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FINAL REPORT FOR TRANSIT SECURITY STUDY (IL-06-0023)

Submitted in partial fulfillment
of Contract Obligations

by the
City of Chicago

to the
Urban Mass Transportation Administration
U.S. Department of Transportation

December 17, 1973

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As per the terms of Contract No. DOT-UT-868, Part I, Section 2 between the City of Chicago and the Urban Mass Transportation Administration, Department of Transportation, we are submitting the final report of Project No. IT-06-0023 "Development of a Plan for the Demonstration of a Transit Security System in the Chicago Region".

I. BACKGROUND

On May 24, 1972, the City of Chicago applied to the Urban Mass Transportation Administration, United States Department of Transportation, for a demonstration grant to finance a plan for the demonstration of a transit security program in the Chicago area. Upon the development of such a plan (termed Phase I), it was envisioned that an application would be submitted to the Urban Mass Transportation Administration for a second demonstration (termed Phase II) to fund the security program developed in Phase I.

The general objective of the two-part program was to demonstrate and test the effectiveness of the use of crime-prevention devices in the effort to promote public transportation as a desired, appreciated, feasible, and viable mode of transportation. A significant aspect of this program is one of changing of attitudes. The patron's perception of safety is a dynamic influence on if an individual will ride mass transit as well as when and where he will ride. Therefore, a specific goal of this program is to demonstrate how to make a person feel safe as well as to provide a mechanism that will increase his actual security.

The initial parameters for the project were developed through meetings with representatives of the Urban Mass Transportation Administration, representatives of national associations, and representatives of Chicago agencies working in the fields of public transportation and law enforcement. These agencies included:

American Transit Association (ATA)

Chicago Area Transportation Study (CATS)

Chicago-Cook County Criminal Justice Commission

Chicago Transit Authority (CTA)

Department of Police (Chicago)

Department of Public Works (Chicago)

Department of Transportation (Illinois)

Illinois Law Enforcement Commission (ILEC)

Institute for Rapid Transit (IRT)

Law Enforcement Assistance Administration (LEAA)

The initial work program developed from these efforts included six major tasks. A brief sketch of each is given below.

Task I. Selection of Project(s) for a Transit Security System to be Demonstrated in Phase II. This task included analysis of the existing crime conditions, investigation of the existing security network on the CTA, and review of potential alternative security systems. From this data a project(s) was to be selected for demonstration in Phase II.

Task II. Selection of a Location. This task consisted of examining all locations, categorizing them as to structure, lighting, incidence of crime, and then selecting that location(s) which appeared to be the most appropriate in terms of the study's objectives.

Task III. Design Facility. Task III was to accomplish the technical design for the facility(ies) or project(s)

selected. An examination was to be made of the technological feasibility, installation capability, and operational potentialities of the project. A detailed engineering design of the facility was to be the final product of this task.

Task IV. Design of Educational Program. The objective of this task was to design an educational/marketing program based on a study of citizens' attitudes concerning perception of crime. The task was based on the proposition that perception of crime may be exaggerated far beyond the actual incidence of crime, and therefore, deterrence of crime may not necessarily aid in improving the viability of the transit operation.

Task V. Design Model for Evaluation of Implemented Demonstration. The objective of this task was to establish a methodology to test the impact of the installation of the selected security facility in Phase II. The testing was to include the demonstrated facility's effect on actual crime, on perceived crime, and on daily ridership.

Task VI. Implementation and Operating Plan for Phase II Demonstration. This task consisted of developing time schedules and cost breakdowns for the Phase II demonstration, and of determining operational responsibilities and manpower requirements. Finalization of Tasks I-V was to be accomplished and a Final Report produced.

To accomplish each of these tasks, the City of Chicago was to hire an outside consultant to engage in the primary research tasks. The study was to span a period of four months.

On August 14, 1972, the City of Chicago's application for a Transit Security Study was approved by the Urban Mass Transportation Administration; the contract was finalized on November 8, 1972.

Before further progress could be made on the project, representatives of UMTA requested several changes in the work design that had been submitted by the City of Chicago. The suggestions were largely

of an organizational nature though the section concerning the technical engineering of the proposed facility was totally dropped at UMTA's request. The rationale for the latter change was that the engineering would best fit in the initial stages of Phase II and that detailed design was a cost not essential to the project selection process in Phase I.

With UMTA's assistance, the project was reorganized to focus on four primary ingredients considered crucial to the decision of what should be demonstrated in Phase II. These four primary research tasks were: (a) the collection of data on CTA ridership, operations, facilities, and crime, and the development of scenarios of crime on the Chicago Transit Authority; (b) the investigation of existing mass transit security techniques and devices on the Chicago Transit Authority; (c) the investigation of the kinds of security devices and techniques available to provide security on mass transportation systems; and (d) the conduct of a general population survey on the perception of crime on the Chicago Transit Authority. Upon the completion of these tasks, it was felt that a demonstration project could be selected on sound, rational grounds.

A second change recommended by the Urban Mass Transportation Administration's representatives was that competition be brought into the project as a means of generating greater innovation as to the nature of the project(s) selected.

In an effort to avoid unnecessary efforts and cost duplication of efforts, a "primary" and a "secondary" consultant were selected. The "primary" consultant was assigned the crime data gathering function as well as all other tasks, whereas the "secondary" consultant

was only responsible for the evaluation of the crime data after collection, and tasks b, c, and d as described on the preceding page.

A third consultant was hired to do the attitude survey, task d. The results of the survey were then given to the other consultants to be used by them in the selection of the project(s) to be demonstrated in Phase II.

The consultants selected were:

Carnegie-Mellon University, Pittsburgh, Pa., selected as the primary consultant;

Loss Prevention Diagnostics, Inc., West Caldwell, N.J., selected as the secondary consultant; and

Survey Research Laboratory, University of Illinois, Chicago, Ill., selected to conduct the attitude survey of crime on the Chicago Transit Authority.

As a result of the requested modifications in the work program by UMTA and subsequent changes in the contracts with the consultants, the project did not get fully under way until December 7, 1972, when finalization of the contracts with Loss Prevention Diagnostics, Inc., and Survey Research Laboratory were completed.

The Study was completed on June 30, 1973. The four-month time period initially planned was exceeded with the approval of UMTA because of unforeseen delays in the collection and cleaning of police crime data, and because of the fact that the Office of Management and Budget did not certify the attitude questionnaire until May 24, 1973, five months after it was submitted to UMTA by the City of Chicago for processing on December 12, 1972. A by-product of the latter delay was that the work of the "primary" and

"secondary" consultants was delayed and that the full use of the data could not be encompassed in their reports by June 30, 1973.

