

An Eye on Philadelphia: CCTV Scans the Subway

Protecting transit system commuters requires advanced methods of surveillance and communication. Philadelphia has taken a major step in combatting the criminal threat by coupling electronics with armed police forces.

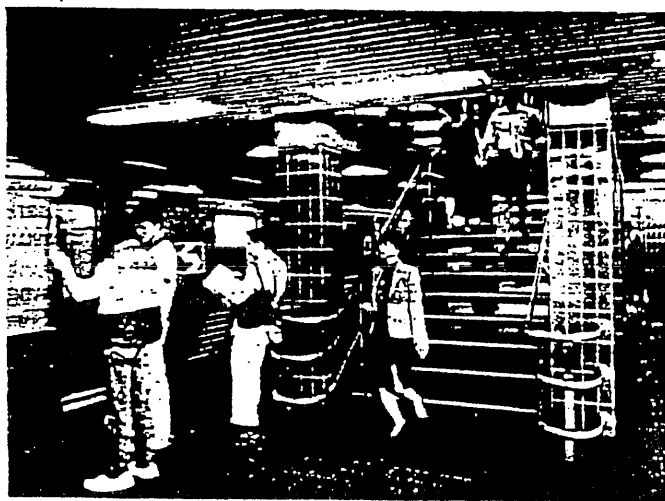
By G.I. Forstater

In 1980, a woman lawyer was raped and seriously beaten in a Philadelphia subway station. Both paralyzed and unconscious, she was not found for more than 24 hours. The brutal act spurred public demand for transit protection.

The incident, while sensational, was not isolated. In 1981, 595 serious crimes were reported on the city's transit system. The number is high, but still relatively small in relation to the million-plus daily riders on the complex of bus, rapid transit and regional rail lines. A 31 percent reduction in 1982 was welcome, but still left 409 crime victims.

Maintaining and increasing rapid transit ridership depends on the confidence commuters have in their own personal safety and protection. While criminal activity on the system cannot be fully controlled, it can be subdued. As public pressure continued, a plan was hatched.

A \$12,000,000 project has been formulated to provide Philadelphia with the largest computerized television surveillance system, in the world. The system, designed to eventually



The Tasker-Morris Station on Philadelphia's Broad Street subway was the first to be completed in an 11-station, \$20-million project to bring old facilities up to modern, bright, attractive and safe condition. According to the Southeastern Pennsylvania Transportation Authority, the need for improved security prompted many important design decisions. The most noticeable here is the new stairway construction, with the old bulkhead-type stairs replaced by open-riser stairs that can be seen through and not hidden behind. The SEPTA took advantage of this renovation program to begin implementation of its new CCTV security system.

comprise 1,450 cameras covering all stations in the subway and transit system, will be monitored by more than a dozen surveillance operators. The cost of implementing and maintaining the system, while high, may be extremely small compared to potential liability payments resulting from the inaction of governmental

agencies in protecting the public.

Philadelphia is a composite of two cities, the first underground and the second at and above street level. The underground city, extending at some points to a depth of almost 90 feet, is comprised of multi-lane subway tracks and extensive concourses and lobbies. Lower light levels and hidden pathways present substantial opportunities for successful assault, mugging, pocket-picking and other criminal behavior.

The second city, above ground, serves as the primary location for the monitoring of the underground's emergency and distress signals. Communications between the two cities utilize fire and intrusion alarms, radios, public address systems and closed-circuit television.

Safe and secure transportation requires a combination of sophisticated electronic protection and, especially, trained enforcement personnel devoted to public safety.

The Southeastern Pennsylvania Transportation Authority (SEPTA) uses a special police force for patrolling underground as well as above-ground areas. Coordinating with the

SEPTA, the Philadelphia Police Department's Transit Police are deployed to enforce laws and monitor commuter areas.

Both the SEPTA and Transit police forces must offer a sense of protection to every rider.

Law Enforcement Perspective

The efforts of the SEPTA and Transit police units are coordinated, and both groups are being upgraded to better protect Philadelphia's commuting public. The SEPTA force's status was changed last year, and its officers can now carry weapons and make arrests. The Philadelphia Crime Task Force, meanwhile, has recommended that the Transit Police be made an elite force.

