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Applications of Automated Speed Enforcement

Study SD2001-06-F
Final Report

Prepared by
South Dakota Department of Transportation
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16. Abstract

Previous studies have shown that the presence of the highway patrol can reduce traffic speeds in work zones, but unless officers actually issue citations, the effect of presence alone is temporary. Sufficient numbers of officers are not available for continuous enforcement.

The project's technical panel selected Automated Speed Enforcement (ASE) equipment to be used in this study to photograph the rear of vehicles violating the speed limit, resulting in high-resolution photographs revealing the vehicles' license plate number.

A vehicle-mounted ASE system was leased from Traffipax, Inc. for one month during the summer of 2002. It was placed in work zone and school zone environments. The objective for this system is to issue a citation to every speeder. In a short time, it becomes an effective deterrent to motorists who repeatedly travel through that work zone without the need for a law enforcement officer to be present.

The Traffipax system performed reliably when the batteries were kept charged. It was designed to be operated as a manned system, rather than operated unmonitored for a day at a time as it was envisioned by the panel. The system compared favorably with a Lidar speed measurement unit, and never took a photograph of a vehicle not exceeding the set threshold. Photographs gave clear presentations of the license plates. When configured to take photographs of the rear of the vehicle, identification of the driver is impossible.

Recommendations:

1. Seek legislation using model language.
2. Narrow scope to work zones and school zones rather than statewide.
3. Emphasize reliability, accuracy and effectiveness of available equipment and operating ASE programs .
4. Incorporate ASE vehicle into DOTCOP program
5. Establish program to share ASE with local jurisdictions during off-peak times.

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Executive Summary

Traffic accidents in work zones are a nationally significant problem. In urban areas, heavy traffic volumes and high speeds make work zones extremely hazardous. In rural areas, traffic volumes may be lower, but the problem of high speeds can be even more severe. (Bowie, N., and M. Walz, Data Analysis of the Speed-Related Crash Issue, National Highway Traffic Safety Administration, undated). Between 1993 and 2001, there were 17 fatalities, 777 people injured, and $12,392,000 in damages in South Dakota work zones (South Dakota Department of Transportation, Office of Accident Records, June 2003).

Traditional speed enforcement methods offer short-term effects, and speeds gradually increase as motorists become aware that enforcement activity is no longer a "risk" (Managing Speed, TRR Special Report 254, 1998, 140, Transportation Research Board). The fact is, there is not a sufficient number of officers available for continuous enforcement in all work zones.

Research project SD97-12 evaluated a manned video/Lidar system to detect speeders with the intention of issuing citations through the mail. Video/Lidar is a system that uses a Lidar speed measurement unit to measure speed, and a video unit to record violators. The SDDOT attempted to pass legislation in 1997 allowing the issuance of speeding citations through the mail. The legislation did not pass, and the use of video/lidar systems was not allowed in the enforcement of regulatory speed limits in work zones. Legislators were unwilling to support issuing citations based on video or photos taken of a speeding vehicle. Therefore, citations could not be issued, and the only effect measured in the study was the effect of personnel and equipment in the work zone on vehicle speed.

Automated Speed Enforcement (ASE) has been used throughout the world for about 30 years. There are currently about 75 countries that use ASE, but the United States has only used the technology for speed enforcement in the last 10 years. There are about a dozen states that use cameras for enforcing red light running, but only five states have laws that authorize the use of ASE: Washington, D.C., California, Colorado, Nevada and Utah (Automated Enforcement Laws, Insurance Institute for Highway Safety, Highway Loss Data Institute, October 2002).

Legislation was introduced during the 2002 session of the South Dakota legislature to ban any automated methods of identifying speeders. The bill was ultimately tabled, but will likely be discussed during a future session. Issues discussed in 2002 were the reliability of the technology and the long length of time elapsing between the violation and receipt of the ticket in the mail. Also discussed was the fact that someone other than the owner may have been driving the vehicle. These issues are addressed in the Legal Issues section on page 14.

The panel felt that by demonstrating the capability of Automated Speed Enforcement to record motorists speeding through work zones and school zones, passage of legislation to allow the use of automated enforcement technologies to issue citations would be more likely.