On June 30, 1973, the final reports of the consultants were submitted to the City of Chicago and subsequently to the Urban Mass Transportation Administration. A summary of each report is provided below:

Improvement of Mass Transportation in Chicago by Carnegie-Mellon University

Synopsis: This report incorporates all the contract work tasks assigned the primary consultant. It contains scenarios of the nature of crime on the CTA; it delineates the existing means used directly and indirectly to deter crime on the CTA; and it inventories the possible devices presently on the market that may be used by the CTA or other agencies to deter crime or the appearance of such on the CTA. Also included is an evaluation of the statistics resulting from a public attitude survey taken concerning the perception of crime on the CTA.

From the above information, several security programs were suggested and a preliminary design of each was provided in the report. The primary recommendation made was for a closed-circuit television system termed "Teleview Alert".

Three Solutions in Reduction of Criminal Opportunities in Mass Transportation by Loss Prevention Diagnostics, Inc.

Synopsis: This report contains LPD's summarization of all previous tasks and makes three recommendations for the Phase II demonstration per their contract requirements. LPD's recommendations were (in decreasing order of preference):

-- A closed circuit television system activated by an emergency telephone or a push-button alarm. Signals would be directly sent to patrol cars to expedite response time.

-- An emergency telephone and alarm boxes provided for the patron. All alarms are recorded by camera for later use in the prosecution of offenders. This system includes color-coded security areas and intermittent public messages instructing patrons as to the location of the "secure" areas.

-- A closed-circuit television system on rapid transit cars to be monitored by the conductor from a protective booth. This proposal allows the conductor to view all cars on the trains without having to be physically present in the car. Direct contact would be possible with security personnel.

In addition, the following "in-house" work reports were made available to the City of Chicago. This material, where appropriate, was incorporated in the final reports of Carnegie-Mellon University and Loss Prevention Diagnostics, Inc. These reports were coincidentally sent to the Urban Mass Transportation Administration for their information:

Review and Analysis of Crime Profiles by Loss Prevention Diagnostics, Inc.

Existing Protection Resources-Chicago Transit Authority by Loss Prevention Diagnostics, Inc.

Stable State of the Art -- Review of Protection Hardware by Loss Prevention Diagnostics, Inc.

Perception of Crime on Mass Transportation by University of Illinois Survey Research Laboratory

II. SUMMARY OF CRIME ON THE CHICAGO TRANSIT AUTHORITY

The crimes examined in this report were limited to robbery, battery, assault, and crimes against persons which included murder, manslaughter, rape, and indecent exposure. Certain crimes such as theft and disorderly conduct were not included in the study because of the inability to readily get to the data, and secondly, because little data relevant to the CTA is presently being collected for particular crimes.

A brief breakdown of the composition of crime on the Chicago Transit Authority is presented below:

-- 75% of all crimes studied occurred on the rapid transit system;[1] ridership statistics indicate 61% use only the bus, 17% use only the rapid transit, and 22% use both facilities (transfers).[2]

-- 75% of the crimes studied on the rapid transit system were robberies, and approximately 20% were batteries; 52.5% of all crimes studied on buses were batteries and 40.4% were robberies.[3]

-- 55% of the crimes studied on the rapid transit system were committed on the North-South route and 39% of these were committed on the South Side "L" portion of this route which has eight of the 129 CTA stations examined in this Study. (See Map.)[4]

-- The average number of crimes (limited to those studied) on the rapid transit system was 7.2 per 1,000,000 entries; for buses the crime/ridership index was .7/1,000,000 riders.[5] The crime/ridership index for the various segments of the rapid transit system fluctuates widely:

[1]Carnegie-Mellon University, Improvement of Mass Transportation Security in Chicago, A Report to the City of Chicago, Department of Public Works (Pittsburg, Pa., 1973, p.48.

[2]CM, p.33.

[3]CM, Appendix A, Table 1.

[4]CM, p.48.

[5]CM, pp. 48, 200. The rapid transit had approximately 213 million rides, and the bus 700 million rides for the 18-month study period.

