code detail very carefully how to deal with issues of homelessness—quality of

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19 A quick search on Lexus Nexus did not reveal any Puerto Rico codes that might be applicable to quality of life offenses on the Tren Urbano.
life ordinances need to be prepared to meet legal challenges. The ordinance should be narrowly and carefully crafted to restrict behavior in time, place and manner (Kelling and Cole, 1996, p. 233).

I also recommend that the ordinance not forbid eating and drinking in the station and platform areas (due to the nature of concessions) but to carefully develop a clause that prohibits littering in the station area and on the vehicles. Passengers should be fined if they litter.

5.3.2 Concessions

Contract Requirements: Design Criteria, Contract Book III, Section 6.5 of the STTT contract promotes the establishment of concession facilities in the free areas of the stations, but does not allow concessions in the platform area. Three types of concessions are listed (1) food, beverages and tobacco products sold in the free area of the station (2) vendors selling flowers, magazines, and newspapers and (3) automatic vending machines (which cannot sell food or alcoholic beverages). The concession can either be built into the station area or free standing, but must conform with the total design of the station. The STTT contract does not allow for these concessions to obstruct the lines of sight, to disrupt passenger flow, or to increase the impacts of litter in the station area.

My recommendations: The Tren Urbano system should encourage the use of staffed concessions in the station/mezzanine levels and allow concessions in the platform areas, if the platform level locations do not impede the flow of traffic. The details of the STTT contract appear overly specific for a turnkey project, but do appropriately promote the use of concessions in the free areas of the station. In addition, the GMAEC and Seimens should implement the policies described in detail in Chapter 4 of this thesis. To repeat, these policies include:

\[\text{In recent years, quality of life ordinances have most come under attack for stifling the first amendment rights of the homeless.}\]
Developing a no littering campaign

- Utilizing vigilant maintenance in the platform and station areas to clean up litter
- Fining individuals who do litter
- Requiring that the concessionaires both on the mezzanine and platform level financially contribute to the clean up of the station area.
- Requiring that concessionaires be open during off peak hours to obtain the security benefits of the concessionaires
- Utilizing chain retailers to make passengers feel more secure.
- Training the concessionaires on the correct response to different types of security problems, including whom to alert and contact if they notice a security problem.

5.3.3 Management Options

Contract Requirements: The STTT contract leaves many of the major security management decisions to be decided at a later date in a security program plan and procedures and policy manual to be submitted one year prior to revenue service. Contract Book III, Operations & Maintenance, Division 17020 requires Siemens to employ security guards whose duties include "passenger property protection, station security services, property protection, emergency response, fare enforcement, and fare evasion prevention". These security forces will have to work with "a governmental force of sworn officers" who will have the power to arrest.

The contractor will employ a security manager who will be in charge of security and report directly to the General Manager. The contract leaves several questions unanswered including: Will the Siemens' security force have police powers or will they simply be private security guards? How will the Siemens' security force and the "governmental force of sworn officers" coordinate efforts? Is the "governmental force of sworn officers" to be made up of local police from the three municipalities of the Tren Urbano or a separate force managed entirely by the authority? What type of management strategies will be used? These questions will presumably be answered in the manuals required one year prior to revenue service.

In addition to the security personnel, the STTT contract in Contract Book III, Design Criteria, Section 6. 11 describes the duties and responsibilities of the Station Control Booth (SCB).
station control booth is located at the entrances to the station and allows for: monitoring of the
CCTVs placed strategically around the station, access to the public address system, and the ability
to monitor telephone, intercom, elevators, and ticket vending machines. A security/staff room is
also to be located in each station.

In addition the SCB must be able to coordinate with the Operations Control Center. The
Operations Control Center will have several security responsibilities when no station agent is on
duty which will include; monitoring the CCTVs, providing information to patrons, acting in
emergencies, and controlling the entrances and exits to disabled individuals at fare barriers.

The design and duties of the SCB imply that there will be a “station agent” of some sort who will
monitor the SCB and someone at the operations control center who will monitor the stations when
the station manager is not on duty. The contract does not specify who will manage the station nor
does it clarify the roles and responsibilities of the station managers or the way in which they will
work with the contractor’s security force, the “governmental force of sworn officers” and the local
police force.

My recommendations:

Several key decisions need to be made by Siemens:

- The type of security force they will use; privatized guards or sworn transit police

- Role of station agent and operations control center

- Coordination activities between Siemens’ security force, station agent, operations control
center, “governmental force of sworn officers”, and local police.

- Type of patrol and management practices used by security force and station agent

The Siemens’ security force should aim to maintain order by patrolling the station areas, becoming
familiar with those using the transit system, and deterring quality of life offenses. If privatized
security guards have the power to fine and detain individuals who are committing quality of life offenses, and the ability to contact a “governmental force of sworn officers” when more serious problems erupt, then privatized security guards may provide a more cost effective security force than “sworn transit police.” (Assuming, of course, that privatized security guards are cheaper than “sworn transit police” and that the Authority is providing a “governmental force of sworn officers” for more serious problems). However, the Tren Urbano system travels through three municipalities, San Juan, Bayamon, and Guaynabo, which potentially have three different local police forces. It is currently unclear how the Authority’s force of sworn officers will interact with these “local police.” Coordination between the local police, the “governmental force of sworn officers” and the Seimens’ security force is essential to create a secure transit system.

