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16. Abstract

Automated speed enforcement (ASE) devices have been and are being used in many countries to supplement limited enforcement resources. Although these devices have been tried in the U. S., they have not met with great success. The objectives of this research were: to review how ASE devices have been used as part of an enforcement agency's strategy; to determine what results can be expected from using ASE devices; to identify what legal and political issues could prohibit the use of ASE devices; and to identify what operational problems are associated with using ASE devices.

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AUTOMATED SPEED ENFORCEMENT DEVICES

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December, 1989
November, 1991

A Report from the
Texas Transportation Institute
The Texas A&M University System
College Station, Texas 77843

Prepared for the
Texas Department of Transportation

METRIC (SI*) CONVERSION FACTORS

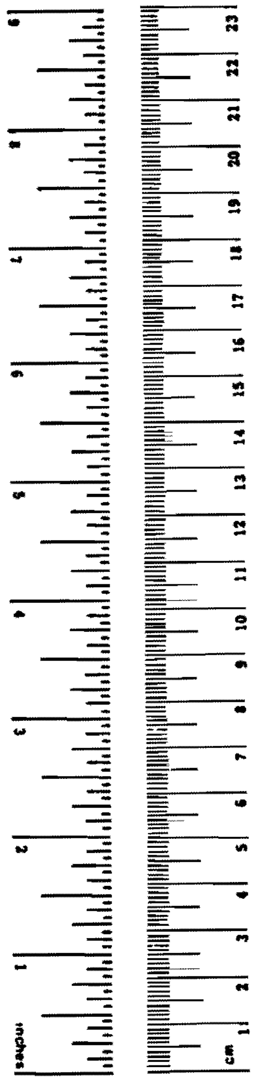
APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	2.54	centimetres	cm
ft	feet	0.3048	metres	m
yd	yards	0.914	metres	m
mi	miles	1.61	kilometres	km
AREA				
in²	square inches	645.2	centimetres squared	cm²
ft²	square feet	0.0929	metres squared	m²
yd²	square yards	0.836	metres squared	m²
mi²	square miles	2.59	kilometres squared	km²
ac	acres	0.395	hectares	ha
MASS (weight)				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
VOLUME				
fl oz	fluid ounces	29.57	millilitres	mL
gal	gallons	3.785	litres	L
ft³	cubic feet	0.0328	metres cubed	m³
yd³	cubic yards	0.0765	metres cubed	m³

NOTE: Volumes greater than 1000 L shall be shown in m³.

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

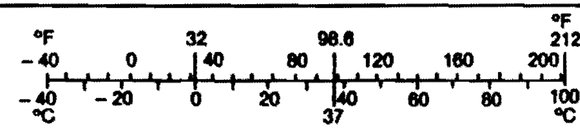


APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimetres	0.039	inches	in
m	metres	3.28	feet	ft
m	metres	1.09	yards	yd
km	kilometres	0.621	miles	mi
AREA				
mm²	millimetres squared	0.0016	square inches	in²
m²	metres squared	10.764	square feet	ft²
km²	kilometres squared	0.39	square miles	mi²
ha	hectores (10 000 m²)	2.53	acres	ac
MASS (weight)				
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1 000 kg)	1.103	short tons	T
VOLUME				
mL	millilitres	0.034	fluid ounces	fl oz
L	litres	0.264	gallons	gal
m³	metres cubed	35.315	cubic feet	ft³
m³	metres cubed	1.308	cubic yards	yd³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



These factors conform to the requirement of FHWA Order 5190.1A.

* SI is the symbol for the International System of Measurements

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Disclaimer

This report is not intended for construction, bidding or permit purposes.

Automated Speed Enforcement

Technology

Traffic law enforcement has always been difficult. Limited resources constrain the efforts of the police, and 100 percent compliance with speed limits will never be achieved using traditional methods. New technologies such as automated speed enforcement devices may offer solutions to these problems.