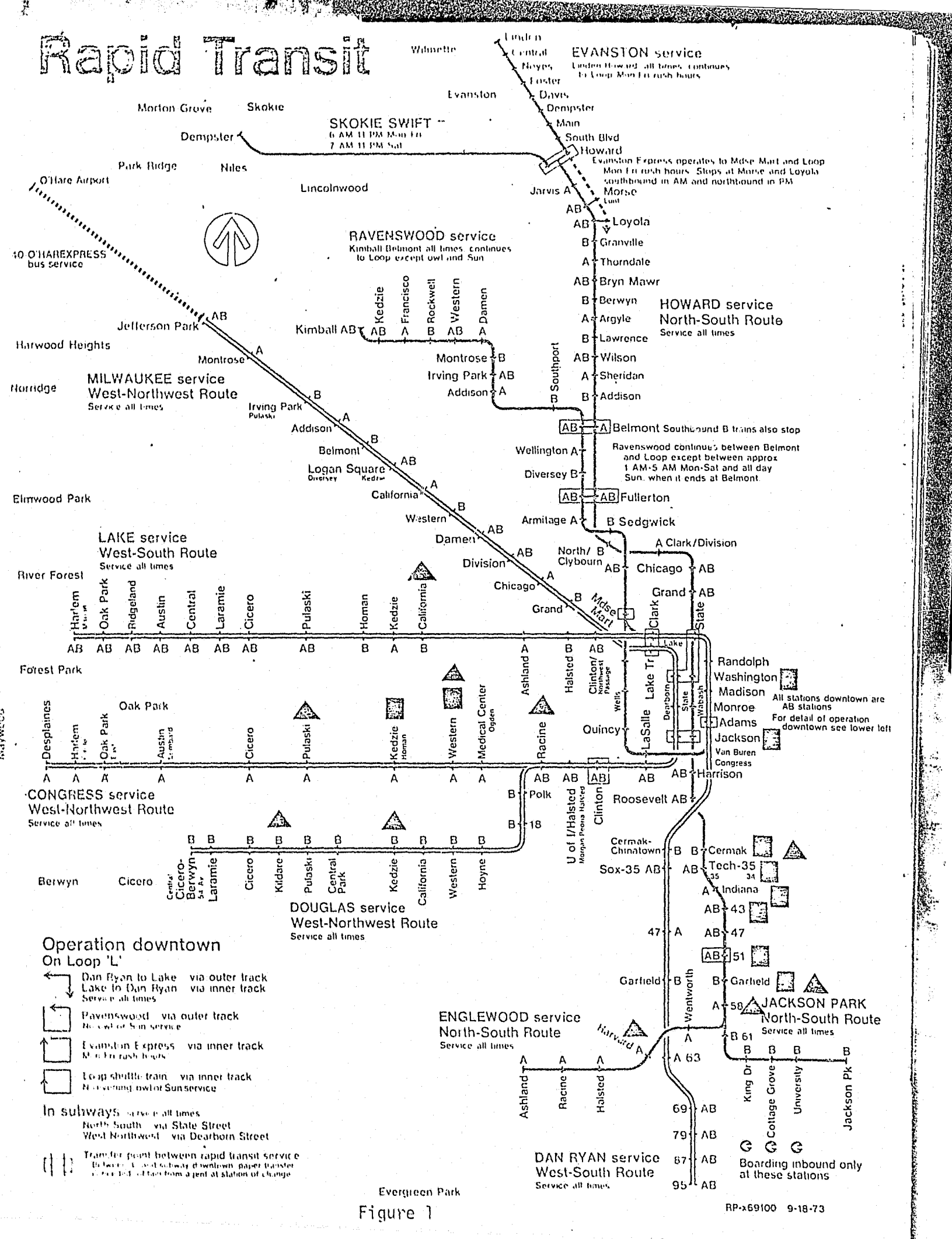

Rapid Transit
Wilmette
Linden
Central
Noyes
Foster
EVANSTON service
Linden Howard all times Continues to Loop Mon Fri rush hours
Evanston
Davis
Dempster
Main
South Blvd
Howard
Morton Grove
Skokie
SKOKIE SWIFT
6 AM 11 PM Mon Fri
7 AM 11 PM Sat
Dempster
Park Ridge
Niles
Lincolnwood
O'Hare Airport
40 O'HAREXPRESS bus service
Evanston Express operates to Mdse Mart and Loop Mon Fri rush hours Stops at Morse and Loyola southbound in AM and northbound in PM
Jarvis A
Morse
Loyola
Granville
Thorndale
Bryn Mawr
Berwyn
Argyle
Lawrence
Wilson
Sheridan
Addison
RAVENSWOOD service
Kimball Belmont all times continues to Loop except owl and Sun
HOWARD service
North-South Route
Service all times
Kedzie
Francisco
Rockwell
Western
Damen
Kimball
Jefferson Park
Harwood Heights
Montrose
Irving Park
Addison
Belmont
Southport
Norridge
MILWAUKEE service
West-Northwest Route
Service all times
Irving Park
Pulaski
Addison
Belmont
Logan Square
Kedzie
California
Western
Damen
Division
Chicago
Grand
Wellington
Diversey
Fullerton
Armitage
Sedgwick
Belmont Southbound B trains also stop
Ravenswood continues between Belmont and Loop except between approx 1 AM-5 AM Mon-Sat and all day Sun when it ends at Belmont
Elmwood Park
LAKE service
West-South Route
Service all times
North/ Clybourn
Clark/Division
Chicago
Grand
Mdse Mart
Clark
State
River Forest
Harlem
Oak Park
Ridgeland
Austin
Central
Laramie
Cicero
Pulaski
Homan
Kedzie
California
Forest Park
Lake
Randolph
Washington
Madison
Monroe
Adams
Jackson
Van Buren
Congress
Harrison
Ashland
Halsted
Clinton/ Northwest Passage
Lake Tr
Wells
Dearborn
State
Wabash
LaSalle
Quincy
All stations downtown are AB stations
For detail of operation downtown see lower left
Oak Park
Desplaines
Harlem
Oak Park
Austin
Cicero
Pulaski
Kedzie
Western
Medical Center
Racine
CONGRESS service
West-Northwest Route
Service all times
Polk
18
Roosevelt
Clinton
U of I/Halsted
Cermak-Chinatown
Cermak
Sox-35
Tech-35
Indiana
43
47
51
Garfield
JACKSON PARK
North-South Route
Service all times
Wentworth
Harvard
ENGLEWOOD service
North-South Route
Service all times
Berwyn
Cicero
Cicero-Berwyn
Laramie
Cicero
Kildare
Pulaski
Central Park
Kedzie
California
Western
Hoyne
DOUGLAS service
West-Northwest Route
Service all times
Ashland
Racine
Halsted
King Dr
Cottage Grove
University
Jackson Pk
Boarding inbound only at these stations
DAN RYAN service
West-South Route
Service all times
69
79
87
95
Evergreen Park
Operation downtown
On Loop 'L'
Dan Ryan to Lake via outer track
Lake to Dan Ryan via inner track
Service all times
Ravenswood via outer track
Not owl or Sun service
Evanston Express via inner track
Mon Fri rush hours
Loop shuttle train via inner track
Not operating owl or Sun service
In subways service all times
North South via State Street
West Northwest via Dearborn Street
Transfer point between rapid transit service
RP-x69100 9-18-73