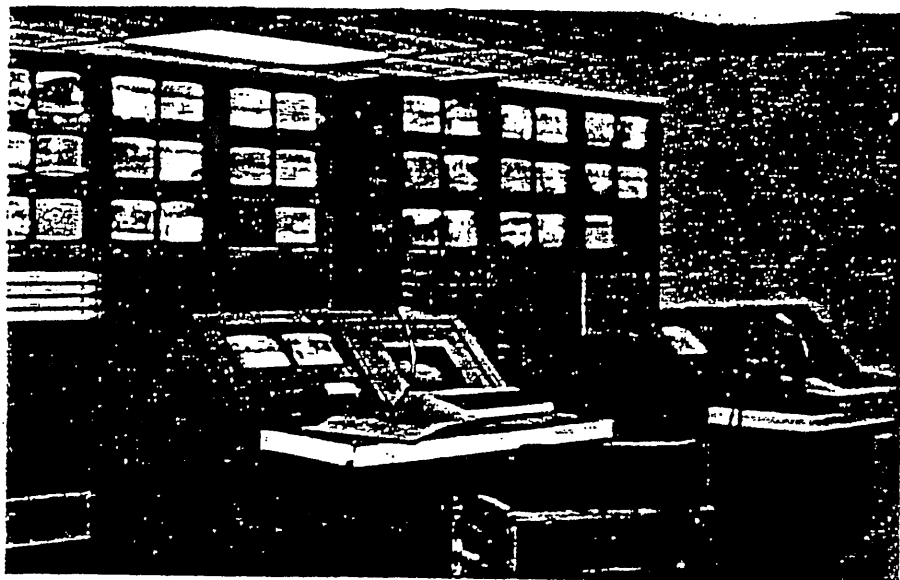
To further enhance these changes, the force is being given the manpower it needs to do its job properly. The SEPTA utilizes approximately 125 people, including detectives and a plainclothes contingent. Chief of Security Tom Smith indicates that "the most serious incidents we face are pickpockets, muggers in concourses and sexual molesters," with pocketpicking the most prevalent criminal activity.

Chief Smith is adamant in his feeling that uniformed police officers are a deterrent to possible crime, stating that "One uniformed officer is better than 20 in plain clothes."

The Philadelphia Police Department's Transit Police are used as a special division in the underground and above-ground commuter stations and vehicles. Captain Karl Filacheck indicates that his 250 personnel are "deployed for crowds and the expected heavy-volume traffic, but real problems occur when the platforms or concourses are empty."

Filacheck agrees with Smith that the predominant threats are pickpockets and muggers, primarily purse

G.I. Forstater, an electrical engineer, was personally involved in the design of both the computer-controlled video system and the commuter rail connection security console and audio evacuation systems described in this article. He is employed by the Sigel Group, the engineering/architectural firm in Pennsylvania that was retained to design the computer systems and software.



(Above) In City Hall, signals from 114 CCTV cameras at 11 stations on Philadelphia's two main subway lines are received. The 6,000-square-foot facility is designed for expansion to accommodate 12 operators and 3 supervisors, monitoring a total of 1,450 cameras. (Right) Philadelphia's City Hall is the site of the monitoring facility for the rapid transit system's new computerized CCTV security system.

snatchers. When an incident occurs involving bodily injury, he stated, "The public usually does not realize that the victim was alone. There is great truth to safety in numbers."

The real physical problem in providing security, according to Capt. Filacheck, is the geography of the stations. The lobbies and concourses offer nooks and crannies to hide in before and after perpetrating a crime. "It is, of course, very difficult to man each and every point," he noted.

The Crime Watch

To supplement the police forces and help cover the obscure hiding places, closed-circuit television monitoring was first installed in a few Philadelphia transit stations in 1979. Today, the dominant feature of the upgraded electronic protection system is the computerized CCTV monitoring system installed in 1982 at City Hall.

The \$12-million project, when completed, will involve 1,450 cameras at virtually all subway stations, commuter terminals, suburban con-



nection points and other stations. The first phase, representing an investment of about \$2 million, includes 114 cameras at 11 stations, monitoring consoles and communications lines. The headquarters rooms, complete with raised floors and a Halon fire protection system, have been laid out to accommodate further additions to the full system.

The system utilizes a mainframe computer and advanced multiplexed data communications to remotely control camera switchers located in the subway stations. The digital data, transmitted on specially installed communication lines, is decoded at the subway station where the appropriate camera is activated.