Reducing the number of speeders will reduce the variance in motorists' speeds, which is theorized to reduce the accident rate. Since accidents adversely affect the orderly and efficient movement of people and goods, as well as the health of the people being moved, reducing the variance in speeds should make the transportation system run more efficiently and safely. Automated speed enforcement (ASE) devices might aid in reducing this variance, but they have not gained widespread acceptance in the United States despite extensive use in European countries.

Even with our many technological advancements, the U.S. appears to be behind in the technology of ASE and other speed control techniques. Most European models of ASE devices use across-the-road radar to measure vehicular speed and trigger the automatic camera. Most U.S. law enforcement agencies use radar aimed down the road as part of the traditional pursuit method of enforcement. The across-the-road radar has a number of technical advantages over down-the-road radar. By aiming a narrow beam of radar across the road, the speeding vehicle can be identified more accurately without the training and experience usually required to make an accurate assessment with down-the-road radar. The narrow beam aimed across the road is also very difficult to detect with a radar detector.

Blackburn and Glauz (1984) tested four ASE devices in common use in Europe. Three of the devices used across-the-road radar and the fourth used piezoelectric roadway sensors to determine a vehicle's speed. All four devices can be used with a camera to obtain photographic evidence of a violation, and some can operate automatically with only minor periodic maintenance.

The Multanova ASE device was judged to be the best of the four examined, but all of the devices were subject to periodic malfunctions, especially film jamming and tearing in cold weather and blown fuses. The vehicle owners could be identified in 90% of all cases where the license plate number could be read and the state identified. Usually, however, the state name and expiration date were too small to be read, so substituting a longer focal length lens was suggested. The most automated devices were better at detecting and identifying speeders, were preferred by the police commanders, and were cheaper per arrest than the less automated devices, but were also the least acceptable to the public and the courts. The piezoelectric roadway sensors worked well but were quickly shredded by heavy truck traffic in cold, wet weather and were hazardous to set up.

The authors recommend several actions to make ASE devices more effective and acceptable. They suggest engineering modifications to the devices to increase portability and make them more weatherproof. Subsequently, the devices should undergo additional engineering evaluation, as well as field tests in an operational setting where the devices are used to actually issue warnings and then citations for speeding.

One device which has seen actual use in the U.S. is a photomechanical device called ORBIS III, which is a propriety name for a system developed by LTV, Inc. ORBIS III uses roadway sensors to detect speeders and trigger a camera to photograph the front of the vehicle on infrared film. The photograph shows the speed, time, and date, as well as the driver and the vehicle license plate. The device was originally used at fixed locations in New Jersey and Texas and showed some potential for reducing speeding and accidents. The main problems encountered were that drivers became familiar with the sites and often slowed down only in the vicinity of the device and technological problems resulted in a loss of significant amounts of data (Dreyer and Hawkins, 1979).

Dreyer and Hawkins (1979) examined the effectiveness of a mobile ORBIS III unit in increasing driver compliance with posted speed limits and the cost-benefit of using an ORBIS III system. Four sites with various posted speeds (40, 45, 50, and 55 MPH) and roadway environments (residential, rural, urban, and urban thoroughfares) were used to test the ORBIS at several levels of enforcement. Each site was 0.5 miles long with an ORBIS III station in the middle and cumulative volume/speed counters located at either end.

Phase I involved the residential and rural sites with 50-percent enforcement (the mobile ORBIS spent equal time at each cite). The number of speeders leaving the residential test location decreased, but the number of speeders entering the test location remained the same as before the ORBIS usage. The number of speeders both entering and leaving the rural test area increased considerably. Data indicates that drivers slowed down as they approached the van holding the electronics, light source, and camera.

Phase II involved 25-percent enforcement (the mobile ORBIS spent equal time at each of the four locations) at all sites and resulted in a decrease in speeders at all locations. The residential site speed pattern remained the same as in Phase I. The rural site had a decrease in speeders leaving the test area, but the percent of speeders entering the test area remained higher than it was prior to the use of ORBIS. Phase II activities reduced the number of speeders passing the van at both urban sites, but speeders leaving the urban thoroughfare location increased slightly.

