Electronic Monitoring: What Does the Literature Tell Us?*

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Introduction

IT HAS been almost 20 years since electronic monitoring (EM) devices became available for criminal justice use. During that time a great deal has been written about them in professional journals, popular magazines, newspapers, textbooks, and other sources. A number of states have written laws specifying when EM can be used. Many articles describe how to establish or evaluate programs or the outcomes of program participants. However, experimental studies have been few, and those that have been conducted have had small samples. Therefore, in spite of the volume of information written about EM, little definitive information about the effectiveness of the equipment is available.

I wrote this literature review after reading a large number of publications and reviewing abstracts from the National Criminal Justice Reference Service and from the Criminal Justice Abstracts database. I also searched a legal database and the Internet.

From this variety of sources, it is apparent that the literature on EM can be divided into several groups. One group describes EM equipment and particular programs. Some of these simply describe program operation and others continue with a discussion of the outcomes of the participants in the program. Another group discusses programs in terms of theoretical issues or the pros and cons of establishing programs. Many of the states have established laws and regulations related to EM, and another group of articles addresses these. Finally, there are textbooks and newspaper articles that discuss monitors to inform students and the general public.

Some authors take pains to point out that EM is not, in and of itself, a sanction. Rather, it is a technology to ensure compliance with a sanction or restriction such as home confinement or curfew.[1] Others treat it as a sanction, in and of itself.[2] Many also focus on EM as part of the continuum of intermediate sanctions.[3]

Equipment

EM refers to the equipment that generally is used to monitor compliance with a condition requiring the offender to remain at the monitored location, usually the offender's home. Remaining at home may be all the time, home detention; during specific parts of the day, home confinement; and between certain hours, curfew.[4] The term *home confinement* also is used generally to refer to any program that requires an offender to remain at home, but other terms such as *house arrest* and *home incarceration* also are used.[5]

The equipment presently in use generally is described similarly and is divided into two basic types. One type is continuously signaling and the other is programmed contact. Some types combine features of those two types, and new equipment is always being developed and tested.[6]

Continuously signaling equipment has three parts. The transmitter is worn by the offender, usually on the ankle. The receiver-dialer is attached to the telephone at the monitored location, usually the offender's home. The receiver-dialer receives the signal from the transmitter and dials the central computer at the monitoring center, where the offender's schedule is stored in the computer's memory. The receiver-dialer calls the central computer whenever there is a change in the offender's status, coming or going. For example, if an offender is scheduled to be out of the house at work from 8:30 to 5:30, he or she might leave at 8:35. The receiver-dialer notifies the central computer that the person has left. The central computer checks the individual's schedule, notes that leaving after 8:30 is permitted, and records the departure in the record. At 5:30, the central computer polls itself, notes that the offender has not returned, and prints out a message. Then, the monitoring center takes whatever action is required by the conditions of monitoring this offender, usually contacting a supervising officer.[7] Thus, this equipment informs the monitoring agency whether the offender is at the monitored location or not, but not what the offender is doing there or where the offender is if not there.

Programmed contact equipment, on the other hand, initiates periodic calls to the offender's home to verify that the offender is there. Verification occurs in a variety of ways. The offender may wear a device that is inserted into equipment attached to the telephone to perform what one manufacturer calls an "electronic handshake."[8] Voice verification technology may ask the

***Opinions expressed in this article are the author's and do not necessarily represent the position of the Federal Bureau of Prisons or the U.S. Department of Justice.**

person being monitored to repeat words for which a voice print was made when the offender was enrolled.[9] Another device, which looks like a wristwatch, beeps the person being monitored, who then calls an "800" number. Pressing a button on the equipment acoustically transmits a pseudo random code over the telephone line to establish the identity of the person being monitored and "caller ID" establishes the location from which the call is made, allowing monitoring from school, work, home, and other locations.[10] This equipment also may include breath-alcohol testing.[11] Thus, with this type of equipment, the monitoring agency knows whether the offender was present at the monitored location at the time the call was made.

Some continuously signaling devices can be described as hybrid in that they also contain features of programmed contact devices. Examples include those with voice verification technology to be used if it appears that the offender is out of range.[12] Others have the capacity for breath-alcohol testing.[13]

Another equipment variation is a drive-by unit. This option is available with some brands of continuously signaling equipment and allows the officer to "drive by" and check if the offender is present at a planned activity outside of the monitored location, such as at work or an Alcoholic Anonymous meeting.