Figure 1

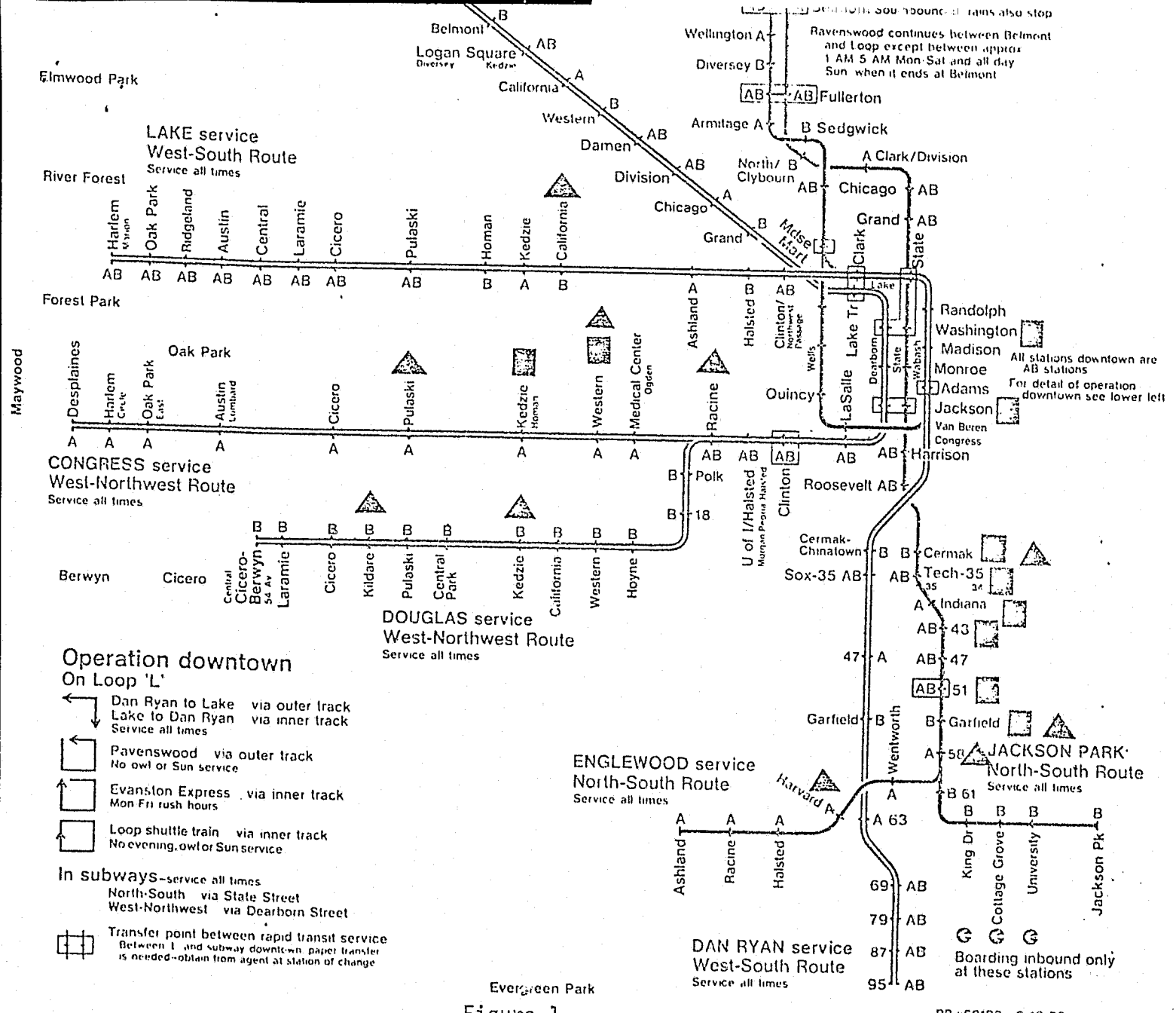


Figure 1

RP-x69100 9-18-73

10 Highest Crime Volume Stations

1. 43 on North-South Line
2. Cermak on North- South Line
3. Tech/35 on North-South Line
4. 51 on North-South Line
5. Washington on State Street Subway
6. Western on Congress Line
7. Jackson on State Street Subway
8. Kedzie on Congress Line
9.5 Garfield on North-South Line
9.5 Indiana on North-South Line

10 Highest Crime Risk Stations

1. Western on Congress Line
2. California on Lake-El Line
3. Kedzie on Douglas Line
4. Kildare on Douglas Line
5. Harvard on Englewood
6. Cermak on North-South Line
7. Racine on West-Northwest Subway
8. Pulaski on Congress Line
9. 58 on North-South Line
10. Garfield on North-South Line

North-South Line	-	9.3
North Segment	-	4.2
State Street	-	6.3
South Side "L"	-	27.4
Jackson Park	-	8.9
Englewood	-	14.1
West-Northwest Line	-	7.5
Milwaukee Subway	-	3.7
Milwaukee West El	-	2.2
Congress El	-	36.8
Douglas El	-	13.8
West-South Line	-	4.4
Lake El	-	10.1
Lake Subway	-	2.3
Dan Ryan	-	3.8
Ravenswood	-	3.0 [6]

The Western Station on the Congress had the highest risk ratio with a 91.4 crime/ridership per 1,000,000 entries.[7]

-- The crime/ridership index increases if one considers the number of persons who ride the system rather than the number of entries; entries do not indicate multiple exposure to crime by an individual who rides regularly. It has been estimated that about 228,000 persons make up the "rapid transit community" and therefore, may be a more accurate basis for computing crime risk. Based on robbery data for a single year, the risk index for the "rapid transit community" is 332/100,000; for comparison purposes, street robberies were 954/100,000 of the City's total population. The national average for street robberies for 1971 was 187/100,000 as computed by the FBI in its 1971 Uniform Crime Reports.[8]

-- 39 of the top one-third (43) rapid transit stations with the highest crime/ridership are in neighborhoods containing the highest and second highest street robbery rates and the highest and second highest unemployment rates.[9]

[6] CM, pp. 55-56.

[7] CM, Appendix A, Table 6.

[8] CM, pp. 196-197.

[9] CM, p. 74.

-- The rapid transit crimes studied tended to vary by day and hour of the day; 50% of all rapid transit robberies occurred on weekends, but assualts and batteries did not show as much of a peak. 67% of all robberies occurred between 6:00 p.m. to 12 midnight with the peak period occurring around midnight; batteries tended to begin and end earlier -- 4:00 p.m. to 10:00 a.m.[10]

-- Based on the crime/ridership index, weekend travel (Saturday and Sunday) is indicated as the most dangerous with the risk ratio being seven times greater on Saturday than on Wednesday (lowest ratio) when riding the rapid transit system.[11]

-- Based on the crime/ridership index, the most dangerous time of the day is between 8:00 p.m. and 5:00 a.m. -- for both rapid transit and bus riders. For rapid transit, the crime/ridership index is estimated to reach 225/1,000,000 for the 1:00 a.m. to 4:00 a.m. period.[12]

-- Victims of rapid transit crimes studied tended to be male (65.2%), white (54.4%), and between the ages of 21-50 (63.1%).[13]

-- Rapid transit crimes tended to be committed by lone individuals (48.7%), who were male (97.45), and between 16 and 30 years of age (79.7%).[14]

-- On the rapid transit system, 68% of all crimes studied occurred in the station and 64% of these occurred on the platform; the remaining crimes were located as follows: 16% on the stairs, between stairs and at the entrance, 17.5% in ticket booths, and 2.9% in "other" locations.[15]

-- Offenders tended to escape from the crime scene by leaving the transit system rather than using it as a means of escape, i.e. they tend to commit transit crimes in their own neighborhood making their escape "safer" than if committed on other segments of the system.[16]

[10] CM, pp.59-62.

[11] CM, p.65.

[12] CM, pp. 65-66.

[13] CM, Appendix A, Tables 17, 18, 19.

[14] CM, Appendix A, Tables 24, 25, 27.

[15] CM, Appendix A, Tables 31, 32.

[16] CM, p. 79.

-- Police response time was 5 minutes or less for 38.8% of the rapid transit crimes studied, 6 to 15 minutes for 22.9% of the crimes, 15 to 30 minutes for 13.7% of the crimes, 31 to 60 minutes for 8.7% of the crimes, 61 minutes to 3 hours for 7.4% of the crimes, 3 to 6 hours for 2.5% of the crimes, 6 to 12 hours for 2.5% of the crimes, and 12 to 24 hours for 3.8% of the crimes. Crimes of assault had the highest percentage (46.9) with five minutes or less police response.[17] (In understanding these figures, it must be kept in mind that police response is dependent on communication of an incident to them; response time comparisons indicated that the maximum probable response time for the older elevated structures was about 10 minutes longer than for any of the other types.)[18]

-- For crimes that were responded to quickly (five minutes or less), an apprehension occurred in over 60% of the cases.