Phase III involved 50-percent enforcement at the two urban sites. Both locations showed a further reduction in the percent speeders. The speed patterns remained the same as in Phase II.

Data collected up to 8 weeks after completion of ORBIS activities at the rural sites and up to 3 weeks after completion at the urban sites showed continued effects (i.e., fewer speeders).

As operated in the study, ORBIS equipment and personnel requirements were about four times as expensive as the costs associated with a traditional patrol unit. Nevertheless, the authors and NHTSA point out that actual operational costs would likely be much lower and citation revenues higher, resulting in a more economically efficient device.

Legal Questions

Dreyer and Hawkins (1979) wrote that the two greatest legal problems encountered were the issuing of citations or warrants requiring a court appearance and the introduction of ORBIS III photographs into evidence. In this project, violators were issued a civil warrant or citation. The photograph and driver registration information derived from the license plate were considered sufficient evidence to support the citation. In support of such use of photography, the Attorneys General of Texas, South Carolina, Michigan, and Nevada, and the Arizona Department of Public Safety have asserted that taking a photograph of a persons travelling the public highways is not an invasion of privacy. If the owner of the car can be identified as the driver of the vehicle, the citation is issued to the owner. If the driver cannot be identified, the owner may be compelled to appear in court to identify the driver, unless the driver is a spouse.

Judicial acceptance of ORBIS may initially require many expert witnesses. After its validity and reliability have been established, the prosecutor must show that the device was used properly and that the photograph was authentic. The authors claim that the courts are now more willing than they once were to accept photographs as evidence without an accompany witness to verify its contents. They also point out that a 1955 New York case (People vs Hildebrandt, 126N.E. 2nd. 377; 499 ALR 4d 449) establishes the need to have a photograph of the violators face for the photograph to hold up in court. The authors conclude that ORBIS III photographs present no unique legal problems and assert that the only question for a court to decide is if the driver in the picture and the defendant in the case are the same person. The legal acceptance of ORBIS had not become an issue at the time the study was written. Most citations were paid without the need for prosecution.

Glater (1973) also discusses possible legal challenges to the use of automatic speed enforcement devices such as ORBIS. The type of ASE device used as a basis for discussion detects speeding vehicles and photographs the front of the vehicle and the faces of the driver and passengers. Three legal aspects of the device are discussed: (1) the question of whether its operation violates individuals' right of "privacy" as protected by the U.S. Constitution, state laws, and common law precedents; (2) the issue of unlawful inequities in traffic law enforcement, resulting from the device's operational limitations, which permit some speeders to pass by undetected; (3) the admissibility into evidence in speeding prosecutions of photographs taken by the device.

After a more detailed description of ORBIS, the author describes a 1955 case in which a photograph was taken of a speeding vehicle. Since the car was not stopped and the driver could not be identified, the court refused to create a "rebuttable presumption" that the owner was the offending vehicle operator. The possibly severe penalties for a speeding offense and the inability to identify the vehicle driver caused the court to overturn the owner's conviction. This case, according to the author, established the need for a photograph of the driver of the speeding vehicle.

The discussion of possible conflicts between ORBIS and individuals' right of privacy began with the Constitutional protection of privacy. The author concludes that ORBIS is not an unconstitutional invasion of privacy as defined by the Supreme Court's decisions, because it does not interfere with an especially fundamental right or zone of privacy and it does not constitute an unreasonable invasion. The photograph taken by ORBIS is not an unreasonable search because it does not invade an area which may reasonably be expected to be free from public view. ORBIS does not interfere with the rights of association guaranteed by the First Amendment, either, because it does not present a "specific present objective harm or a threat of specific future harm" and does not "involve observations of arguably protected political speech and association." The author also concludes that ORBIS does not interfere with state common law rights of privacy because it is not an unreasonable intrusion upon the seclusion of another. Lastly, the study asserts that ORBIS does not contravene state statutes pertaining to the right of privacy because most of these statutes are for preventing the unauthorized use of a person's name or likeness for advertising or business purposes.