I believe that it is important for Seimens to utilize both station agents and a security force. Station agents have the ability to oversee the operations of an entire station, from maintenance, to providing information to passengers, to monitoring the CCTVs. The station agents serve a different role than the security guards who are actively fining and detaining individuals who commit quality of life offenses.

Obviously clear paths of communication between station agents, the Seimens police force, the authorities police force and the local police must be created. The station agents, the maintenance staff, and the concessionaires should also have clear channels of communication. The security force should interact with the community and address the community’s concerns about security.

5.3.4 CCTVs

Contract Requirements: The STTT contract describes the use of CCTVs in several places. The design criteria in Contract Book III, Section 6 mandate that the station design allow for CCTV monitors in the station control booth and the operations control center. Technical Provisions, Systems, Contract Book V, Volume IV, Division 16736 of the STTT contract details the type and amount of CCTV equipment to be provided. For example, individual CCTV subsystems will exist at the stations, the yard and shops, and the operations control center. The operations control center
will be connected to each of these subsystems via a fiber optic cable system. Each station is also mandated to have a minimum number of cameras, and one monitor for each camera will be located in the station control booths. The camera locations are as follows:

- two or three at the platform’s edge to monitor vehicle loading and unloading and to view platform access and egress activities (stairs, escalators, elevators)
- one or two at ticketing vending areas
- one at each station entrance
- as many as needed to view public and employee parking lots

The capital cost of installing this type of CCTV network in the Tren Urbano system is relatively low. A subsystem of about eight color stationary cameras with a monitor for each camera costs about $14,000 to install. The price to connect each of these subsystems to the main operating control center ranges between $3,000-$8,000. Thus for a system like the Tren Urbano with about eight color and fixed CCTVs at each station, 12 stations, and a main control system, a capital cost estimate might be approximately $200,000 for the CCTV system.

The STTT contract requires that the Tren Urbano system implement an extensive CCTV network, but it leaves several questions unanswered: What type of policy will the station control attendants use in monitoring the CCTVs? When station attendants are not on duty, and the operations control center is monitoring the system, how will effective monitoring be ensured?

My recommendation is that the Tren Urbano system install the extensive network of CCTVs and use the station agents to monitor the CCTVs in a manner similar to that of the station agents in Washington D.C. using them to deter quality of life offenses and maintain order.

I also recommend that in strategic locations the Tren Urbano system, alarms should be installed so passengers can alert the station agent or the operations control center to a particular CCTV. This alarm system will allow for more effective monitoring.
5.3.5 Design Issues

Contract Requirements: The STTT contract clearly dictates many design guidelines required by the contractor. Table 5-1 summarizes the design requirements of the STTT.

<table>
<thead>
<tr>
<th>Table 5-1: Design Strategies</th>
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<tbody>
<tr>
<td>Long lines of sight</td>
</tr>
<tr>
<td>No hidden nooks or crannies</td>
</tr>
<tr>
<td>No Public Bathrooms</td>
</tr>
<tr>
<td>Division between paid and unpaid areas</td>
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<tr>
<td>Graffiti Resistant Design &amp; Materials</td>
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<tr>
<td>The ability to close exit and entrances with grills</td>
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<tr>
<td>Attention to Lighting</td>
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<tr>
<td>Off peak waiting areas</td>
</tr>
<tr>
<td>Fencing</td>
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<tr>
<td>Connections to neighborhood area</td>
</tr>
</tbody>
</table>

General design guidelines include maximum visibility from all areas, no hidden corners, intense lighting, and vandal resistant materials. Contract Book III, Section 6 details the need for station entrances to be capable of being closed by iron grills; the role and function of the station control booth, operations control center, and the transit dispatch center; and the role of fare collection barriers and fences. In certain sections, specific criteria are listed such as the height of the fare collection barriers and the type and position of the lighting. The contract divides portions of the station area into high, medium, or low priority security levels.

Contract Book, Section 6 describes the station design guidelines to connect the stations to its nearby neighborhoods. “The station site will be designed as a safe and secure zone whose purpose is to serve the station. It shall be designed to discourage inappropriate behavior such as loitering, vandalism, graffiti and poster application, illegal parking and other vehicular misbehavior and crime. To that end the station site shall be clearly differentiated, well-lit and designed as a cohesive “defensible” project. “ The STTT contract then provides more specific design guidelines for neighborhood development for two station areas, Los Lomas and Torrimar.
My recommendations: The STTT contract appears to have adequately created design guidelines with a concern for security. Concerns remain over the relationship of the six other contracts to the design of the system and the way in which they follow the design guidelines. More interaction with community groups and potential passengers may be helpful in creating effective design strategies.

5.3.6 Other issues

Community involvement and cleanliness are important to the quality of life and security of the transit system. The contract has sections describing the need for community interaction and involvement. Transit security practices both in the design and management areas should work with various members of the community to make sure that community input is used in making security decisions. The contract also places emphasis on cleanliness, as graffiti must be removed daily, and no vehicle is to be allowed in service if it has graffiti on it. Trash cans must be emptied and never overflowing, and spills must be cleaned up immediately. These cleanliness measures are part of the Tren Urbano’s performance objectives and work towards preventing disorder in the system.