Two operators and a supervisor,

CCTV Operating Costs Overshadow Equipment Costs

working from their consoles, may select the appropriate camera to monitor a preferred area. Upon sighting an incident, the operator feeds information into the computer to register the incident in the data base and provide a record of the event. Entering an emergency-incident-in-progress report will automatically call the police for armed response.

An operator may request to view any camera on his surveillance screen. The time to access the camera picture is less than one second, making the system very effective for surveillance and incident documentation.

Cameras are currently installed on platforms and turnstile areas of key stations on the Broad Street and Market Street subway lines. These two routes, the most heavily traveled in the city with some 353,000 riders per day, require more than simple television surveillance.

Supplementary Protection

Public address capabilities are offered at many stations to inform a possible assailant or suspicious individual that he is being watched. This action is done at the City Hall CCTV surveillance location, with camera selection automatically providing access to the speakers at that station. Selective zoning of speakers is planned for

the future. Capt. Filacheck feels that "the assailant doesn't know how close an officer is, but he knows he is being watched by television and questioned through the public address system."

Filacheck also pointed out that "An operator can legally be used as a witness, as if he were on the platform." In addition to the recording of evidence, however, Filacheck said that the interface with television surveillance and public address is "a big brother idea. You never know how many crimes have been prevented by CCTV, or by uniformed police, due to the deterrent effect."

When fully implemented, the CCTV equipment cost will be quickly overshadowed by the cost of operators. The current costs — a staff of 12 (three on each of four shifts to cover 24-hour, seven-day operations) plus maintenance and overhead, runs to about \$1 million a year. These costs will be watched closely before the system is expanded.

The fully operational system will employ 12 operators and 3 supervisors on each shift, plus an in-house maintenance crew of 16.

Police Communication

The backbone of effective police enforcement must be the communication lines between the command

center and the officers on patrol. Due to the sub-terrain level, enormous amounts of steel, and significant numbers of small spaces and corridors, underground radio-frequency communications are difficult. Normal frequencies tend to bounce or reflect in patterns that destroy clear communications.

A new cable system is being installed to alleviate dead spots in several concourse areas, according to Capt. Filacheck. This involves a looping type of antenna system that will provide a significantly greater amount of gain during transmission to the hand-held radios. To reduce problems in cross-communications, several frequencies are available for SEPTA, Transit and street-level police use.

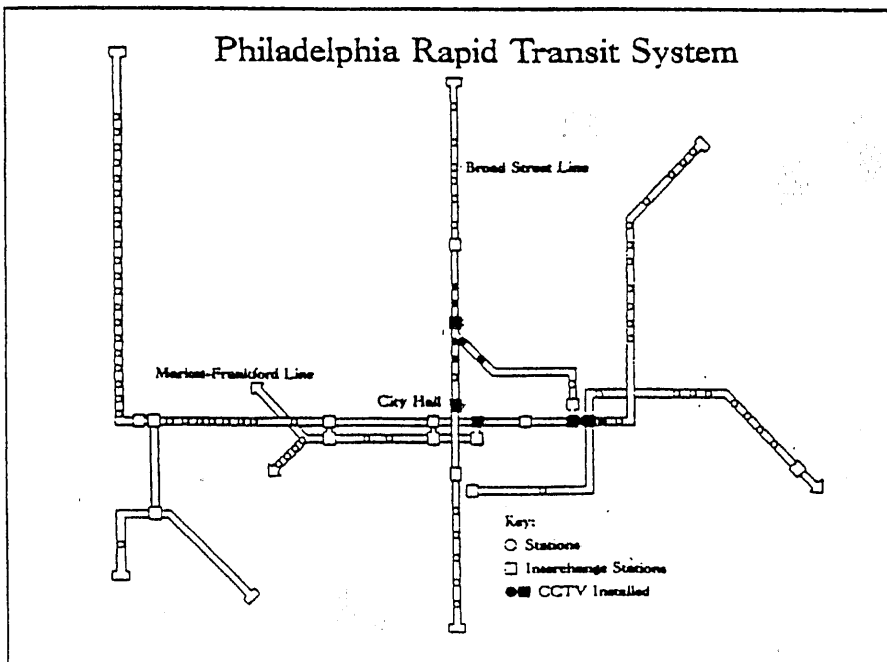
Any urgent request for aid is thus retransmitted from one police radio

Transit Security

"From a historical viewpoint, crime on mass transit systems is not a new phenomenon. The type of crime, however, with which the public seemed concerned changed over time. Prior to World War II, most concern was expressed over pocket-picking, a non-violent crime. After World War II, the concern shifted to acts of violent crime — robbery, assaults, etc.