Other legal concerns about ORBIS include the equal protection aspects of its use and the admissibility into evidence of ORBIS photographs. Defendants may cite the inability of ORBIS to photograph every speeder as denying equal protection of the law. ORBIS' limitations, however, do not result in the intentional discrimination proscribed by the Fourteenth Amendment's Equal Protection Clause. Defendants may also claim that the photographs taken by ORBIS are not admissible evidence. To be admissible, the prosecution would have to show that "the photograph is relevant and material to issues raised at trial and must show that the photograph is an accurate, authentic representation of the scene it contains." The ORBIS photograph is obviously relevant, and all of the people handling the film can testify to its accuracy to the extent that no tampering occurred. Normally, however, human testimony is needed to confirm the authenticity of a photograph by claiming personal perception of what the photograph purports to portray. To overcome this obstacle, the prosecution must describe the techniques used to insure the photograph's authenticity and the official who loaded the film should testify as to the familiarity of the background. Since this does not always work, officials may need to encourage the legislature to pass statutes authorizing the admission of ORBIS photographs in speeding prosecutions.

Currently, the Federal Communications Commission does not allow unmanned radar for law enforcement purposes due to its possible interference with other communication devices. For this reason, fully automated radar-based ASE devices may require special Congressional legislation before being used. Presently, radar-based enforcement devices are manned but can still be automatically activated. Roadway sensors such as induction loops may be required for fully automatic operation without human oversight.

<u>Summary</u>

Automatic speed enforcement devices may offer an economical solution to the problems of limited enforcement resources and the dangers of pursuit and arrest in heavily travelled thoroughfares. Unless current FCC regulations are changed, the fully automatic devices will most likely use induction loops or another speed detection method other than radar. ASE devices using radar but with human supervision may still prove effective due to the rapid rate at which the photographs can be taken versus the time required to pursue speeders. In any case, the technology is available to take accurate and reliable pictures that can be used as evidence of speeding violations.

The most difficult aspect of ASE device usage is having them accepted by the judicial community. After a number of expert witness have testified in many different cases, the devices' validity and reliability should become as accepted as that of traditional radar enforcement devices. The main problem will be to verify the authenticity of the photographs to the court's satisfaction without human testimony to validate the photograph's contents. Once these problems are overcome, the only thing for the court to decide is if the driver in the picture and the defendant in the case are the same person. Thus, once photographs from ASE devices gain routine admission into court as evidence, ASE devices will likely become a standard part of the traffic law enforcement strategy.

References

Blackburn, R.R. and Glauz, W.D. (1984). Pilot tests of automated speed enforcement devices and procedures. Midwest Research Institute. Washington, DC: National Highway Traffic Safety Administration.

Glater, D. (1973). Legal issues raised by ORBIS, a motor vehicle speed detection device taking photos of speeders. Transportation Systems Center. Washington, DC: Department of Transportation.

Dreyer, C.B. and Hawkins, T.E. (1979). Mobile ORBIS III speed enforcement demonstration project in Arlington, Texas: Program Evaluation. Department of Traffic and Transportation, City of Arlington, Texas, and Southwest Research Institute, San Antonio. Washington, DC: National Highway Traffic Safety Administration.

Anecdotal Data

According to Gerlack (1989), Galveston County Precinct 8 area photo-radar was supplied by the Traffic Monitoring Technology (TMT) Company for 1987. TMT contracted with the Precinct 8 to provide the equipment and the citations. The contract provided that TMT would be reimbursed $20.00 for every citation that was paid to the Galveston County Precinct 8 court.

The TMT photo-radar systems consists of the following components: doppler radar, microcomputer, 35mm camera, flash attachment for camera, and a hand held operating unit. The system will fit in the back of a station wagon or similar type vehicle.