The project technical panel selected Automated Speed Enforcement equipment to photograph the rear of vehicles violating the speed limit, resulting in a high-resolution photograph revealing the vehicle's license plate number. The vendor chosen was Traffipax, a Germany-based company. This choice was based on purchase price, price of processing film and citations, and the fact that the company would provide an ASE-equipped vehicle for a one-month lease at a reasonable price. The alternative would be to actually purchase ASE equipment without having an established program for processing and mailing citations

An ASE system mounted in a vehicle was leased from Traffipax for one month during the summer of 2002. It was placed in work zone and school zone environments. The principle idea for this system is to issue a citation to every speeder. In a short time, it becomes an effective deterrent to motorists who

repeatedly travel through that work zone, without needing a law enforcement officer to be present. (Managing Speed, TRR Special Report 254, 1998, Transportation Research Board, p. 148).

This study collected data for one month to determine the extent of speeding in work and school zones, and whether automated speed enforcement devices are capable of deterring speeders in work zones. The ASE vehicle was placed in work and school zones to collect speed information, giving the researcher an idea of how many citations would have been issued if legislation allowed it.

Conclusion

The Traffipax system performed reliably when the batteries were kept charged. It was designed to be operated as a manned system, rather than operated unmonitored for an extended time as previously envisioned by the panel. The system compared favorably with a Lidar speed measurement unit, and never took a photograph of a vehicle not exceeding the set threshold. Photographs gave clear presentations of the license plates. When set up to take photographs of the rear of the vehicle, identification of the driver is impossible, addressing privacy concerns.

The system was simple to set up and operate. Members of the South Dakota Highway Patrol and Sioux Falls Police Department felt that such a system would be beneficial to speed enforcement efforts because of its ability to record each violation. The system was used in two work zones generating over 4,800 photographs, which would have resulted in over $700,000 dollars in traffic fines if citations had been sent. If ASE were used in conjunction with the DOT COP program, annual costs of personnel and citation processing would be about $75,000. The costs of the program would be quickly recuperated, and would result in safer work zones. Of course, the goal of the program is to reduce the number of violators, which would in turn reduce the number of fines. If the revenue produced by fines were not enough to support an ASE program, ASE would probably not be necessary.

The literature shows that communities and states that have used automated speed enforcement programs have experienced a decrease in violations and in crashes. Long-term compliance of speed limits in school zones and work zones is only possible when there is a substantial risk of violators being cited. Short of traditional speed enforcement, a publicized ASE program is the most effective method. Red light running cameras are more widely used in the United States, but speed enforcement cameras are slowly becoming more accepted by the public.

Recommendations

1. **Seek legislation using model language.**

   The National Committee on Uniform Traffic Laws and Ordinances has proposed model legislation for automated enforcement, and is given in Appendix A. The model law imposes only a civil fine for traffic law violations. As with parking violations, no record of the traffic law violation resulting from automated traffic law enforcement is placed in the driver's licensing file for possible point assessment or licensing action.

2. **Narrow location of ASE deployment to work zones and school zones rather than statewide.**

   The public is more receptive to speed enforcement when they realize it is taking place in areas where speeding might be particularly dangerous, such as in residential areas, school zones and work zones. The use of it everywhere in the state, especially on long stretches of highway with little traffic and no work zones is perceived as invasive and offering no benefit.

3. **Emphasize reliability, accuracy and effectiveness of available equipment and operating ASE programs.**

   Jurisdictions such as Washington D.C. and San Jose, California have been operating successful ASE programs since the mid-1990's. Showing the successful deployment of ASE technology should help allay concerns that automated equipment is unreliable.

4. **Incorporate an ASE vehicle into the DOTCOP program.**

   The DOT COP program has been an effective way to use local law enforcement personnel to enforce regulatory speed limits in work zones. ASE makes better use of personnel by allowing them to stay on-site and record violators. The combination of having a vehicle in the work zone, public awareness, and mailing tickets will have the desired effect of reducing speeding in work zones.

5. **Investigate a program to share ASE with local jurisdictions during off-peak times.**

   Discussions with law enforcement revealed that ASE would be desirable in jurisdictions throughout the state, although few jurisdictions have funding to purchase such equipment. Sharing ASE equipment would be an effective way to utilize the equipment throughout the year, and reach out to communities where speeding may be a problem. The Department should work with the Office of Highway Safety to identify steps to be taken to best use ASE equipment.