The latest development of equipment has a tracking capacity.[14] Experiments have been conducted using receivers much like the cells for cellular phones.[15] One company is developing tracking systems using the Global Positioning Satellites.[16] Another company is working on a system that will transmit the offender's location over either telephone lines or a wireless network.[17] Information about the latest equipment developments is available in the media,[18] on the Internet,[19] and at conventions.[20]

EM equipment is produced commercially by private business concerns. Many of the users are public agencies. In between these two are service providers, private companies who actually receive the computer generated output and notify the agencies of irregularities.[21]

How Many Are Being Monitored

In spite of interest in EM and writing about it, the number of offenders being monitored is unknown. It is not known how many offenders are being monitored on a particular date, from a 1-day count, or over some time period such as a year. The last known study that attempted to count persons being monitored was done in 1989 and estimated that the number of offenders being monitored by non-respondents was about the same as those monitored by respondents.[22] Earlier studies obviously are further out of date.[23]

There have been attempts to determine the number of offenders being monitored. Unfortunately, the last of the relatively complete studies was done in 1990, when it was reported that the numbers had increased from 826 in 1987, to 2,277 in 1988, to 6,490 in 1989, and to an estimated 12,000 in 1990.[24]

In August 1991, the International Association of Residential and Community Alternatives undertook a survey of its members from which it received a 25 percent response rate or 59 responses. In the category on programs, 25 respondents reported that they have electronic monitoring programs and 9 reported home detention programs. In the category on services, 20 reported curfew programs and 19 reported EM programs. In both categories, some agencies may have both types of programs.[25]

As part of a 1995 study on technology in criminal justice, the National Institute of Corrections supported a survey of the nation's largest local jails and jail systems, federal and state prisons, and state and local probation and parole agencies. Of the 218 agencies sent the survey, 148 responded. Seventy-eight agencies reported using continuously signaling equipment, 27 reported using programmed contact equipment, and some reported not having any.[26]

The Corrections Yearbook, 1997 reports EM programs separately by the nature of the program. The category "Inmates Placed in Work and Study Release and Diversion Programs During 1996" shows that 11,553 were placed on EM. Looking at jail programs, 8 of the 18 largest systems responding had programs with an average monthly participation of 91 while the other 96 systems responding had 39 programs. Of the responding jail systems, 40.9 percent had EM programs during 1996. *The Corrections Yearbook, 1997* also reported that 31,236 probation and parole cases were monitored on January 1, 1997, and that the average caseload was between 22 and 25 cases with an average cost per day of $8.86. Also reported was that EM equipment was worn on the average for 12 to 15 weeks. Unfortunately, some of the data are based on 1-day counts, some on monthly averages, and some on yearly totals, so the figures cannot be aggregated. Nonetheless, this is the only readily available source of recent figures, and they do provide some indications of the number of offenders being monitored.[27]

The number of offenders being monitored, however many there may be, has been a disappointment to jurisdictions,[28] manufacturers, and others. EM has not "taken off" as fast as some had hoped or expected.

Program Descriptions and Evaluations

EM programs are operated in most, if not all, states in the United States and in a number of foreign countries. Some of the materials about EM describe issues to consider in establishing a program.[29] Some discuss an operating program[30] and many report research related to programs,[31] some of which are limited to particular groups of offenders, such as drunk drivers, while others

focus on a particular point in the criminal justice process, such as probation. Still other programs focus on relatively high risk groups, such as those "at risk of failure," while others focus on relatively low risk offenders, such as first offenders.[32] A few describe research issues,[33] and a number mention the severe paucity of good research with a reasonable number of cases.[34]

One frequent question is about cost effectiveness.[35] A study of drunk drivers found that electronically monitored house arrest is a cost-effective alternative to incarceration. The study further found that even when the cost of jailing is removed from the calculation, the jurisdiction still benefited. This gain primarily is due to the fact that offenders paid an EM fee as well as a supervision fee when in the community while those in jail did not. The program was reported to have achieved its goals without widening the net of social control and without jeopardizing public safety unduly.[36] Another study of drunk drivers found that monitoring was cost effective, created few equipment problems, and generated few client complaints. Nearly all the clients completed their monitoring successfully but after the monitoring success of probation declined somewhat.[37]