The photo-radar system is operated with the vehicle parked parallel to the road. The time, date, location, and citation speed are placed in the computer at the operational site. The system produces a black and white photograph with a picture of the vehicle operator, front and rear license plate, time, date, and location of the photo-radar system.

The photograph is maintained in a central file at the police station. A citation is mailed to the register owner of the vehicle listing the methods available to adjudicate the citation.

This system offered several benefits which includes a reduction of speed. Accident data was not analyzed for possible reductions. A side benefit was the additional revenue which was provided to the county.

The TMT system was abandoned because of political issues according to Gerlack (1989).

Fustes (1989) stated that TMT photo-radar equipment is being considered for use in 193 cities acrossed the United States. Currently TMT photo-radar equipment is in use in Paradise Valley, AZ and Pasadena, CA. The Paradise Valley Police Department has prepared a video tape demonstrating the system as is adapted for them. A copy of this video has been requested.

The legal issues addressed in Glater (1973) article are addressed by TMT as follows:

1) The Plainview doctrine is a U. S. Supreme court case which gives law enforcement agencies the right to photograph evidence (Katz vs U.S 389 US 347 351 88SCT 507, 511, 1967).

2) ORBIS relied on strips in the road to monitor speed which could result in inequities in traffic law enforcement. TMT system has a radar bean which all traffic crosses. The

system can give the average speed up to 5 minutes prior and 5 minutes after the designated citation event.

3) The admissibility into evidence of photographs in speeding prosecutions is clarified in Texas by Wilson vs State of Texas, 168 Texas Criminal 439, 328 SW2D 311, 313 1959, 5th Court of Appeals.

The judicial history goes back to 1911 when researchers at MIT developed a system of taking two photographs one second apart and then by the size of the vehicle could determine the speed of the automobile. The Mass. court upheld the principle but said the procedure was to cumbersome.

In 1954 a case which involved the photographing a vehicle for the rear was tried in the New York supreme court. In a 5-4 decision against this procedure because there was no way to identify the person in the car.
In Arizona, Paradise Valley uses the city speed ordinance but added a civil law which allows the owner of the registered vehicle to identify the driver of the vehicle at the time of the ticket. If the owner does not provided the information he is charge with a civil offense of aid and abetting a offense. Paradise Valley Police Department was taken to the State Supreme Court challenging the legality of the photo-radar (State of Arizona vs Rose Ann Cortright, 1989). The case was not accepted for consideration. Because of this case other municipalities throughout the United States have become interested using the TMT photo-radar system.

The TMT equipment has the capability of gathering speed data and recording that data on a MS-DOS floppy disk. Currently the Insurance Institute of Highway Safety is planning a pre post study regarding speed compliance in Peoria, AZ within the next six months.

Anecdotal Data References

Fustes, M. (1989). Personal conversation with Manual Fustes, Traffic Monitoring Technologies, on December 7, 1989.

Gerlack, B. (1989). Personal conversation with Barbara Gerlack, Court Clerk, Galveston County Precinct 8, on December 7, 1989.

Annotated Bibliography

Blackburn, R.R. and Glauz, W.D. (1984). Pilot tests of automated speed enforcement devices and procedures. Midwest Research Institute. Washington, DC: National Highway Traffic Safety Administration.

This study examines the currently available technology in automated speed enforcement (ASE) devices and its applicability in the United States. After describing some of the general strategies used in European speed enforcement, the report discusses the testing of four ASE devices from Europe. Three of these devices use radar aimed diagonally across the road. This allows for more accurate identification of the speeding car than does the typical American down-the-road radar, and it reduces the effectiveness of radar detectors due to the narrowness and direction of the beam. The fourth ASE devices uses piezoelectric roadway sensors to determine a vehicle's speed. All four devices can be used with a camera to obtain photographic evidence of a violation, and some can operate automatically with only minor periodic maintenance.

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