Introduction

Traffic accidents in work zones are a nationally significant problem. In urban areas, heavy traffic volumes and high speeds make work zones extremely hazardous. In rural areas, traffic volumes may be lower, but the problem of high speeds can be even more severe. (Bowie, N., and M. Walz, Data Analysis of the Speed-Related Crash Issue, National Highway Traffic Safety Administration, undated). Between 1993 and 2001, there were 17 fatalities, 777 people injured, and $12,392,000 in damages in South Dakota work zones (South Dakota Department of Transportation, Office of Accident Records, June 2003).

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Automated Speed Enforcement (ASE) has been used throughout the world for about 30 years. There are currently about 75 countries that use ASE, but the United States has only used the technology for speed enforcement in the last 10 years. There are about a dozen states that use cameras for enforcing red light running, but only five states have laws that authorize the use of ASE: Washington, D.C., California, Colorado, Nevada and Utah (Automated Enforcement Laws, Insurance Institute for Highway Safety, Highway Loss Data Institute, October 2002).

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Background

The technical panel selected Automated Speed Enforcement (ASE) equipment to photograph the rear of vehicles violating the speed limit, resulting in a high-resolution photograph revealing the vehicle's license plate number. The vendor chosen was Traffipax, a Germany-based company. This choice was based on purchase price, price of processing film and citations, and the fact that the company would provide an ASE-equipped vehicle for a one-month lease at a reasonable price. The alternative would have been to actually purchase ASE equipment without having an established program for processing and mailing citations

This study collected data for one month to determine the extent of speeding in work and school zones, and whether automated speed enforcement devices are capable of deterring speeders in school zones. The ASE vehicle was placed in work and school zones to collect speed information, giving the researcher an idea of how many citations would have been issued if legislation allowed it.

A vehicle-mounted ASE system was leased from Traffipax for one month during the summer of 2002. It was placed in work zone and school zone environments. The principle idea for this system is to issue a citation to every speeder. In a short time, it becomes an effective deterrent to motorists who repeatedly travel through that work zone, without needing a law enforcement officer to be present. (Managing Speed, TRR Special Report 254, 1998, Transportation Research Board, p. 148).

Legislation was introduced during the 2002 session of the South Dakota legislature to ban any automated methods of identifying speeders. The bill was ultimately tabled, but will likely be discussed during a future session. Issues discussed in 2002 were the reliability of the technology and the long length of time elapsing between the violation and receipt of the ticket in the mail. Also discussed was the fact that someone other than the owner may have been driving the vehicle. These issues are addressed in the Legal Issues section on page 14.

Project Objectives

The project panel wanted to determine whether automated speed enforcement would be an appropriate deterrent to speeding in work zones. In light of the past failed legislation to allow the use of automated forms of enforcement, the panel sought to expand the use of ASE to school zones as well as work zones. Unfortunately, even though the objectives were focused on school zones, during the time the ASE vehicle was available only one school zone was used using the equipment. The study objectives are given below:

1. To Determine to what extent speed enforcement issues exist in select school zones.

Before determining the effectiveness of ASE, the panel wanted to first know the extent of any speeding problems. ASE was used in only one school zone due to the short duration the Department was able to secure the ASE vehicle, and speeding there was quite prevalent. The other sites studied were maintenance zones with visible activity and lane restrictions, where speeding was present, but not as severe.

2. To identify benefits and disadvantages of automated speed enforcement systems in school zones.

This objective was intended to identify any problems, inherent in ASE equipment or organizationally, in using ASE in school and work zones. The research showed that the equipment worked well. The researcher found there were many benefits of using ASE. The important step that needs to be taken, however, is for legislation to be passed allowing ASE to be used to generate citations that could be sent through the mail.

3. To recommend an automated enforcement system for use in school and work zones.

Based on experience with the Traffipax system, and discussion with agencies who have implemented ASE, the recommendation was made to use ASE, specifically the Traffipax system. This study was not to be an evaluation of all the available ASE systems, but whether ASE technology would help solve the issue of dangerous speeding through work zones.

Task Description

Task 1. Perform a literature search that includes speed enforcement initiatives in school and work zones.

The literature review revealed many ASE deployments, in the United States and abroad, where violations have been reduced through the use of ASE.