Professor Sudipto Roy at Indiana State University published a description of the program in Lake County, Indiana, for 5 years beginning in January 1989. The program initially served juveniles and was expanded a year later to include adults. Over the 5 years studied, the program served 560 juveniles and 233 adults. Of the juveniles, 93 percent of the first offenders and only 37 percent of the repeat offenders successfully completed the program. Among the adults, the success rates were the same, 78 percent, both for the first offenders and the repeat offenders. Roy also found that adults under 35 were more likely to fail than older participants. Adult failure was predicted by number of prior offenses, prior institutionalization, and substance abuse history. However, among juveniles, failure was predicted by race, current offense, substance abuse history, prior offense history, and most recent prior offense.[38] Another study of Lake County's pretrial EM program found, among other things, a positive correlation between the seriousness of the offense and the use of electronic monitoring as a condition of release and noted the importance of screening participants.[39] A third study there found that EM showed promise in deterring pretrial releasees from criminality or flight.[40]

The Community Control Project of the U.S. Parole Commission uses home confinement with electronic monitoring to provide close supervision of federal parolees making the transition from the institution to the community. This program appears to be cost effective and does not lead to a higher violation rate than would have occurred in a halfway house. However, EM was not found to be sufficient to enforce a viable home confinement program without personal involvement between the supervising officer and the offender.[41] When the results of the Community Control Project were compared with those of federal offenders placed in halfway houses, findings showed that offenders in halfway houses and offenders in an EM program were arrested at about the same rate while participating in the program. The two groups also had similar rates of rearrest and drug use during the supervision that followed either the halfway house or the EM program.[42] Another report on that project pointed out the importance of officer involvement to ensure that the offender is working, that the living arrangements remain stable, and that the parolee is complying with all parole conditions.[43]

Maxfield and Baumer studied three programs in Marion County, Indiana. They found that successful completion of a pretrial program was more likely if the defendant had a suitable living arrangement with parents or spouse and only a minor criminal record.[44] They then compared that program with one for convicted offenders and later compared those two with another for juveniles. They found that even though the programs were in the same jurisdiction, with basically the same equipment, rules, and regulations, important differences existed between the three programs in terms of their indicators of client success or failure and the rate of arrests and absconds by participants. For example, convicted juveniles and adults absconded less frequently than pretrial adults.[45]

Other studies examined particular groups of offenders but, likewise, did not have an experimental design. These include the following:

- Cook County, Illinois, pretrial releasees were divided into three groups, all of which had relatively high failure rates. The study resulted in recommendations for program improvement.[46]
- Boys and girls who were adjudicated delinquent and sentenced to a training school could request admission to an EM program in Fort Wayne, Indiana, if their parents also requested their admission to this voluntary program, which permitted the juveniles to leave home only for school or work. Research found that the program provided structure for the juveniles and was an appropriate alternative.[47]
- The U.S. probation office in the Southern District of Mississippi began monitoring sentenced offenders with reservations about how much control could be achieved. However, the district gradually began accepting higher risk offenders, who successfully completed the program.[48]
- Offenders involved in the Community Control Project of the Florida Department of Corrections were supervised by a number of different kinds of electronic monitoring devices. Researchers found that EM programs successfully provided the officers with

information about the new technologies and the judiciary with an alternative to incarceration. They felt that EM should be viewed as a tool to enhance the officers' ability to supervise rather than a substitute for officers.[49]

- A very small study of juveniles in Kenosha County, Wisconsin, found that successes had family participation, commitment to stay in the particular community, familiarization with the program, and minimal drug and alcohol problems. On the other hand, failures lacked family support, had minimal commitment to the program—which was a "last ditch" effort—had severe alcohol and drug dependence, or were chronic runaways.[50]
- The EM program in Pima County, Arizona, was felt to be cost effective. Researchers found that some "net widening" had occurred, although the amount was very difficult to determine.[51]
- Comparing 126 drug abusers sentenced to house arrest with EM in Los Angeles with 200 drug abusers sentenced to ordinary probation revealed that both groups had the same attributes and about 40 percent of each group tested positive for drug use at least once. Those who were monitored had significantly fewer rule violations and were revoked significantly less often.[52]
- In Los Angeles, intensive drug treatment combined with electronic monitoring proved an effective community-based alternative, particularly if offenders received substance abuse treatment that they completed.[53]