Security planners for the Tren Urbano also need to be concerned about passenger security in the areas surrounding the station and during inter-modal connections. As a large percentage of passengers are forecast to arrive to the Tren Urbano system by modes other than walking (55% by bus or publico, and 5.5% by auto), security during these transfers and at parking lots is important (U.S. DOT et al, 1995, p. 4-8).

The station design guidelines in Section 6 of Contract Book III require that the station area be a "well-lit and cohesive defensible project”. The guidelines also require that waiting areas for bus and publicos be marked by lighting, and that landscaping of the parking lots be open enough to allow surveillance. These contract guidelines however are not enough to promote intermodal security and security in the station areas. These guidelines need to work with other design strategies and management tools.
In designing the transfer areas, the contractors and the Tren Urbano Office need to follow the same design principles that they are applying to the station itself. For example, off peak waiting areas should be creating not only for those waiting for Tren Urbano, but also for those waiting for buses and publicos. Security at Park and Ride lots is an important concern (as demonstrated by the BART system) and telephone call boxes and CCTV surveillance should be set up in these areas.

The security management of the Tren Urbano must be aware of these parking lots, the surrounding areas, and transfer points. Security guards and station managers should patrol and oversee these areas as well, and if necessary security guards should escort individuals to their cars. In addition, partnerships with local police should be created to help improve the security in the area surrounding the station.

These suggestions have only taken a cursory glance at intermodal security and Tren Urbano personnel need to think about this important issue carefully. Lastly, while research seems to suggest that the security concerns of San Juan residents are similar to the security concerns of residents in other parts of the United States, there may be cultural issues unique to Puerto Rico and San Juan which affect the security approach taken by the Tren Urbano system. These cultural issues and appropriate security responses need to be investigated.

5.4 Evaluation Methodology for San Juan

In addition to developing a security program and several key strategies to improve the quality of life on the transit system, management of the Tren Urbano system (whether during design by GMAEC or during Seimens operations) needs to develop a mechanism for continuing evaluation of these strategies and policies. The development of a security program plan should fulfill the FTA final rule requirement for a system safety plan and help Tren Urbano define and evaluate its security goals and objectives.

First and foremost to this evaluation process is a data collection system that can record and track the types of crime, the location, and the victims of crime occurring in the transit system. The contractor should be in charge of developing and implementing this system, though the Authority
may want to oversee data collection. The data collection system should also be coordinated closely with the data collection system of the local police forces and the authority's force of sworn officers.

From this data collection the security planners will be able to make more informed decisions on where to place resources and emphasis. This data collection should be tracked on at least a monthly basis to trace crime trends over time. The data collection process should also include surveys and focus groups on passenger perception. By tracking passenger perception transit agencies can investigate the concerns of its passengers. These surveys should be done on a regular basis. Security planners and officials should also analyze the cost - effectiveness of their decisions.

5.5 Conclusions

In general the STTT contract outlines many important security issues and demonstrates that the Tren Urbano Office has seriously thought about meeting the security concerns of its future travelers. The contract has requirements about areas being well-lit, clean, and mandates police and security guards. The contract also outlines design guidelines, specifies the type of CCTV equipment, and mandates the communication requirements necessary for a safe and secure system.

The STTT contract demonstrates that the government has retained a large amount of control over the contractor's decision making process. While leaving management decisions to the contractor, the contract clearly dictates to the contractor many design decisions that impact the security of the system. These design decisions appear to be well thought out and in most cases to incorporate the successes and techniques of other transit agencies. While many of the security management decisions of the Tren Urbano system have been left to the contractor to decide, the design of the system will greatly impact the management techniques and tools of the contractor. The contractor and the Authority need to continue to negotiate security design decisions to incorporate potential
innovations of the private sector and to capitalize on connections between design and management.

The contract decisions on security design and security management have developed a solid framework for the development of a successful security program. However, the Tren Urbano Office and Siemens still need to continue to think about several important security issues including:

- Strengthening the connections between management and design
- Security Design coordination between the STTT contract and the civil contracts
- Security management strategies for the system
- Incentives to promote security
- Intermodal security strategies
- Cultural security concerns
- Security evaluation techniques

Investigating these concerns, the contracting relationships, and the transit security decisions of the Tren Urbano should improve the proposed security plan for the system and develop important lessons that might be applicable to other systems.
This thesis has described the importance of quality of life offenses, perception, and disorder to transit security. The thesis highlighted and evaluated the context in which five case study agencies make transit security decisions. Different types of transit security labor and management strategies and evaluation procedures for each of the case studies were described. Recommendations and strategies in five key quality of life security areas have been suggested. These recommendations are applicable to the case study transit agencies as well as to the Tren Urbano system. In addition to the specific recommendations in each of the five quality of life areas, this research has also developed general lessons that are applicable to transit security programs. These overall lessons and the limitations of my research are discussed below.