However, while concern about different types of crime changed, the response from authorities didn't. Whenever crime became a problem, more police were added to patrol the systems. It was not until the late 1960s and early 1970s that major studies of mass transit crime were undertaken, primarily because of pressure from employee unions and the rising cost of vandalism to transit properties."

The quote is taken from the "History of Transit Security" chapter in the *Transit Security Guidelines Manual*, a massive 600-page looseleaf volume published in 1979 by the American Public Transit Association. Although out of print, the manual is being updated. Announcement of its availability will be carried in *Security World*.



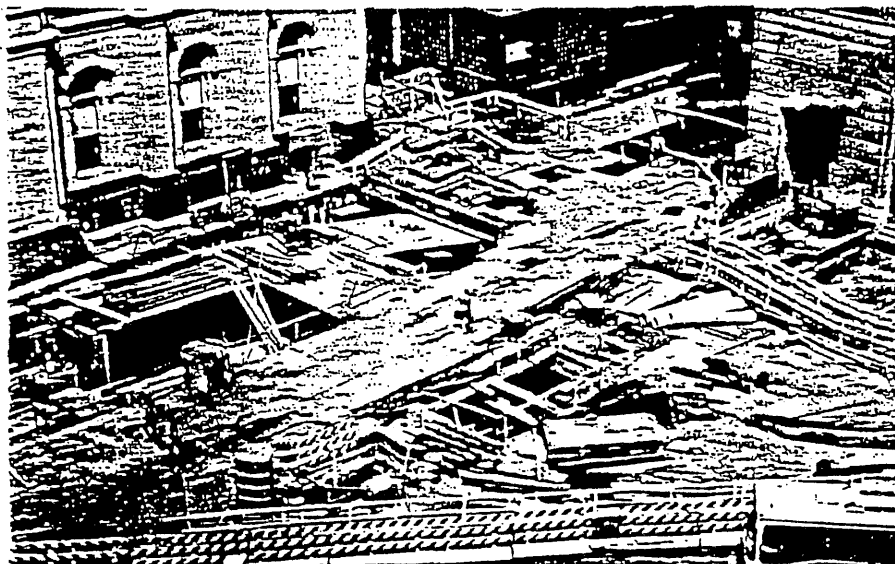
Eleven stations on Philadelphia's Market and Broad Street subway lines have installed CCTV cameras. Monitoring is handled at consoles in City Hall.

band to another during an emergency. If a CCTV surveillance operator witnesses an incident, he may call to police headquarters directly via a "hot line" for rebroadcast over the appropriate radio bands.

Rail Terminal Link

A separate \$300-million transit construction project, scheduled for completion by 1985, will link several subway and surface railway systems. A chief component of the Center City Commuter Rail Connection is a facility incorporating a 9-foot-wide by 6-foot-high central console that will monitor door security, elevator status, public emergency telephone, police telephone, railroad communications, electrical switchgear status, and fire alarms and smoke detectors. Integration of signals and controls was the key to design and construction.

Planned in 1978, before the CCTV security system was developed, the



Philadelphia's new commuter rail terminal, which is still under construction, will contain its own function control console, including security devices. For emergency situations, it will be linked by direct telephone line to the security CCTV monitors at City Hall.

Computer Controlled Video

These are the steps involved in monitoring a CCTV camera from the operator's console in the newly developed Philadelphia mass transit security program:

1. Operator requests the camera number through the keyboard at the control room in City Hall.
2. Computer central processing unit (CPU) identifies the camera and its location from pre-programmed data storage.
3. Multiplexing hardware transmits data via data lines through modems to the remote camera switchers.
4. Remote camera switchers electronically activate the camera.
5. Camera scene is RF-modulated onto video lines at the remote sites.
6. Camera scene is RF-demodulated at control room.
7. Control room switchers, directed by the CPU and multiplexing equipment, route the video scene to the correct television monitor.

This sequence occurs in less than one second, start to finish. The operator is then prompted to retrieve various information that may

be useful at a later date. He may report an "incident in progress" directly through the computer keyboard. In the case of an emergency requiring police aid, the keyboard input signals the computer to automatically dial police radio headquarters, saving precious seconds.