Some evaluations looked at intensive supervision probation (ISP) that uses electronic monitoring:

- Using Colorado agency records, researchers found that the ISP program successfully diverted offenders from prison and saved money while not increasing the risk to the community.[54]
- A Canadian study, this one in Saskatchewan, examined the first 201 offenders referred to EM/ISP. Only 94 were actually placed. Six of the 94 committed a new crime and 40 percent violated some condition of the program. The program was found to be a credible sentencing option.[55]

A few studies were conducted using an experimental design. Examples of these include the following:

- In Baton Rouge, Louisiana, the effects of Computer Assisted Offender Monitoring were examined using a sample of probationers matched with those probationers who were electronically monitored. The experimental group had a lower rearrest rate than the control group but, because of the increased restrictiveness of the program, a higher rate of technical violations.[56]
- The Cuyahoga County Juvenile Court tested the impact of EM on recidivism in its home detention and ISP programs. It found that EM was effective in controlling recidivism but not more effective then regular home detention. It also found that EM had no impact on in-program outcome or measures of recidivism for intensive supervision cases.[57]
- A small study of three Georgia ISP sites looked at two types of EM, continuously signaling and voice verification with alcohol testing, and found that 23 percent (17) of the experimental group and 21 percent (16) of the controls failed. It recommended that EM not be used for additional surveillance, except as a possible enhancement to home confinement; that future use employ continuously signaling equipment; that drug testing continue; and high priority be placed on increasing drug and alcohol treatment alternatives.[58]

Operating programs or trial efforts exist in other parts of the world. Among these are small efforts in Britain,[59] the Netherlands,[60] and Sweden.[61] In addition, Israel is planning a pilot program to begin early in 1999 that will serve work releasees, parolees, pretrial detainees, and those sentenced to community service.[62] Research has pointed out that transplanting programs can be difficult because of the differences in the culture, the criminal justice system, and probation.[63]

Commentaries on Electronic Monitoring

Related to the descriptions of equipment and its use are general discussions of the use of EM,[64] including discussions of public attitudes.[65] Some attempt to provide a context for the discussion of the equipment in terms of the criminal justice system.[66] Others provide agencies with tools for self-assessment.[67] Still others are concerned that monitoring may increase application of social controls, known as "net widening," by increasing the amount of the sanctions that would be applied or the number being sanctioned who previously would not have been.[68]

Monitoring programs are operated by public and private agencies and serve offenders at almost every point in the criminal justice process. Some authors feel that whether EM represents a meaningful form of punishment is a policy issue that should be discussed based on pragmatic experience of philosophical prospective.[69]

A recent issue of *The Journal of Offender Monitoring* published four papers under the heading "EM: What's Wrong? What Can Be Done? Four Experts Speak." The authors felt that the field had been hurt by unrealistic expectations and misconceptions. There also has been little solid research.[70] Similar concerns also are expressed in other articles.[71]

Concerns also have been expressed about the political environment in which a program exists[72] and the hidden costs of the program as a 24-hour-a-day job.[73]

Yet, many programs expanded and were accepted in relatively short periods of time.[74] Others are concerned about whether the technology is replacing human contact[75] and changing the nature of the probation officer's job.[76] Some of the authors expressing these concerns are former advocates of EM.[77]

Corbett and Marx expressed a number of concerns about electronic monitoring. They suggest that EM, along with video surveillance and testing for drugs or alcohol, is changing the way that behavior is monitored and also may be leading to the surveillance of more people than would otherwise be true. They describe what they label "fallacies" that are occurring in the acceptance and use of the new technology. Among these are those of "surface plausibility" (it seems as if it would work) and "painless dentistry" (the programs will return only good results without accompanying losses). In these cases and others, they cite few examples to demonstrate their point.[78]

A different and more extreme argument is made by Thomas Toombs, who suggests that prisons are obsolete and costly. They should be replaced by EM equipment using surgically implanted transmitters signaling the global satellite system. He argues that this approach would be more cost effective and afford offenders more individualized treatment.[79]

Taking a different approach, one author discusses tagging, the British term for EM, in a cultural context while also pointing out the intrusive nature of the technology. The author feels that technological solutions are not appropriate for social problems.[80]

In a study guide to its video on house arrest, the National Institute of Justice points out that house arrest may be electronically monitored or not. Regardless of whether it is monitored or not, the advantages of house arrest are that it is cost effective, is responsive to local and offender needs, and can be implemented with ease and timeliness. Its disadvantages are that it may widen or narrow the net of social control, it focuses primarily on offender surveillance, it is intrusive and possibly illegal, race and class bias may enter participant selection, and it can compromise public safety. The study guide concludes that the future of the program invites scrutiny.