6.1 Key Findings

Following are the most important overall lessons in developing and maintaining security on rail transit systems.

- All of the case study transit agencies prioritized the prevention of quality of life offenses and utilized tools such as “zero tolerance policing” and ordinances to deter these offenses. This emphasis on quality of life offenses may lead to a decrease in crime and/or improved passenger perceptions.

- A systemwide approach to security that includes maintenance workers, station agents, and the support of upper management, as well as a highly trained security force is essential to establishing an effective security program.
• Enforcement mechanisms and the ability to implement policy initiatives prove essential to establishing a security program to deter quality of life offenses.

• All of the case study agencies recognize the importance of physical design in the development of a secure transit system. These physical design security strategies in transit, innovative when first implemented, are now acknowledged among transit security professionals as a key part of decreasing crime and improving passenger perceptions for new systems. In addition, these design changes can have a lasting effect on the overall security of a transit system.

• Management tools that emphasize community policing and community partnerships can also help strengthen the role of and support for transit police and help create a more secure and responsive transit environment for patrons.

• Transit agencies should utilize “non-security personnel and resources” to help improve the security of the system. Concession activity and station agents/station managers can play a valuable role in improving the quality of life, order, and security of the transit system.

• Equipment and Technology like CCTV may help improve the perceived and actual security of the system, but transit agencies must do more targeted studies to understand the effectiveness of these devices.

• The National Transit Database documents that transit crime rates are higher on heavy rail than the overall transit system.

6.2 Areas for Further Research

This thesis, however, also leaves many questions unanswered. Currently transit agencies do not conduct enough targeted research to understand which strategies may increase or decrease crime. Research and crime statistics are only beginning to be standardized across transit agencies and the lack of standardization makes it difficult to compare passenger perceptions among transit agencies.
The database (even just the first year) provides a valuable tool in documenting trends and highlighting problems on an industry wide basis. However the National Transit Database only serves as starting point for further analysis. Statistics in the database only address crime at the systemwide level and transit agencies also need to analyze station specific trends, or crime trends in response to a specific security policy. While the National Transit Database serves to highlight several issues, it cannot address most policy solutions. The database demonstrates that more crime occurs at heavy rail systems than on other parts of the system and points to station areas and park and ride lots as areas with high crime rates. An analysis of why heavy rail is subject to more crime than other parts of the system, and strategies for park and ride lots are important items that need to be investigated.

This research only superficially investigates the crime rate of metropolitan area as compared with the crime rate of the rapid rail system. An in-depth analysis comparing the crime rates of the rail system with its neighborhood crime rates is essential to understanding the effectiveness of a transit agency's security program. However due to limitations in neighborhood level crime data and station specific crime rates this analysis remains largely undeveloped. Research that compares crime at the station level with crime at the neighborhood throughout several transit systems would provide valuable analysis in determining exogenous factors that effect transit security.

The analysis of Buenos Aires suggests that transit agencies in other parts of the world face similar security problems as those in the United States. However a study which looks at more systems in Latin America (or in other parts of the world) and draws comparisons between these areas and the United States may provide valuable insight in transit security policies and practices.

No results from the case studies definitively resolve whether the use of privatized police agencies or sworn transit police agencies can create a more secure environment. Also no conclusive research documents whether the reliance of a system solely on police officers for security (without the use of station agents) creates a more or less secure transit environment. Both of these areas
would benefit from more targeted analysis and research and an understanding of current policing and security trends.

Finally, this thesis did not find evidence that strongly links transit security practices to disorder, perception, and actual crime. Transit agencies and researchers still need to solidify these important connections. All of these limitations clearly demonstrate that there is a need for more effective and targeted security research on better security approaches.
Appendices

Appendix 1: Questionnaire

**Quality of Life Topics for discussion**

Quality of Life offenses are those that disturb or disrupt patrons and increase their sense of fear. These offenses do not physically threaten patrons and may have an effect on their use of the transit system. These offenses include the following: disorderly conduct, homelessness/vagrancy, drunkenness, liquor law violations, smoking/eating/drinking/littering/loud music, public urination, narcotics violations, sex offenses-(excluding rape), prostitution, and graffiti.

I. **Identifying Quality of Life Strategies**  
What are the major strategies your transit agency uses that may impact Quality of Life offenses?

II. **Determining Transit Security Strategies**  
How does your transit agency determine which security practices to use?

III. **Evaluating Security Strategies**  
How does your transit agency evaluate security strategies once they are in place?

IV. **Data Collection**  
What type of data collection does your transit agency use to understand and analyze security strategies?

V. **Policing Strategies**  
How do you research the role that transit police play in the prevention of Quality of Life offenses?

VI. **The Role of Non-Security Transit Personnel**  
What role if any do other transit personnel such as fare collectors, vehicle operators, maintenance employees, and inspectors or supervisory staff play in the prevention of Quality of Life crimes?

VII. **Equipment & Technology**  
How does your transit agency investigate the role and cost/benefits of security equipment and technology like CCTVs?

VIII. **Station Design**  
How does your transit agency measure the impact of station design or re-design on security?

IX. **Passenger Perception**  
How does your transit agency measure/evaluate the way in which passengers perceive the Quality of Life conditions of your system?