-- Approximately 37% of all rapid transit robberies led to an apprehension.[19] For the City of Chicago, the apprehension rate for robberies for 1971 was 38.1%.[20]

[18]CM, p. 81.

[19]CM, Appendix A, Table 61.

[20]Chicago Police Department, Chicago Police Annual Report, 1971, Table 5.

III. PERCEPTION OF CRIME*

A major objective of the CTA Transit Security Study was an assessment of the public's attitude toward the CTA service -- particularly with regard to its perception of the level of crime occurring in the transit facilities and the general security of those facilities. The intent was to determine the extent to which an individual's perception of the incidence of transit crime was realistic and how this perception affected his ridership behavior. It was expected that information could be elicited which would help to identify the conditions necessary to attract riders to the CTA system.

A forty-five question, 19-page questionnaire was the instrument used to gather the information related to citizens' perception of security on the CTA. A total of 1,586 phone interviews were completed; persons were selected by a random digit dialing process which allows unlisted numbers to be included in the universe. In the following material, a summary of the results of the questionnaire is presented:

-- Among non-riders, security was cited by 21% as a reason for not riding the bus, and cited by 25% as a reason for not riding the rapid transit. 79% of the non-riders also cited the automobile as a reason for not riding mass transit.

-- 30% of bus-only riders cited the lack of security as a reason for not riding the L-subway; 16% of the L-subway only riders cited security on the bus as the reason they did not ride it.

-- Both bus and train users agree that the transit system is especially unsafe after 9 p.m.; the bus system and the rapid transit system are avoided by 89% of the respondents after that hour.

-- 15% of the bus only users rated security on the bus as poor to very poor, and 61% of the users rated the security good to very good; the remainder rated the system fair.

*The sources for this chapter are a combination of Carnegie-Mellon, Improvement of Mass Transit Security in Chicago, Chapter V, "The Public's Perception of CTA Security," and of technical working papers, computer printouts, and other unpublished materials.

-- 23% of the L-subway users rated security on the subway as poor to very poor, and 47% of the users rated the security as good to very good; the remainder rated the system fair.

-- Users of mass transportation rated the most insecure aspects of the transit system as being the stairs, rampways, and tunnels of the L-subway; the L-subway platforms and the L-subway trains (in increasing order of security). The most secure aspects of the system as seen by the users were while riding the bus, while going from home to public transportation system, and while waiting at the bus stop (in decreasing order of security).

-- The users of the system rated nine security measures as to their order of preference. Presence of police officers was the first choice followed by the "awareness" that quick assistance was at hand. The third choice was the deployment of police officers with K-9 dogs.

The other six options (listed in decreasing order of preference) were:

-- other passengers in the same car, and 2 car trains during non-rush hours (rated equally).

-- other people nearby on the platform, and other passengers nearby on the platform (rated equally).

-- more frequent trains.

-- better lighting

-- 70% of those interviewed cited the bus as the "safest" vehicle; 16% selected the L-subway trains.

-- The twenty police districts were ranked according to actual crime (robbery) and perceived crime with the result that riders living in high crime areas perceived the CTA as high in crime, while those living in the low crime areas perceived the CTA to be low in crime. In addition, higher income riders tended to rate the mass transit system as having a higher quality of security than the rating given by lower income riders.

IV. SURVEY OF SECURITY DEVICES AVAILABLE FOR USE ON THE CHICAGO TRANSIT AUTHORITY

An examination of security devices presently on the market revealed the following security devices, structures, and procedures exist that complement, supplement, and in some cases duplicate each other.

-- Access control devices prevent the movement of people into certain areas.

-- Alarms are aimed at thwarting unauthorized activity by locally announcing that such an activity has been activated.

-- Apprehension devices include responsive devices which may be used to facilitate the apprehension of a suspect shortly after a crime has been committed. (On-site police officers are included in this category.)

-- Communications devices comprise three categories:

1. security force communications devices are used by security forces to coordinate activities, report incidents, and deploy men in the transit system. They require the installation of a lossy line;

2. passenger activated communication devices include public alarms and emergency telephones;

3. automatic communication devices.

-- Event recorders are used to temporarily record activity in certain areas of the system.

-- Exit or escape devices permit a threatened passenger to physically remove himself from contact with other persons.

-- Identification devices include routine identification devices which provide detailed information as to who is on the system, and responsive identification devices which record a criminal act in progress.

-- Intrusion detection devices and perimeter protection devices are designed to detect the presence of a human within a fixed space or as he crosses a boundary defining such a space, whenever this space has been closed to public use.

-- Lockers and safes provide safekeeping for passenger's valuables while waiting for a train.

*The sources for this chapter are Carnegie-Mellon, Improvement of Mass Transit Security in Chicago, Chapter IV, "Survey of Security Devices Available for Use on the CTA", and Loss Prevention Diagnostics, Inc. Three Solution in Reduction of Criminal Opportunity in Mass Transportation.

-- No-hide architecture includes architectural features which are designed to prevent a person from lying in wait for a victim or from escaping detection during and after a crime.

-- Passenger flow controls include moveable platform partitions which permit the use of large station areas during heavy use periods, while restricting passengers into small self-protective groupings during off hours.

-- Rerouting or misrouting alarm devices indicate whether a transit vehicle has been delayed, is proceeding too rapidly, or has taken an improper or unusual route.

-- Surveillance devices include devices by which an area can be continuously watched and/or listened to from a remote location.

-- Vandal-resistant materials, though not exclusively of a security nature, would overlap with other categories listed above.

Not all security measures listed above may be properly termed devices. Indeed, it would seem more appropriate to call some of them structures or procedures. Regardless of their designation, however, they tend to contribute to passenger security and therefore must be considered. Many of the devices imply certain security procedures which were not mentioned explicitly. It is important to remember that a particular device may be used according to several different security procedures which give it different degrees of effectiveness. For example, the installation of the lossy line in the subway tunnels will have no effect on security unless police with radios are present on the trains within the tunnel. Conversely, a liberal scattering of police throughout the system would be less effective without adequate communication between them.

This research segment of the Study was a continual process that went into greater depth as the field of alternatives was narrowed

down by the consultants. The initial requirement in the contract was aimed more at developing a state of mind and knowledge, rather than the ultimate work product that came with completion of the task.

V. EXISTING SECURITY DEVICES ON THE CHICAGO TRANSIT AUTHORITY*

Carnegie-Mellon and Loss Prevention Diagnostics, Inc. examined the CTA security system. Both reported a nearly identical picture with both agreeing, independently, that communication was a major obstacle to an effective security system. The following material highlights the major characteristics of the existing system:

-- Transit security operations are divided between the Chicago Police Department's district command, the Mass Transit Unit in the Chicago Police Department, and the Security Division of the Chicago Transit Authority.