A number of studies show that red light cameras have reduced crashes at intersections. Only about a dozen jurisdictions in North America use ASE and no State departments of transportation are using it to enforce speed laws in work zones. Active enforcement still appears to be the norm. The summary of these reports is given in the Literature Review section later in this report.

Task 2. Propose a work plan including timing and duration of speed measurements, and equipment to be used to verify speed measurements.

A formal work plan was not produced. Rather, a meeting of the panel was requested when the researcher became aware that an ASE vehicle would be available for lease from Traffipax for one month. The panel agreed that leasing the equipment for a month would be beneficial in gaining experience with ASE. A longer period was desired, but would have required the purchase of equipment without the benefit of a planned ASE program and the ability to process, review and issue citations. The panel discussed current construction and maintenance projects where the ASE vehicle was to be used, and five were selected. The selected projects were construction on US83 in Ft. Pierre, a bridge project on I-90, Omaha St. in Rapid City, I-29 at Sioux Falls, and a school zone in Sioux Falls.

Task 3. Meet with the technical panel to review the project scope and work plan.

The panel met with the researcher on several occasions to discuss the scope of the study, the type of equipment to be considered, and ultimately that the Traffipax system should be leased. The panel provided input helpful in determining which locations should be used for the evaluation.

Task 4. Verify that signing within the school zones selected by the panel is compliant with the Manual on Uniform Traffic Control Devices (MUTCD).

The only school zone used during the month the ASE system was available for lease was Lincoln High School in Sioux Falls. Signing there identified the area as a school zone and indicated the speed limit, complying with Part 7 of the Manual on Uniform Traffic Control Devices. The ASE vehicle was parked off the road and parallel to it. It was set up to measure vehicle speeds and take pictures only while the school zone was in effect. The speed threshold used was 10 mph over the speed limit, the same threshold used by the Sioux Falls Police Department. A representative of the police department was consulted regarding the choice of school zones, placement of the vehicle, and values to use in setting up the system. The vehicle was in place August 20-23, 2002. As shown in Table 1, 66% of the observed vehicles were moving faster than 25 mph, 10 mph over the school zone limit of 15 mph. This school zone was selected because of its pedestrian accident history.

Task 5. Collect speed data with ASE equipment in conjunction with other speed logging equipment as a control.

Speed data was collected at the locations listed in Table 1, under the Automated Speed Enforcement section. Speed logging equipment was not used in conjunction with the ASE system because it was not possible or practical to obtain equipment for the short duration the ASE vehicle was available. A Lidar

unit manufactured by Kustom Signal was used in real time to verify that the speeds were accurate. Also, calibration shots, pictures and radar measurements taken to verify that the equipment was correctly calibrated were taken at the beginning and ending of each enforcement session. The calibration shot constitutes a self-calibration of the ASE system and imprints the system data on a photograph. Comparing the beginning and ending calibration shots on the film cartridge verifies the system is properly calibrated, and that all photographs and data in between are accurate. When citations are contested in court, these calibration shots are used to verify that the speed measurement and photographic equipment are accurate.

Task 6. Analyze the performance of ASE equipment including reliability, clarity of images, effective identification of vehicles without being driver-intrusive, recording of speed, date and time, and the number of citations identified.

The ASE equipment was evaluated for the one-month period it was available to the Department. The researcher positioned the vehicle and set up the equipment in accordance with the manufacturer's instructions. Speeds measured by the equipment were verified using a Lidar speed measurement unit, and by visual observation. The performance was reliable and consistent, and photographs taken were clear, revealing the license plate number, but not the identity of the occupants.

Task 7. Recommend automated methods to improve long term compliance with speed limits in school zones.

Recommendations are given in the recommendations section at the end of this report.

Task 8. Prepare a final report summarizing research methodology, findings, conclusions and recommendations.

This final report includes the researcher's methods, findings, conclusions and recommendations, fulfilling the requirements for task 8.

Task 9. Make an executive presentation to the SDDOT Research Review Board at the conclusion of the project.

An executive presentation was given to the Research Review Board on February 13, 2003.