X. **Other Activity**  
Has your transit agency investigated the role that concessions and other non-transit related activity within the station area plays in Quality of life offenses and passenger perception?
@ 640. Acts committed on or in facilities or vehicles of public or subsidized transportation systems

(a) Any of the acts described in subdivision (b) is an infraction punishable by a fine not to exceed two hundred fifty dollars ($250) and by community service for a total time not to exceed 48 hours over a period not to exceed 30 days, during a time other than during his or her hours of school attendance or employment, when committed on or in any of the following:

(1) Any facility or vehicle of a public transportation system as defined by Section 99211 of the Public Utilities Code.

(2) Any facility of, or vehicle operated by any entity subsidized by, the Department of Transportation.

(3) Any leased or rented facility or vehicle for which any of the entities described in paragraph (1) or (2) incur costs of cleanup, repair, or replacement as a result of any of those acts.

(b)(1) Evasion of the payment of any fare of the system.

(2) Misuse of any transfer, pass, ticket, or token with the intent to evade the payment of any fare.

(3) Playing sound equipment on or in any system facility or vehicle.

(4) Smoking, eating, or drinking in or on any system facility or vehicle in those areas where those activities are prohibited by that system.

(5) Expectorating upon any system facility or vehicle.
(6) Willfully disturbing others on or in any system facility or vehicle by engaging in boisterous or unruly behavior.

(7) Carrying any explosive or acid, flammable liquid, or toxic or hazardous material in any public transit facility or vehicle.

(8) Urinating or defecating in any system facility or vehicle, except in a lavatory. However, this paragraph shall not apply to any person who cannot comply with this paragraph as a result of a disability, age, or a medical condition.

(9)(A) Willfully blocking the free movement of another person in any system facility or vehicle.

(B) This paragraph (9) shall not be interpreted to affect any lawful activities permitted or first amendment rights protected under the laws of this state or applicable federal law, including, but not limited to, laws related to collective bargaining, labor relations, or labor disputes.

(10) Skateboarding, roller skating, or rollerblading in any system facility, vehicle, or parking structure.

(11)(A) Unauthorized use of a discount ticket or failure to present, upon request from a transit system representative, acceptable proof of eligibility to use a discount ticket, in accordance with Section 99155 of the Public Utilities Code and posted system identification policies when entering or exiting a transit station or vehicle. Acceptable proof of eligibility must be clearly defined in the posting.

(B) In the event that an eligible discount ticket user is not in possession of acceptable proof at the time of request, any citation issued shall be held for a period of 72 hours to allow the user to produce acceptable proof. If the proof is provided, the citation shall be voided. If the proof is not produced within that time period, the citation shall be processed.

HISTORY:
Added Stats 1981 ch 766 @ 1.
Amended Stats 1983 ch 576 @ 1; Stats 1985 ch 251 @ 1; Stats 1988 ch 311 @ 1;
Stats 1989 ch 1151 @ 1; Stats 1990 ch 261 @ 1 (AB 3844); Stats 1994 ch 541 @ 1
DISTRICT OF COLUMBIA CODE ANNOTATED
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*** THIS SECTION IS CURRENT THROUGH THE 1996 SUPPLEMENT ***
*** (PERMANENT AND TEMPORARY LEGISLATION AS OF FEB. 9, 1996) ***
(EMERGENCY LEGISLATION AS OF MAR. 31, 1996) ***

TITLE 22. CRIMINAL OFFENSES
CHAPTER 33A. PANHANDLING CONTROL

D.C. Code @ 22-3312 (1996)

@ 22-3312. Prohibited acts

(a) No person may ask, beg, or solicit alms, including money and other things of value, in an aggressive manner in any place open to the general public, including sidewalks, streets, alleys, driveways, parking lots, parks, plazas, buildings, doorways and entrances to buildings, and gasoline service stations, and the grounds enclosing buildings.

(b) No person may ask, beg, or solicit alms in any public transportation vehicle; or at any bus, train, or subway station or stop.

(c) No person may ask, beg, or solicit alms within 10 feet of any automatic teller machine (ATM).

(d) No person may ask, beg, or solicit alms from any operator or occupant of a motor vehicle that is in traffic on a public street.

(e) No person may ask, beg, or solicit alms from any operator or occupant of a motor vehicle on a public street in exchange for blocking, occupying, or reserving a public parking space, or directing the operator or occupant to a public parking space.

(f) No person may ask, beg, or solicit alms in exchange for cleaning motor vehicle windows while the vehicle is in traffic on a public street.

(g) No person may ask, beg, or solicit alms in exchange for protecting, watching, washing, cleaning, repairing, or painting a motor vehicle or bicycle while it is parked on a public street.

(h) No person may ask, beg, or solicit alms on private property or residential property, without permission from the owner or occupant.