In a recent letter, a Kansas official summarized the problems that agencies face in developing EM programs as including "unclear goals and objectives; inappropriate target population; and failure to include an evaluation component in the program."[81]

State Laws, Regulations, and Standards

Inquiry to the Westlaw data system showed that a number of states mention electronic monitoring in their codes but in different ways. One way in which it occurs is in the definition of a program. For example the definition of Florida's Community Control Project includes the authorization to use EM.[82] In the definition section of its Home Detention Act, South Carolina defines an approved EM device as a device approved by the state agency responsible for the offender "which is primarily intended to record and transmit information as to the defendant's presence or nonpresence in the home."[83] The Wisconsin statute authorizes the state to contract with the counties for EM services and charge offenders.[84] West Virginia allows the court to order the use of EM in conjunction with home confinement.[85] In Georgia, "home arrest" is defined as EM of the offender at a residence, for which charging the offender is authorized.[86]

The American Correctional Association (ACA) has published *Standards of Electronic Monitoring Programs*[87] for use by agencies that only or primarily provide EM services. It includes an optional chapter which can be used to accredit agencies, such as jails and halfway houses, where EM may be part of a larger program.[88] In both of these, the agency seeking accreditation is required to have policies and procedures covering a variety of areas, including maintaining accountability for the offender, limiting access to the computer, for emergencies, and other aspects.

The Maryland Legislature passed a bill, signed by the Governor in June 1998, which charged the Maryland Commission on Correctional Standards (MCCS) with establishing, by June 1999, standards and licensing for private companies providing EM services. Those standards currently are being developed.

Previously, in October 1997, the MCCS began to develop standards for the state-operated home detention program. Then, in anticipation of the legislation, the Commission's executive director sent a letter to a number of states inquiring about what standards they might have. The following descriptions of state activities are taken, in part, from the replies:

- Kansas has standards much like the ACA's in that it specifies what areas require policies and procedures but not what their content should be. There, EM is an enhancement of intensive supervision and used for those who have violated its conditions.[89]
- The Maine Department of Corrections has established standards for county and municipal facilities, one five-page chapter of which is for home release and electronic monitoring programs. The programs are for residents of the county, where the sheriff has a program, who are serving sentences for a less serious offenses and have no history of escape or violence. The inmate is required to be involved in a structured program of work, school, or treatment and must agree to searches without probable cause or a warrant, as well as a number of other conditions including abstinence from and testing for the use of alcohol and drugs. The inmate may be charged for participating.[90]

- Missouri responded with the operational manuals for its programs as well as sections from the Request for Proposals (RFPs) that the state had used to solicit program services[91] while New Jersey sent its program manual.[92] Federal probation also has a monograph for its electronic monitoring program and has an RFP specifying the contractors' responsibilities.[93]
- Ohio established a commission for the certification of electronic monitoring devices. The criteria for certification require continuously signaling equipment and technology that is able to call the offender and use voice verification technology to ensure that the person answering the phone is the offender.
- The director of the Indiana Department of Corrections believed that it was imperative that home detention programs receiving state funds have professional operating standards. The department's draft home detention standards provide standards, much like the ACA's, for all aspects of program operation, including administrative, personnel, training, intake, and participant supervision. At the same time, the standards refer to the "home detention component," which indicates that home detention is part of a larger program.[94]

Textbooks, Newspaper Articles, and the Like

In the years since viable electronic monitoring came on the market in the United States, a number of discussions concerning the use of the equipment have been written. In textbooks, some of these describe the equipment and its use.[95] Some apparently were intended to stimulate discussion.[96]

Community corrections is a standard part of the criminal justice curriculum in many colleges and universities. General corrections textbooks[97] and those designed specifically for community corrections courses[98] contain discussions of EM devices and their use, as do collections of readings.[99] However, these would not normally be a source of new findings or original studies. For example, one book presents opposing viewpoints in two articles with questions for the reader/student to consider. Each of the articles is a reprint of a previously published article that is cited elsewhere in this discussion.[100] Another anthology presents 35 previously published articles, including four on EM.[101]

Some discussions of EM are intended to provide information to certain groups. Decision makers such as public officials[102] or legislators[103] are one group while corrections professionals,[104] probation officers,[105] and lawyers[106] are others.