In the actual sequence, the operator begins with the "Help Directory," which displays the following choices on his console:

- F 1 - Initiate Camera Request
- F 2 - Initiate Incident Report
- F 3 - System Log In/Log Out
- F 4 - Executive Summaries
- F 5 - Time and Attendance Summary
- F 6 - Supervisor Comments
- F 7 - Supervisor Log In/Log Out of Operator
- F 8 - Operator Awareness Response
- F 9 - Help
- F 10 - System Setup

By pressing the "F1" key, he'll receive the following list:

- Camera Request Directory
- A - Select Camera
- B - Station Camera Listing

C - Return to Function Directory

By pressing "B," he'll view the camera number listing. Entering "A" and the proper number will then activate that camera and bring the image to his monitor.

Function "F10" is the computer program data base. It includes the following items:

- Set Date and Time
- Primary Camera ID and Location
- Adjacent Camera ID and Location
- Password Definitions
- Incident Directory Definition
- Action Required Directory Definition
- Set Default Time-Out for Incident Reports
- Set Awareness Response Time Limit
- System Log In/Log Out Directory Definition
- Re-set Primary Data Line

Each of these set-up functions can be accessed. Prompting is provided to aid in entering the appropriate information for each option.

Commuter Terminal Console Controls Sound Systems

commuter terminal console will not accommodate cameras. Some communications links to City Hall are planned, however.

The console's public address/emergency evacuation sound system, which is battery operated during power outages, contains logic programming for pre-recorded emergency paging. Special amplifier couplers guarantee that messages will be amplified throughout all necessary paging zones. The system will be used for both standard and emergency announcements, including fire, smoke or hazard instructions. Three kilowatts of audio power, controlled by special electronics that sense the ambient noise level, provide clean, powerful sound above the trains' roar or a disorderly crowd's shouting.

Public telephone lines will link the commuter rail connection to the CCTV monitoring console at City Hall. Telephone calls, made only in emergency situations when life or property are threatened, will be received by the operator at the monitoring console and relayed to police headquarters. □

Equipment

Manufacturers of the equipment mentioned in this article include:

Rapid Transit CCTV System:
CCTV system: *Vicon Industries, Inc.* — Circle No. 200

CCTV cameras, modulators and demodulators: *RCA CCTV* — Circle No. 201

CCTV monitors: *Audiotronics* — Circle No. 202

Videotape recorders: *NEC America, Inc.* — Circle No. 203

Camera identification system: *Portac, Inc.* — Circle No. 204

Computer central processing unit: *Digital Equipment Corp.* — Circle No. 205

Computer control system: *General Sound, Inc.* — Circle No. 206

Computer software: *Robert J. Sigel, Inc.* — Circle No. 207

Commuter Rail Tunnel:
Door switches: *Sentrol, Inc.* —

Circle No. 208
Fire alarm system: *Gamewell Corp.* — Circle No. 209
Control console: *Maris Equipment Co.* — Circle No. 210
Annunciator panel: *The Riley Co., Panalarm Div.* — Circle No. 211
Amplifiers: *Crown* — Circle No. 212
Speakers: *Quam-Nichols Co.* — Circle No. 213
Backboxes and grilles: *Lowell* — Circle No. 214
Equipment racks: *Soundolier, Inc.* — Circle No. 215
Microphones: *Shure Brothers, Inc.* — Circle No. 216
Pre-amplifiers: *McMartin Industries, Inc.* — Circle No. 217
Equalizers: *White Instruments, Inc.* — Circle No. 218
Ambient noise level amplifiers: *United Recording Electronics Industries* — Circle No. 219

Center City Commuter Rail Connection

The central operator's console at Philadelphia's new Center City Commuter Rail Connection will

integrate communications, monitoring and control functions, including:

Monitoring

Alarm Annunciators Indicates status of fire alarms, smoke detectors, door tampering alarms, emergency generators, electric switchgear, fire pumps, and other apparatus.

Ventilation Fans Indicates status of all fans used for smoke exhaust and ventilation.

Communications

Public/Emergency Paging Allows announcements to entire subway connection through 3.6-kilowatt audio system backed-up by batteries. Taped cassettes used for emergency evacuations.

Emergency Telephone Public telephones used for requesting aid.

Railroad Telephone

Bell Telephone

Police Radio

Employee telephones used for train and track status.

Public telephone communications.

Radio for intercommunication to officers in subway connection.

Controls

Fire Lights

Elevator Control Panel

Lighting Control Panel

Turns on fire lights throughout subway connection.

Controls and monitors all elevators.

Controls and monitors all lighting systems.