HISTORY: Nov. 17, 1993, D.C. Law 10-54, @ 3, 40 DCR 5450.
NOTES:
SECTION REFERENCES. -- This section is referred to in @ 22-3314.
LEGISLATIVE HISTORY OF LAW 10-54. -- See note to @ 22-3311.
@ 44-223. Unlawful conduct on public passenger vehicles

(a) For the purposes of this section, the term "rail transit station" means a regular rail stopping place for the pick-up and discharge of passengers in regular route service, contract service, special or community-type service, including the fare-paid areas and roofed areas of the rail transit stations (not bus terminals or bus stops) owned, operated, or controlled by the Washington Metropolitan Area Transit Authority: Provided, that the term "rail transit station" shall not include parking lots, roadways and other areas intended for vehicle traffic.

(b) It is unlawful for any person either while aboard a public passenger vehicle with a capacity for seating 12 or more passengers, including vehicles owned and/or operated by the Washington Metropolitan Area Transit Authority, which is transporting passengers in regular route service within the corporate limits of the District of Columbia; or while aboard a rail transit car owned and/or operated by the Washington Metropolitan Area Transit Authority which is transporting passengers within the corporate limits of the District of Columbia; or while within a rail transit station owned and/or operated by the Washington Metropolitan Area Transit Authority which is located within the corporate limits of the District of Columbia to:

1. Smoke or carry a lighted or smoldering pipe, cigar, or cigarette;
2. Consume food or drink;
3. Spit;
4. Discard litter;
5. Play any radio, cassette, recorder, musical instrument or other such device, unless it is connected to an earphone that limits the sound to the individual user;
6. Carry any flammable or combustible liquids, live animals, explosives, acids or any other item inherently dangerous or offensive to others, except for seeing eye dogs properly
harnessed and accompanied by a blind passenger and for small animals properly packaged;

(7) Stand in front of the white line marked on the forward end of the floor of any bus or otherwise conduct himself in such a manner as to obstruct the vision of the operator;

(8) Park, operate, wheel, or chain to any fence, tree, railing, or other structure not specifically designated for such use, tricycles, unicycles, skateboards, or roller skates;

(9) Park, operate, carry, wheel, or chain to any fence, tree, railing, or other structure not specifically designated for such use, mopeds, motorbikes, or any other such vehicle;

(10) Park, operate, carry, wheel, or chain to any fence, tree, railing, or other structure not specifically designated for such use, noncollapsible bicycles, unless an individual has a current permit issued by the Washington Metropolitan Area Transit Authority for the transporting of noncollapsible bicycles by rail transit and the individual is complying with all the terms and conditions of said permit: Provided, that an individual shall surrender said permit upon the request or demand of any agent or employee of the Washington Metropolitan Area Transit Authority. Sections 44-225 and 44-226 shall not apply to a violation of the terms and conditions of said permit.

(c) It is unlawful for any person, while aboard a rail transit car which is transporting passengers within the District of Columbia, knowingly to cause the doors of any rail transit car to open by activating a safety device designed to allow emergency evacuation of passengers. It is an affirmative defense to a prosecution under this subsection that the person charged believed, in good faith, that the action was necessary to protect people from injury or death.

(d) It is unlawful for any person at a rail transit station to stop, impede, interfere with, or tamper with an escalator or elevator or any part of an escalator or elevator apparatus or to use an escalator or elevator emergency stop button, unless this action is taken by a person with the knowledge or the reasonable good faith belief that an emergency makes the action necessary to preserve or protect human life or property, or unless such action is taken by a WMATA employee, other government employees, or WMATA contractor acting pursuant to their official duties.


NOTES:
SECTION REFERENCES. --This section is referred to in @ @ 6-911, 6-920, 44-225 and 44-226.
Appendix 4: Recommended Evaluation Criteria

The objective of this appendix is to develop criteria with which to evaluate alternative security strategies and to highlight problems in evaluating transit security strategies and programs. These criteria should serve as a guide for transit agencies in creating a process and standards with which to evaluate security strategies and programs.

The evaluation criteria are discussed on a systemwide level; that is, I examine the criteria as they apply to the entire security program of a given transit agency. In addition, evaluation criteria can be applied on a strategic level in order to understand how to evaluate a single policy. The evaluation criteria consist of five factors necessary in assessing a security strategy or program. Ideally a successful program would fulfill all five of these factors, and an effective program evaluation process should be guided by them.  

1. Reducing Actual Crime  
2. Improving Passenger Perception  
3. Maintaining System Wide Employee Support  
4. Encouraging Broad Community Support  
5. Achieving High Cost-Effectiveness

This appendix presents each criterion, describes techniques, problems and measurements used to assess each, and discusses how to forecast the success of each in new security programs.

The evaluation of a total security program differs from the evaluation of a single security strategy. In a systemwide evaluation the effects of different security strategies are aggregated and program effects are easier to measure as successful or unsuccessful. In contrast, the benefits and costs of implementing a single strategy may be hard to isolate. While a systemwide security program should ideally, include all of the five criteria, a security strategy may only aim to achieve some of these goals.

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21 Two studies done in the late 1970's early 1980's have referenced frameworks for evaluation. Larry Richards and Lester Hoel in Planning Procedures for Improving Transit Station Security and Vincent Rouse presented a speech entitled "Developing a Methodology for Evaluating the Effectiveness of Crime Reduction Measures for Mass Transit". 
All transit agencies are currently required by federal legislation to develop a systemwide security plan and program. This plan should discuss the goals and objectives, the scope, the management, and the role and responsibilities of the security program (Balog et al., 1994, p. 5). Evaluating a transit agency’s security program can be done by comparing the agency’s security goals, objectives, and standards with the agency’s actual performance. A transit agency should track its performance to meet as many security goals, objectives, and standards as possible.