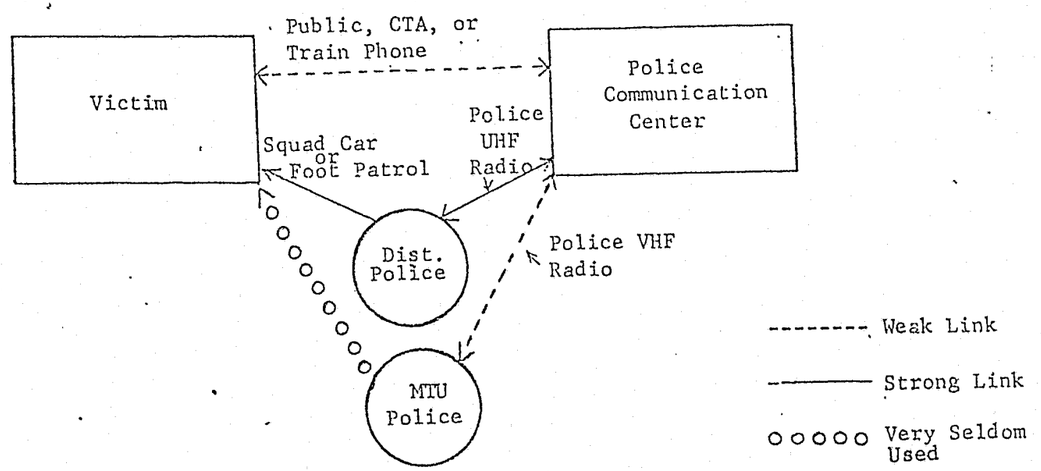
-- The C.P.D. district command is responsible for patrolling on the hour any rapid transit station contained in its patrol beat. District patrolmen also periodically stop buses for inspection purposes and are solely responsible for responding to crimes on buses.)

-- The Mass Transit Unit (MTU) of the Chicago Police Department augments district patrol capability re: the CTA. The MTU has patrol responsibility for all areas of the L-Subway system and outlying rapid transit platforms. The MTU has officers assigned to patrol posts throughout the rapid transit system; the patrol posts are both fixed and mobile. The MTU consist of approximately 250 full-time officers.

-- The CTA Security Division consists of approximately 60 members who are responsible for protecting CTA property with only incidental involvement in controlling crimes connected with CTA personnel and patrons.

-- A major aspect of a security system is the communication network provided between the patron and the response agency; the existing communication security system on the CTA presently contains several inadequacies as illustrated in the following design:

*The sources for this chapter are Carnegie-Mellon, Improvement of Mass Transit Security in Chicago, Chapter III; "Existing Security Devices on the Chicago Transit Authority", and Loss Prevention Diagnostic, Inc. Existing Protection Resources Chicago Transit Authority.



Existing Chicago Crime Communication and Response System

-- The limited communication capability of the MTU makes it largely an "on-site" response agency; emergency calls for assistance while on the CTA are largely the responsibility of the district patrol units.

-- In non-peak hours, train length is limited to two cars resulting in a CTA employee being present on each car. The "skip-stop" pattern used in rush hours is in non-peak hours replaced by "all stop" trains in an effort to eliminate long waits on the platform. A by-product of this change is that train travel time is increased.

VI. RECOMMENDATIONS FOR PHASE II

Objective of the Demonstration:

The overall objectives of any study demonstration of transit crime as it relates to transit's acceptability and use must neccessarily straddle both the question of crime control and that of system image. Regardless of the success attained in reducing crime, the public's appraisal of personal security on the system must improve if the demonstration is to be judged at all effective. More precisely, one objective is to reduce, control, and/or deter the occurrence of serious crime on the system at high risk locations and at the times when it is most likely to occur. A companion objective is to improve the public's perception of security on the system not only by the actual control of crime, but by ensuring that the public is aware of all efforts to do so.

Many social and economic considerations highlight the importance of attaining these objectives and one of those that readily comes to mind is the energy crisis. The energy crisis will of necessity increase ridership, and the increased ridership may also entail an intensification of the security problem. It is thus of the utmost importance to take measures to increase security on mass transportation and to improve the public's percention of security on the system.

The Recommendations:

Demonstration No. 1 -- The Teleview Alert System. The T.V.A. system is intended to eliminate the weak communication link that presently exists between a concerned CTA rapid transit passenger and the police. The improved communication will enable the police

to respond more quickly to requests for aid. The speedy response would improve the public's perception of security on the transit lines, and also deter crime by improving the police apprehension capability regarding transit incidents.

Placement of the demonstration of the TVA system was thoroughly discussed by the Transit Security Committee. Carnegie-Mellon University recommended several individual locations based on a patron-risk formula (station crime/station ridership). The Committee examined all data and determined that the areas with the largest volume of crimes had the greater effect on citizen's perception and thus their decision not to ride the system. As a result, stations on the southern portion of the North-South line were focused upon. This section of the system includes eight stations which contain 23.5% of all robberies and 21.2% of all crimes studied on the rapid transit system for the 18-month period. Only 5.6% of the riders are credited to this section of the CTA system. The southern portion of the North-South line has a risk ratio of 27.4% (crimes/100,000 entries) compared to a systemwide ratio of 7.2%. Only the Congress Line with half the ridership and nearly 100 fewer crimes has a higher line risk ratio for crimes studied (36.8/100,000 entries).

The teleview alert system consists of four primary items; a public address system, a push/pull emergency alarm, an emergency telephone, and a closed-circuit television system. These items will be supplemented by good lighting and highly visible signs making prominent the existence of the installed devices. Such a coordinated system will provide the public with an emergency phone and

an alarm system for a quick and efficient method of communicating with the authorities in the event of trouble. Television coverage will provide the police with a method of determining the legitimacy of the alarm, and, by recording events, with a reference for describing the event and the offender. The cost of Demonstration 1 is estimated to be $1,299,520.*

• Demonstration No. 2 -- The Emergency Telephone and Ticket Agent/Alarm/Intercom System. The Transit Security Study Committee determined, based on the data gathered by the consultants and on the recommendations of the consultants, that an alternative demonstration project was desirable at stations with low ridership but comparatively high crime risk levels.