Literature Review

Automated enforcement of traffic laws is routine in many countries. But camera enforcement is catching on more slowly in the United States. ASE, also referred to as photo radar or speed cameras, is the most widely used form of automated enforcement in the world. In the United Kingdom, almost half of all speeding tickets result from automated enforcement. The reason ASE is so popular is because traditional enforcement alone isn't enough to curb violations. Available enforcement officers are capable of observing and ticketing only a handful of violators. Drivers know the risk of being detected is small. ASE, however, is capable of identifying virtually every offender. Drivers are discouraged from violating the laws when cameras are in use because they know the risk of getting caught increases. (Status Report, Vol. 37, No. 5, May 4, 2002, Insurance Institute for Highway Safety). Jurisdictions in the United States seem to feel that there is a lack of public support for ASE, although in many communities in the country, support is between 55%-90%.

Canada and Australia have both used automated speed enforcement. In Ontario, a one-year ASE pilot program reduced the number of vehicles exceeding the speed limit by 50%. The number of vehicles traveling at more than 40 km/h (25 mph) over the speed limit was reduced by 74%. In Australia, the percent of traffic exceeding the speed threshold for enforcement fell from 10.8% to 2.4% after the ASE system was implemented (*ITE Journal,* Vol. 68, No. 6, Institute of Transportation Engineers June, 1998).

Washington, D.C., has used photo radar in numerous locations throughout the city, and has found that violations decreased 38 to 89%. Public support there has also been high, because it is generally realized that speed cameras help reduce the number of accidents due to speeding. The program manager of the photo radar program in Washington, D.C. makes two recommendations for a successful automated speed enforcement program: the police, rather than the photo radar vendor or citation processing contractor, should review citations before mailing, and a flat fee be assessed for the program, rather than per citation. These recommendations are made to address concerns by the public that the program objective may be centered on revenue rather than safety (Lt. Patrick Burke, Metro PD, personal interview, May 7, 2003).

Crashes in British Columbia declined 7% and deaths declined 20% after photo radar was implemented. British Columbia is the largest deployer of photo radar in North America. (Status Report, Vol. 33, No. 10, December 5, 1998, Insurance Institute for Highway Safety).

According to a comprehensive survey of 6,000 drivers aged 16 and older, more than 7 in 10 drivers thought it was a good idea to use photo enforcement devices to reduce speeding and running red lights and stop signs. A higher number of drivers supported photo devices in locations where crashes frequently occur (4 out of 5 drivers) and in school zones (9 out of 10 drivers) (Schulman, Ronca, & Bucuvalas, Inc., *National Survey of Speeding and Other Unsafe Driving Actions, Volume III, Countermeasures***,** National Highway Traffic Safety Administration, USDOT, January 1999).

The Denver Public Works Department acquired three speed cameras, intending to deploy them in neighborhoods with verified complaints of speeding. Instead, the police department put the cameras on interstates and freeways, arousing concern from legislators. It appears that those locations that have been successful have limited the use of speed cameras to those areas where speeding problems exist. To use speed cameras widely throughout an area is deemed unnecessary by the public. (Status Report, Vol. 35, No. 3, March 11, 2000, Insurance Institute for Highway Safety).

Automated Speed Enforcement System

The ASE system, installed in a 2002 Ford Explorer, comprises a radar antenna, camera and flash. The ASE system used in this study, a Traffipax Multanova 6F, took pictures from the rear of the vehicle (Figure 1) and from the front. The radar antenna and flash for the front camera was installed in the front grill (Figure 2) and the forward-looking camera was installed on the dashboard (Figure 3). Keypads for the front- and rear-facing cameras are installed in the center of the console. All parameters such as threshold speeds, begin and end times, units, etc., are programmed from the keypads. The vehicle speeds are displayed there as well.

Figure 1 Antenna, camera, flash and batteries installed in rear of vehicle.

Figure 2 The forward antenna and flash.

Figure 3 Keypads and camera unit.

Figure 4 The ASE vehicle in a work zone on I-90.

Photographs are recorded on a 35mm film cartridge capable of storing 800 photographs. The system calibration data are also recorded there, and are used for verifying the proper operation of the radar, computer and camera. When the cartridge is used completely, it is sent to the processing contractor for developing and generation of citations. The processor sends back a fresh cartridge for continued use. If SDDOT were to issue citations, the citations would be reviewed by DOT or Highway Patrol personnel and prepared for mailing.