Just as transit agencies have established standards in service and operations planning, they should develop system-wide security measures, standards, and policy objectives that are easy to understand and assess. “Measures” refer to the way in which the transit agency tracks certain criteria. “Standards” are acceptable levels or changes in the measures. “Policy Objectives” are goals that the transit agency would like to achieve. On the strategic level, transit agencies should develop measures and standards which fulfill the specific strategy. Transit agencies should also recognize that they cannot measure all aspects of a security program. Each transit agency must repeatedly review their security practices to determine the appropriate standards and measures.

1. Reducing Actual Crime

A systemwide security program should decrease the amount of crime occurring in the system. Similarly, a security strategy should have a targeted approach to decreasing actual crime or offenses, either in a specific location or with respect to a specific type of crime.

For Part I crimes, transit agencies, like police agencies, measure reported crime which may increase or decrease due to changes in reporting mechanisms. Techniques in reporting and classifications of crime may differ among transit agencies and may change over time. These changes may cause comparisons to be inconsistent and unreliable. Transit Agencies measure Part II offenses by the number of arrests made; thus, arrests could go up due to increased vigilance by the police, while actual crime may be decreasing. More arrests may not mean more crime. Furthermore, comparisons between a city’s crime rate and a transit agency’s crime rate use two
different populations—a city's crime rate is usually determined by the number of crimes per resident; a transit agency's crime rate is usually determined by the number of crimes per rider.

Many transit agencies track reported crime by organizing operator reports, incident reports, and dispatch logs in a database. Effective database management and analysis can help to locate and identify crime trends and determine the appropriate measures for analyzing crime. Many transit agencies have a full-time crime analyst assigned to this task. Noting the measurement difficulties mentioned above, the following is a list of potential systemwide and strategy measures that transit agencies could use to evaluate decreases in crime:

Potential Systemwide Measures:

- Annual change in the total number of crimes (Part I and Part II) occurring on the system
- Annual change in the total number of Part I crimes reported on the system
- Annual change in the rate of Part I crimes per million passengers reported on the system.

Potential Strategy Measures:

- Monthly change in the total number of crimes occurring at station x.
- Monthly change in the amount of graffiti occurring on the system.

Potential Systemwide Standards:

- The total number of crimes occurring on the system should decrease by 5% per year.

Potential Strategy Standards:

- Total crime at station x should decrease by 20% this month

Transit agencies can determine the systemwide measures described above with current reporting practices that are now required by the federal government. However, determining the effects of a single strategy on crime requires the transit agency to adopt a rigorous data collection procedures before and after the implementation of the strategy. Ideally, such an analysis will isolate the effects
of that strategy. To forecast the effects of a strategy on actual crime, a strategy may be carried out in a specific location and then replicated throughout the system if the results are favorable.\textsuperscript{22}

2. Improving Passenger Perceptions

A quality of life security strategy or a set of strategies should make passengers feel more secure and safe while using the transit system. People who perceive that the system is secure will be more likely to use the system. Conversely, passengers who feel unsafe while using the transit system will choose if possible to travel by other modes.

Assessing the effect of a policy on passenger perception may often require expensive market research efforts and extensive knowledge of market research techniques. Transit agencies need to carefully design market research studies on passenger perception and security to reach the target population. Transit agencies may have difficulty in assessing the perceptions of certain segments of the population and may often overlook the security perceptions of non-users.

Passenger perception can be evaluated by asking passengers their opinions of the security on the system. Transit agencies use focus groups, surveys, community meetings and opportunities to meet the staff to evaluate passenger perception. Passenger complaints may also identify passenger's security perceptions. Transit agencies often employ sophisticated market research techniques and market research experiments to determine the effect of strategies on passengers. These studies may include interviewing individuals before and after a strategy has been implemented.

For example, in New York City, transit agencies interviewed people about how secure they felt in a particular station before and after the station was redesigned. Passengers were also invited to give design suggestions about a particular station.

\textsuperscript{22} It is important to note the potential paradox between more and better data collection and passenger perception. While better data allows transit agencies to make better decisions on deploying resources, this data can draw media attention to the rate and type of crime occurring on transit. This focus on transit crime may in turn, increase passenger's perception that the system is unsafe.
Passengers can be asked about how they feel or would feel about a certain type of strategy. Transit agencies can try different strategies for a short amount of time, and survey passengers about the effects of such trials. For example, NYCT conducted a series of surveys in which they asked passengers if they noticed the appearance of a person distributing leaflets, the appearance of a policeman distributing leaflets, or a policeman standing in place. They found not surprisingly that transit passengers most remembered a policeman distributing leaflets. (Weiss, 1997).