Discussions of EM also appear in publications not related to corrections. For example, under the heading of applications the *IEEE Spectrum* published an article that describes the evolution of the equipment and the future approach, tracking. The focus is on the engineering of the technology itself.[107] Periodically, publications such as legal journals also have articles about EM.[108]

Articles about EM have appeared in newspapers and magazines. Some have explained programs as human interest stories.[109] Some have been published when programs were having trouble.[110] Others have looked at the fact that monitoring has not grown as fast as was originally hoped.[111]

NOTES

[1]Examples include: John O. Smykla and William L. Selke, *Intermediate Sanctions: Sentencing in the 1990s.* Cincinnati, OH: Anderson Publishing Company, 1995, pp. 1–54; Mike Goss, "Electronic Monitoring: The Missing Link For Successful House Arrest," Corrections Today, July 1989, pp. 106, 108.

[2]For example: Joseph B. Vaughn, "Electronic Monitoring," *Journal of Offender Monitoring,* vol. 2, no. 1, January 1989, pp. 1, 3, 6–7.

[3]Examples include: National Committee on Community Corrections, *Tough Punishments That Make Sense: An Introduction to Intermediate Sanctions.* Washington, DC: Rasco Graphics, 1997, 15 pp.; Terry M. Simpson and Kim A. Johnson, *Analysis of Alternatives to Incarceration: Intermediate Sanctions.* Washington, DC: U.S. Department of Justice, Justice Management Division, Management and Planning Staff, September 10, 1993, 26 pp.; Mike Goss, "Electronic Monitoring Programs Provide Prison Alternatives," *Corrections Today,* vol. 52, no. 4, July 1990, pp. 80, 82, 84. Richard A. Ball and J. Robert Lilly, "A Theoretical Examination of Home Incarceration," *Federal Probation,* vol. 50, no. 1, March 1986, pp. 17–33.

[4]Paul J. Hofer and Barbara S. Meierhoefer, *Home Confinement.* Washington, DC: Federal Judicial Center, 1987, 73 pp.

[5]Richard A. Ball and J. Robert Lilly, "A Theoretical Examination of Home Incarceration," *Federal Probation,* vol. 50, no. 1, March 1986, pp. 17–23; Richard A. Ball and J. Robert Lilly, "Home Incarceration: An International Alternative to Institutional Incarceration," *International Journal of Comparative and Applied Criminal Justice,* vol. 9, no. 2, Winter 1985, pp. 85–97.

[6]For an overview of equipment, see, for example: Annesley K. Schmidt, "Electronic Monitoring: Past, Present and Future," in *Correctional Issues: Community Corrections.* Lanham, MD: American Correctional Association, 1996, pp. 101–110.

[7]The equipment of a number of manufacturers fits this description, including: BI Incorporated, 6400 Lookout Road, Boulder, CO, 800-241-2911; Digital Products Corporation, Elmo Tech, Limited, 16 Gaigalie Haplada, Post Office Box 12511, Herzelia 46129, Israel, 972-9-509391; General Security Services Corporation, 3329 University Avenue, Southeast, Minneapolis, MN 55414, 800-284-2158; Strategic Technologies, 800-827-1942.

[8]Digital Products Corporation, 800 Northwest 33rd Street, Pompano Beach, FL 33064, 800-323-9476.

[9]This is used by several types of equipment, including several of those described below as "hybrid."

[10]Watch Patrol, Electronic Monitoring Systems, Inc., 26081 Merit Circle, Suite 108, Laguna Hills, CA 92653, 714-582-0433.

[11]For example, Mitsubishi Electric Sales of America.

[12]For example, Capstone Technologies, Inc., 200 Russell Street, Huntsville, AL, 205-534-0006.

[13]For example, BI Incorporated (see above).

[14]"Technology: Offender Monitoring Technology Goes into Orbit," *The Corrections Professional,* vol. 1, no. 12, March 8, 1996, p. 9. Also, there are six short articles related to GPS systems in the *Journal of Offender Monitoring,* vol 11, no. 2, Spring 1998, pp. 5, 7–14.