The system was used in five different locations: Reconstruction work zones on US14 in Ft. Pierre and I-29 at Sioux Falls, a bridge work zone on I-90, a work zone on Omaha Street in Rapid City, and a school zone in Sioux Falls.

Table 1 shows locations where the ASE system was used, the duration the system was operating, and the number and percentage of vehicles violating the speed thresholds.

The location in Ft. Pierre had active construction taking place, and traffic control devices routed traffic through turns, inherently causing the vehicles to proceed slowly. The violation rate was low, only 2% to 6.7%. On I-90, the ASE vehicle was parked in a work zone at a bridge maintenance project at MRM 159. Again, workers and equipment were present, and one lane was restricted. The violation rate ranged from 5.3% to 8.7%. The threshold was set at 60 mph, 15 mph over the speed limit of 45 mph.

In Sioux Falls, however, the school zone contained no lane restrictions or visible enforcement. The violation rate there was 28%. Note that while the ASE vehicle was placed in the school zone, the system only recorded and photographed speeding vehicles during the time that the school zone was in effect.

Table 1 Data Collected from ASE Vehicle

Location	Duration	Date	# Vehicles	#Photos	% Violation	Speed limit/ threshold
Ft. Pierre	1 Hour	Jul 29	382	12	3%	25/35
	1 Hour	Jul 30	92	3	3%	25/35
	2 Hours	Aug 2	646	14	2.1%	25/35
	20 Hours	Aug 5,6	2765	185	6.7%	25/35
I-90 @ 159	26 Hours	Aug 7	4172	347	8.3%	45/60
	1 Hour	Aug 7	449	24	5.3%	45/60
	48 hours	Aug 9	6505	568	8.7%	45/60
Sioux Falls Lincoln HS	2 hours	Aug 29	433	122	28%	15/25

Table 2 Fines Assessed for Speeding in Construction Zones

MPH Over Limit	Fine	Total
1-5	$30	$66
6-10	$70	$106
11-15	$110	$146
16-25	$150	$186
26 and over	$200	$236

The Omaha Street location in Rapid City did not result in valid data because the geometry of the work zone forced traffic to remain slow. No violations were observed or recorded. No data is shown for I-29 at Sioux Falls because of problems that are explained in the system reliability section.

Potential fines were calculated based on Statute SDCL §32-25-19.1, to demonstrate how an ASE program can be funded. Citations would have been issued for speeders traveling more than 10 miles per hour over the speed limit. Fines are doubled in work zones, and are shown in Table 2. The numbers in the "Total" column shows the total amount each violator must pay for each offense. Had citations been issued, the 3885 violators in the Ft. Pierre work zone would have been fined $567,210. The 939 violators on I-90 would have been assessed $137,094.

System Reliability

The ASE system from Traffipax performed well throughout the study. Setup and programming for each site took about five minutes. A problem was encountered when the system was left operating with the engine off for more than about 12 hours. The battery voltage dropped below the equipment operating voltage, and the equipment would behave erratically, or would shut down completely. Traffipax informed the researcher that the system was not intended to be left unattended for long periods of time. This problem resulted in some unusable data in a school zone in Sioux Falls and in a work zone on I-29 in Sioux Falls. This data is not shown in Table 1. No other problems with the equipment were encountered.

Figure 5 Photo of vehicle speeding through a bridge repair work zone on I-90.

Figure 6 Close-up of the vehicle license.

The speeds measured by the radar were verified using a Lidar speed measurement gun manufactured by Kustom Signal, Inc. The ASE equipment was observed to take photographs only when vehicles exceeded the threshold. Occasionally, one vehicle would pass another near the ASE vehicle. In these cases, when the radar received conflicting information, no photographs were taken.

Costs

The type of technology used in the ASE system influences the system cost. Three options are available from vendors, as shown in Table 2 below, taken from the National Highway Traffic Safety Administration report, “Guidance for Using Red Light Cameras,” dated March 20, 2003. Although the guidance relates specifically to red light cameras, the technology used for ASE is the same. The cost of the Traffipax ASE system equipped with a single 35 mm camera is $50,000, while a two-camera system, capable of photographing vehicles traveling both directions, including the vehicle to house it, drives the price to $150,000. Operating costs for a wet film system include the cost of film, processing and verification of citations. This study used a 35mm camera, which proved effective, although the film cartridges had to be sent away for developing. Each cartridge stores 800 high resolution images. A system with a single digital camera costs $70,000. Digital video systems don’t appear to be widely used.