An ideal method to measure improved passenger perceptions on the system level, is to carefully design a systemwide survey to ask passengers about their security perceptions. This survey would then be repeated, or updated in following years to measure improvement or differences in passenger perceptions. The following measures could be used:

Potential Systemwide Measures:

- Percentage of passengers surveyed who do not perceive security to be a problem on the transit system
- Percentage of passengers surveyed who feel safe on the system now, than previously.
- Percentage of women (or elderly) passengers who feel safe using the system after dark

On the strategy level, surveys could be targeted to assess specific issues. For example, Potential Strategy Measures include:

- Percentage of passengers who felt safer in station x due to it’s design and rehabilitation
- Percentage of passengers who felt safer in station x due to the installation of CCTVs.

Currently, most transit agencies conduct some type of market research that tracks passenger attitudes. If possible, this market research should include passenger perception’s about security and might prove a cost-effective way of tracking passenger perceptions of security over the entire system. Transit security officials may also want to conduct their own market research.

The implementation of a security plan requires the efforts of the entire transit system. Upper management needs to have a clear idea of the security policies, goals and objectives, so that they can communicate these policies throughout the entire system. Different divisions that work together on a security strategy need to have clear objectives, clear paths of communication, and
appropriate training programs for each division. For example, efforts to eradicate graffiti on a transit system require maintenance workers to remove graffiti, police to apprehend graffiti artists, all employees to be alert for graffiti artists and to notify maintenance when graffiti occurs, and a community relations office to advise the public of the transit agency's efforts to eradicate graffiti.

Transit agencies may have difficulty communicating the security agenda throughout the system—or prioritizing security as a systemwide goal. The requirement of a system security plan (now mandatory under FTA rule) should work towards eradicating some of this problem.

Transit agencies do not usually conduct formal surveys to assess the level of employee support for a security program or strategy, due to the fact that it may be more important to ensure employee support than to utilize expensive methods to measure this support. However other methods to assess employee support include:

- Interviewing selected personnel
- Assessing security training and practices
- Determining the role and gauging the support of upper management for security initiatives

3. Maintaining Systemwide Employee Support

Before a strategy becomes implemented all of the employees involved should understand and support the new policy. Setting up strong channels of communication between the employees involved, creating opportunities for employee feedback, and developing employee support should help ensure a strategy's success.

4. Encouraging Broad Community Support

Politicians and community leaders need to support a transit security program or strategy that requires taxpayer money. Transit agencies cannot solve the problem of crime without working in partnership with community groups, other agencies, and the media. For example, transit agencies can prevent vagrancy and homelessness on the system only by forming partnerships with shelters and social welfare agencies. (In one infamous incident, a bus driver in New Jersey removed a homeless person from the bus; hours later that homeless person froze to death). Other examples
of community involvement include meeting with community groups to discuss the placement of lighting at BART stations in San Francisco to improve security and to ensure that the glare from the lighting did not negatively impact the surrounding neighborhood.

Gathering community support may often require extensive time and effort and may be difficult to assess quickly and/or correctly. The community itself may be diverse and divided and contain differing points of view on an issue. The views of the community and the views of political leadership may also change quickly or demand immediate solutions to complex problems of transit security. The media may also have a powerful influence on community support for transit security and may often highlight incidents occurring near a station as transit security issues.

The transit police need to work with the community, including community outreach, meetings and partnership with transit agencies and other groups, and a honest relationship with the media.

As with employee support, transit agencies do not usually conduct formal surveys to assess the support of the community. The following are suggested methods to assess community support of transit security programs or strategies:

- Interviews with key community members and political leaders
- Media reaction to transit crime
- Analysis of existing community partnerships
- Voter turnout on transit issues

Understanding the community's possible opposition and trying to remedy its concerns is essential in the implementation of a new (or controversial) security strategy.

5. Achieving High Cost Effectiveness

Transit agencies and transit security programs are continually facing budget cuts and must justify and support the policies they decide to implement. Transit security strategies need to be cost-effective and to incur financial costs that are low relative to the benefits of the strategy. Security
programs should work at decreasing many types of crime and, in all cases, need to consider low cost alternatives. Transit agencies and transit security personnel cannot afford to support strategies with high cost but little benefit.

Placing cost and benefits in financial terms to calculate the cost effectiveness of a specific strategy or set of strategies may pose extreme difficulties. Qualitative benefits (such as customer satisfaction) may be hard to quantify in monetary terms, as may be accounting for (dis)economies of scale and savings from offenses not committed. Also security costs may be allocated throughout the entire system and not allocated directly to the security budget. For example, the station manager plays an effective role in creating a more secure area, but also serves other functions.

Transit agencies can evaluate the financial costs of future policies by developing a pro forma cost/benefit analysis of anticipated financial costs and rewards. The following are potential systemwide measures for security cost effectiveness:

- Security cost per annual unlinked passenger trip and violent crime per passenger trip in comparison with other agencies. (Numerous characteristics such as station design may cause differences in operating costs among transit agencies, but this measure provides some context to the issue.)

Potential Strategy Measures for Security Cost Effectiveness:

- Cost of strategy per crime deterred (Transit agencies can determine the amount of crime deterred by analyzing crime rates before and after the implementation of the strategy).

Currently transit agencies do not undertake detailed cost-benefit analysis of security policies, primarily because the benefits are extremely difficult to measure.
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