Carnegie-Mellon University developed a ranking system based on patron risk. This involved simply computing that ratio of station crime to station ridership. The results indicate what risk a patron faces at each station. The results of this ranking show that the stations with the highest risk factor are largely not the stations with the high crime levels. The top four stations in terms of crime volume, 43rd Street, Cermak, Tech/35, and 51st Street, which are on the southern portion of the North-South Line, rank 15, 6, 24, and 22 respectively on the crime/ridership index, while the four high risk stations, Western on the Congress, California on the Lake, Kedzie on the Douglas, and Kildare on the Douglas, rank 6, 23, 11, and 39

*This figure does not include the cost of the evaluation study, project reports, nor contingency.

respectively in terms of crime volume. On these eight stations, the actual crime levels for the period studied decreased in the following manner:

	Total Volume	Risk Ranking	Volume Ranking
43rd Street (North-South Line)	52	15	1
Cermak (North-South Line)	48	6	2
Tech/35th (North-South Line)	47	24	3
51st Street (North-South Line)	45	22	4
Western (Congress Line)	43	1	6
Kedzie (Douglas Line)	34	3	23
California (Lake Line)	19	2	11
Kildare (Douglas)	13	4	39

It was determined that a second demonstration would be of a far lesser magnitude than Demonstration No. 1 because it would have less affect on ridership volume. In this context, it was decided that an emergency telephone and a highly advanced ticket agent alarm/intercom system should be installed.

Demonstration No. 2 is a ticket agent/alarm communications system. It would increase both agent security and the crime prevention role of employees. It would consist of two separate intercoms and a "silent" emergency alarm to link the agent to the Chicago Police Department zone dispatcher and to his supervisor. This system will be tested as to its own merits and as a control for comparison with the Teleview Alert System. The cost of Demonstration No. 2 is estimated to be $115,000.*

*This figure does not include the cost of the evaluation study, project reports, nor contingency.

VII. RATIONALE FOR PHASE II

The selection of Demonstrations 1 & 2 is justified by the security needs of the system, by the security approaches available, by the perception of crime by the citizenry, and by the nature of crime on the CTA. The easiest determination that had to be made was that of the actual location of the system.

The question of securing the bus aspect of the CTA can be eliminated on the grounds that rapid transit crime outstrips bus crime 3 to 1[21] and that risk on the rapid transit is 10 to 1 greater than that on the bus system.[22] Moreover, this reality of crime is supported by the fact that the riders and non-riders alike view the bus as a much safer mode than the rapid transit system. Sixty-seven percent of those questioned in the survey selected the bus system as the safest system while only 17% selected the rapid transit system.

Similarly, on the rapid transit system, the occurrence of crime, the perception of crime, and the evaluation of the existing security network easily indicated the location of any demonstration. Stations and particularly the platforms on the rapid transit are recognized by the citizenry as the unsafest part of the system. Present statistics corroborate this evaluation. Complementing this data is the fact that a major void in the present security system exists in that patrons have no direct means of contacting security forces while waiting on the platform or upon disembarking from a rapid transit car. In Demonstration 1 and 2, this void is addressed in various degrees.

[21] CM, p.48.

[22] CM, p.200.

The choice of the specific devices in Demonstrations 1 and 2 is largely based on the alternatives available as they relate to the specific security needs. The attitude survey indicated that on-site police patrols were the first security choice among riders as well as non-riders. The difficulty with implementing such a proposal is that it is highly expensive and does not necessarily provide the surveillance capability that Demonstration No. 1 would provide.

Assuming that 24-hour, 7 days a week police patrol surveillance were provided, the cost would equal the amount it takes to monitor the teleview alert system, but the teleview alert monitor has the capability of surveying up to ten stations with this amount of manpower. The annual cost of one man patrolling a station around-the-clock approximates $160,000 in the City of Chicago.* Demonstration No. 1 intends to cover four stations. On-site police protection for the same number of stations would cost approximately $640,000 per year. After three years of manned patrol, the cost of the two approaches is nearly equal and, in the following year, the manned patrol for these four stations would cost about three times that of the teleview alert system. Moreover, the teleview alert system can be expanded to at least ten stations without increasing manpower, but manned patrols would cost $1.6 million per year for the same ten stations.

The above figures are not presented to suggest that manned patrols do not deter crime; they obviously provide one with excellent response

*These figures are only estimates based on current data.

capability as the figures on the Medical Center of the Congress Line indicate.[23] But the manned patrol is not omni-present: patrols are largely limited to on-site response. In contrast, Demonstration No. 1 has the capability of being at several different spots at once. Moreover, the data of the Phase I study indicated that police response on the system is not a major problem for the security forces once a crime has been communicated. Earlier, it was indicated that apprehensions occur twice as frequently if the incident was communicated within minutes of occurrence. In summary, manned police patrols would prove to be far more costly in a very short time than Demonstration No. 1, and would provide a capability that would duplicate an existing strength of the system.

In addition to the above strength of Demonstration No. 1, it also has the technological capability of providing the necessary surveillance and eliminates the existing communication void on outlying platforms. Many other electronic devices were examined but, individually, they did not have the necessary characteristics to provide the desired security.

The alarm systems analyzed were plagued by false alarms and lack of information from the incident scene. Phone systems by themselves are subject to false alarms and vandalism -- with only verbal information available from the scene. Standard closed circuit television systems by themselves are hampered by the monitor operator's

[23]The crime level at this station is only 15 while the stations adjacent to it have crime levels of 43 (Western), 40 (Kedzie), and 31 (Pulaski); the crime ridership for these four stations is: Medical Center 9.4, Western 91.4, Kedzie 33.3, and Pulaski 38.5. CM, Appendix A, Tables 6 and 7.

viewing fatigue, while providing no verbal communication with the viewed area. Although each of these alternatives could ~~possibly~~ have a favorable effect on the public's perception of security, none of the available electronic countermeasures can effectively meet all the problems encountered in securing an area accessible to the general public. What is needed is a "total" system which will:

-- Permit a witness or victim to notify the police quickly, efficiently, and in some cases inconspicuously, thereby increasing the public's perception of security as well as actual security.

-- Provide the police with a reliable description of the offense, the offender, and the situation that exists before they arrive on the scene.

-- Reduce the number of false alarms and amount of vandalism so that the police can devote more time to legitimate calls.

-- Minimize increments in manpower costs necessary to effectively accomplish the above.

The available electronic systems do not meet these needs individually, but a combination of them holds considerable promise, and we have termed this combination, the "televiewalert system". We feel this system will meet the citizens' second choice for a security system in that it will provide the knowledge that "help is close at hand".

The rationale behind Demonstration No. 2 is to provide a system that eliminates the communication void on the platform and that gives the ticket agent the capability of aiding the security effort. It is felt that some effort must be made to improve security, but that that effort must reflect usage of the system. Secondly, Demonstration No. 2 is viewed as a control for Demonstration No. 1; evaluation will be made as to ridership, relative volume of crime, false alarms, apprehensions, and ridership perception of security. It is hoped that some cost efficiency results would become available.

VIII. PARAMETERS FOR SUCCESS

Since the aim of Demonstrations No. 1 and 2 is to provide a safe transit environment and thereby increase ridership, it is necessary to develop certain indicators of success. In this study, the effectiveness of the success of Phase II and the various devices used will be measured by the following indicators:

-- The actual amount of use the various mechanisms receive.