Table 3 Camera Units Compared

Camera Unit	Pros	Cons
35 mm	Inexpensive installations; Best resolution.	Collection and development of film.
Digital Still	Digital format; Ease of use; No film collection or development.	Relatively expensive; Needs communication links between cameras and processing center; Comparatively poor resolution.
Digital Video	Provide video clips of alleged violations; Provides circumstances in which violations occur.	High capital cost; Impression of surveillance; Needs communication links between cameras and processing center.

Contracting the processing costs $3000-$6000 a month, depending on whether the contractor does all or some of the processing. Some agencies initially paid a contractor according to the number of tickets, which was deemed inappropriate in San Diego by a Superior Court judge (Status Report, Vol. 37, No. 5, May 4, 2002, Insurance Institute for Highway Safety). Doing the processing in-house would require employee time and a license for processing software. Agency personnel would be required to review and verify citations prior to mailing.

There can be benefits from combining ASE with SDDOT's DOT COP program. The DOT COP Work Zone Speed Enforcement Program utilizes local police department personnel to monitor work zones and issue tickets to speeders. The program has been in operation since 1998, and has proven to be effective. The program is authorized under SDCL statute §32-33-14.1 (Appendix B). In 2002, the DOT COP Program cost the Department $18,481 and generated $130,000 in fines (SDDOT Office of Operations Support, May 2003).

As shown above, ASE is capable of photographing violators resulting in over $700,000 in fines in just a seven day period. Assuming ASE would add $55,000 a year in operating costs, annual costs for the combined DOT COP/ASE operation would be roughly $75,000, half of what the DOT COP programs generates now without the citations generated from using ASE.

The dilemma for the DOT COP officer is the same as that for the Highway Patrol Trooper–once he leaves the work zone to pursue a speeder, the work zone is unmonitored for fifteen minutes or so. ASE allows the enforcement officer to remain at his post, monitor the traffic and equipment, verifying that it is operating properly. The DOT COP program could greatly benefit from the use of ASE equipment used to deter speeders. There are currently four DOT COP vehicles across the state – one for each region.

Legal Issues

During the Transportation Committee meeting of the 2002 session of the South Dakota legislature, four main issues surfaced in the discussion of automated speed enforcement:

- The length of time passing between the alleged violation and receipt of the citation;
- The right to privacy;
- Reliability of equipment;
- The possibility of the vehicle owner receiving a citation when someone else is driving.

One legislator discussed his experience with ASE in Germany a number of years ago. At that time, it was possible for 6 weeks to elapse between a violation and receipt of a ticket. This was a major concern for the legislators. In discussions with EDS, a company who processes citations for several jurisdictions in Maryland, the average time between a violation and receipt of the citation in the mail is eight days. This amount of time is reflected in other ASE programs around the country.

Regarding the right to privacy, legal experts have concluded that automated enforcement does not violate a citizen's legal right to privacy. However, most people have the perception of privacy while driving in their automobile. People feel they are giving up this perceived privacy if they drive in an area with automated enforcement. Therefore, advocates must make very clear what the public is gaining in return. To alleviate the threat to perceived privacy, ASE implementers can photograph vehicles from the rear so the driver may not be identified. This makes the violation similar to a parking violation, thus worthy of only a civil offense. If privacy is a strong concern, implementers can choose not to mail the photograph along with the citation. (Turner, S. and A. Polk, "Overview of Automated Enforcement in Transportation", paper prepared for the ITE Journal, June 1998).

When multiple vehicles pass through the system's field of view, and the vehicles are traveling at differing speeds, no photograph will be taken. In fact, if there is anything in question, there is no possible way a citation would be issued. In every case that a photograph was taken, the vehicle shown was clearly driving faster than the threshold speed. Speeds measured by the ASE system were verified independently using a Lidar gun. In every jurisdiction using automated enforcement in the United States, the agency itself, not a contractor managing the program, verifies the citations prior to sending them out. In San Diego, California, a court found the city at fault for allowing the contractor excessive control and for paying the contractor according to the number of paid tickets. The judge did, however, uphold the constitutionality of the camera program. "Institute senior transportation engineer Richard Retting says "to gain public trust, camera programs must be operated in ways above any suspicion of a profit motive."" (Status Report, Vol. 37, No. 5, May 4, 2002, Insurance Institute for Highway Safety).