[15]John H. Murphy et al., *Advanced Electronic Monitoring for Tracking Persons on Probation or Parole* (96-9SN7-NIJEM-R1). Pittsburgh, PA: Northrop Grumman Corporation, undated.

[16]Advanced Business Sciences, Inc., 3335 North 107th Street, Omaha, NE 68134, 402-498-2734.

[17]Pro Tech Monitoring, Inc., 1211 North Westshore Boulevard, Suite 416, Tampa, FL 33607-4605, 813-286-1038.

[18]Each year the *Journal of Offender Monitoring* publishes a survey of manufacturers conducted by Joseph B. Vaughn. A recent one is "The 1997 Electronic Monitoring Survey," published in Fall 1997 (vol. 10, no. 4). Also, for example: Marisela Montes, "Technological Advances in Parole Supervision," *Corrections Today,* vol. 58, no. 4, July 1996, pp. 88, 90–91.

[19]Using any Internet search engine, the terms "electronic monitoring" or more specifically "electronic monitoring of offenders" will lead to sites for programs, manufacturers, companies working in the area, papers on the topics, and numerous other things.

[20]Among the conventions that have displays of electronic monitoring equipment are those of the American Correctional Association, which holds two conventions each year, one in January and one in August. The American Probation and Parole Association convention also has displays.

[21]Examples include: Jack Fulda, "Electronic Monitoring and the Service Provider Industry," *Journal of Offender Monitoring,* vol. 3, no. 1, Winter 1990, pp. 12–15, 18–20; and Thomas H. Zoet, "Community Based Correctional Facilities as EM Service Providers: A New Option for Criminal Justice Administrators," *Journal of Offender Monitoring,* vol. 3, no. 2, Spring 1990, pp. 8–10.

[22]Marc Renzema and David Skelton, "The Scope of Electronic Monitoring Today," *Journal of Offender Monitoring,* vol. 4, no. 4, Fall 1991, pp. 6–11.

[23]Annesley K. Schmidt, *Electronic Monitoring of Offenders Increases* (NIJ Reports Number 212). Washington, DC: National Institute of Justice, 1989. Also, Annesley K. Schmidt, "The Use of Electronic Monitoring by Criminal Justice Agencies in the United States 1988," in K. Russell and J.R. Lilly (Eds.), *The Electronic Monitoring of Offenders: Symposium Papers.* Leicester, England, 1989, pp. 9–23.

[24]Marc Renzema and David Skelton, "Trends in the Use of Electronic Monitoring: 1989," *Journal of Offender Monitoring,* vol. 3, no. 3, Summer 1990, pp. 12–19.

[25]B. Huskey and A.J. Lurigio, "An Examination of Privately Operated Intermediate Sanctions Within the U.S.," *Corrections Compendium,* vol. 17, no. 12, December 1992, pp. 1, 3–6.

[26]LIS, Incorporated, Longmont, CO, *Technology Issues in Corrections Agencies: Results of a 1995 Survey.* Washington, DC: National Institute of Corrections, 1995, 83 pp.

[27]Camille G. Camp and George M. Camp, *The Corrections Yearbook, 1997.* South Salem, NY: Criminal Justice Institute, 1997, pp. 102, 143–145, 148, 160–164, 229–231.

[28]David Savage, "Electronic Monitoring in the Washington State Department of Corrections," *Correctional Issues: Community Corrections.* Lanham, MD: American Correctional Association, 1996, pp. 111–112.

[29]Examples include: Susan B. Cohen (Ed.), *Guidelines to the Development and Operation of Electronic Monitoring Programs for Local Corrections,* California Probation, Parole and Correctional Association in conjunction with the Board of Corrections, 1994, 150 pp.; Bureau of Justice Assistance, *Electronic Monitoring in Intensive Probation and Parole Programs.* Washington, DC: Author, February 1989, 24 pp.; Ray Wahl, "Is Electronic Monitoring a Viable Option?," *Correctional Issues: Community Corrections.* Lanham, MD: American Correctional Association, 1996, pp. 113–115; and Jim Putnam, "Electronic Monitoring: From Innovation, to Routine, to Anticipation," *Correctional Issues: Community Corrections.* Lanham, MD: American Correctional Association, 1996, pp. 123–126.

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