-- Patrons' subjective feelings of increased personal security.

-- The change in the rate of crime on the properties where the program or part of the program is being tested.

-- The number of crimes thwarted and criminals apprehended through the use of the program or some aspect thereof.

-- The increase of patrons riding in base periods and off-rush periods of the day.*

The fundamental concern of this Section is to present guidelines for assessing the costs and benefits, both quantitative and qualitative, of the suggested methods for reducing CTA rapid transit crime. It will be on this information that decisions could be made as to the relative cost-effectiveness of these proposals. To produce such information will require a considerable expansion of the data base now available, and the devising of experimental procedures that will facilitate the measurement of the impacts of the installed systems.

*Indicators will have to be devised to determine the extent of increased ridership which can be attributed to other factors, the energy crisis, for instance. This should be facilitated by the counts the CTA has been keeping on ridership since the first Sunday service stations have been closed down, December 2, 1973.

The discussion of these matters that follows is divided in three sections concerning the transit rider, the operator and society as a whole, and a framework for analysis.

1. Transit User Impact

The transit rider would be the major beneficiary of the proposed investments in rapid transit security systems. It is assumed that an improvement in the perceived security of the transit system would not only make the rider feel safer while using it, but also offer him real options for changing his transit trip-taking to better suit his needs. This would include riding transit more frequently and riding during times that would previously have been avoided. Non-riders may also be attracted to transit if the perceived reduction in the danger associated with using it is great enough. Very little is known about the elasticity of transit demand with respect to changes in levels of security. However, the results of interviews conducted for this project indicate a widespread concern with transit security. Hence, a substantial increase in transit patronage may be expected after the installation of new security devices and the introduction of new surveillance procedures.

The ridership data that is to be collected should be sufficiently detailed to enable estimates to be made of the increase in the number of rides taken, the number of new riders, the extent of shifting trips from one time to another, and the extent of shifting trips from less secure to more secure stations. For the additional trips taken, it would be of interest to find out how many of them were

diverted and previously taken by auto. If large enough, these diversions could result in sizeable savings relating to auto use such as operating costs, congestion costs, pollution, and fuel. Even the shifted trips represent real benefits since, in the one case, the rider's mobility is enhanced and, in the second case, his feeling of security while riding is increased.

In order to determine the ridership impacts of the new security installations, there will have to be a much broader data base than is now available, a continuous dialogue with the riding public, and an adequate modeling and experimental methodology. The data base should include entering and exiting rider volumes for all stations on a 24-hour, 7 days a week basis. It would be preferable to have hourly counts as well, although taking such counts once a week would be sufficient. Since the routes and stations in which no changes were made would act as a control, and because the redistribution of crime from affected to unaffected stations and/or ridership from unaffected to affected stations may take place, it becomes essential to collect this data for all stations.

The gathering of hard ridership data should be supplemented by continuing interviews with the riding and non-riding public. These contacts would provide information on changes in perception and attitudes, and changes in transit and auto usage resulting from the improved perception of rapid transit security. Of special importance is the identification of the types of people who are most and least affected by the changes. Relative to this would be a comparison of the new perceptions with the new crime levels to determine whether the disparity between the two remains.

Ridership changes are caused by a variety of factors, only one of which is the level of perceived security. To isolate the effect of this variable from the others, a model will be devised which will be able to account for most of the variation or fluctuation in usage. This may take the form of a linear regression equation where ridership would be determined by seasonal and climatic conditions, and a trend factor. Over the long term, the model will have also to take account of factors such as transit fares.

Moreover, there will be a number of indirect benefits resulting from the reduced incidence of crime, including reductions in costs associated with hospitalization, loss of workdays, police time, and prosecution. A decrease in vandalism would mean reduction in the cost of CTA maintenance and repair staff. Because of the selective and limited application of the initial systems, some of the crime that would have occurred on stations with new installations may be shifted to those that are not covered in this way. Such effects must be carefully measured and their costs be deducted from the benefits described above.

Displacement

Another source of potential benefits is that involved with reduced auto usage. If the diversion from auto to transit becomes significant, then account should be taken of the reduction in congestion, in pollution and fuel consumption, and in the time savings of those continuing to use their autos.

2. Evaluation Framework

A rigorous assessment of the merits of the various security systems should be done in a framework in which all impacts could be

considered. As an aid to the decision maker, those effects that are quantifiable are put in a form that facilitates comparisons among alternative systems. It may be quite difficult to separate the impacts of systems which are used simultaneously. However, the results from control locations where only one device was installed, (i.e. emergency phone only) should be helpful in making these estimates. Once this is done, the discounted stream of benefits and costs can be used to compute a benefit-cost ratio. Because of the high initial capital outlays, these ratios are expected to be quite small, certainly less than one.

Investments of this type cannot in all likelihood be justified on the basis of quantifiable cash benefits that would accrue. To offset a demonstration cost of $2.5 million, for example, ridership would either have to increase by 5 million rides annually or conversely, a loss of 5 million rides would have to be averted through the introduction of security measures. It is unlikely over the short run that such revenue benefits would result. However, if 1,500 rides per day or about 550,000 rides per year were added or retained as a direct result of the security system, then the capital security improvement would have gone a long way towards paying for itself in ten years. (As with many public investments, non-quantifiable or intangible effects are often far more important than the quantifiable ones, and it is therefore often considered sufficient if the annualized measurable benefits exceed the annualized operating and maintenance costs.)

Within the decision framework, a panel of experts can evaluate the non-measurable effects, perhaps by use of the Delphi technique. In this way, these factors can be weighted along with those previously measured, and an overall assessment be made. It is important to note the decision process would not occur in one point in time but would rather extend over the course of the experiment, reacting to the continuous flow of data.

IX. NATIONAL APPLICABILITY

The demonstration being proposed is a program that has general applicability to any mass transit line. None of the projects or devices being considered are especially designed for unique conditions in Chicago. Rather, the materials used are "on-the-shelf" items that can be installed in any mass transit system.

Not only is the program universally implementable, but the results will shed light on a problem common to all major urban centers with a public transportation system. The fact that a selected system results in deterring mass transit crime and provides patrons with a greater sense of security will not only be relevant to Chicago but also to New York, Boston, Philadelphia, and other large cities.

Chicago is an ideal place to demonstrate such a program because of its commonality in terms of crime and mass transit with other major urban centers. Chicago is not unique in the crime problems that it faces.

Finally, the Chicago Transit Authority is an appropriate place for demonstration because of its comprehensive nature. Represented within the CTA system are examples of the different types of rapid transit systems used nationally including subways, elevated tracts, median strips and ground-level systems. This diversity allows other systems that may be more limited in service to use the evidence resulting from the demonstration of the project in Chicago.

END