Another concern that arose during the 2002 session was that the photograph is taken of the vehicle, and the citation is sent to the vehicle owner, even if he was not the one driving. Previous users of ASE have handled this by either assessing the violation as a civil penalty, where points are not counted against the driver's license, or by allowing the owner to come to the police station and give the name of the person who was driving, and having the citation sent to that person (Fontaine, M.D., S. D. Schrock, and G. Ullman, "Feasibility of Real-Time Remote Speed Enforcement for Work Zones", Transportation Research Record 1818, Transportation Review Board, 2002).

To address these types of concerns, the Enforcement Technologies Advisory Technical Subcommittee (ETATS), a component of the National Highway Traffic Safety Administration, has been assembled to establish uniform technical and procedural standards for the establishment, implementation and ongoing operation of an automated speed enforcement program. Committee members represent numerous governmental agencies as well as manufacturers and special interest groups. Draft standards for

automated speed enforcement equipment will likely be finalized and submitted for approval in late 2003 or early 2004. The subcommittee has developed an administrative guide for a speed measuring device testing program and model performance specifications for police traffic radar devices. These guidelines and standards will be helpful in addressing the above concerns.

Conclusion

The Traffipax system performed reliably when the batteries were kept charged. It was designed to be operated as a manned system, rather than operated unmonitored for an extended time as previously envisioned by the panel. The system compared favorably with a Lidar speed measurement unit, and never took a photograph of a vehicle not exceeding the set threshold. Photographs gave clear presentations of the license plates. When set up to take photographs of the rear of the vehicle, identification of the driver is impossible, addressing privacy concerns.

The system was simple to set up and operate. Members of the South Dakota Highway Patrol and Sioux Falls Police Department felt that such a system would be beneficial to speed enforcement efforts because of its ability to record each violation. The system was used in two work zones generating over 4,800 photographs, which would have resulted in over $700,000 dollars in traffic fines if citations had been sent. If ASE were used in conjunction with the DOT COP program, annual costs of personnel and citation processing would be about $75,000. The costs of the program would be quickly recuperated, and would result in safer work zones. Of course, the goal of the program is to reduce the number of violators, which would in turn reduce the number of fines. If the revenue produced by fines were not enough to support an ASE program, ASE would probably not be necessary.

The literature shows that communities and states that have used automated speed enforcement programs have experienced a decrease in violations and in crashes. Long-term compliance of speed limits in school zones and work zones is only possible when there is a substantial risk of violators being cited. Short of traditional speed enforcement, a publicized ASE program is the most effective method. Red light running cameras are more widely used in the United States, but speed enforcement cameras are slowly becoming more accepted by the public.

Recommendations

1. **Seek legislation using model language.**

   The National Committee on Uniform Traffic Laws and Ordinances has proposed model legislation for automated enforcement, and is given in Appendix A. The model law imposes only a civil fine for traffic law violations. As with parking violations, no record of the traffic law violation resulting from automated traffic law enforcement is placed in the driver's licensing file for possible point assessment or licensing action.

2. **Narrow location of ASE deployment to work zones and school zones rather than statewide.**

   The public is more receptive to speed enforcement when they realize it is taking place in areas where speeding might be particularly dangerous, such as in school zones and work zones. The use of it everywhere in the state, especially on long stretches of highway with little traffic and no work zones is perceived as invasive and offering no benefit.

3. **Emphasize reliability, accuracy and effectiveness of available equipment and operating ASE programs.**

   Jurisdictions such as Washington D.C. and San Jose, California have been operating successful ASE programs since the mid-1990's. Showing the successful deployment of ASE technology should help allay concerns that automated equipment is unreliable.

4. **Incorporate an ASE vehicle into the DOTCOP program.**

   The DOT COP program has been an effective way to use local law enforcement personnel to enforce regulatory speed limits in work zones. ASE makes better use of personnel by allowing them to stay on-site and record violators. The combination of having a vehicle in the work zone, public awareness, and mailing tickets will have the desired effect of reducing speeding in work zones.

5. **Investigate a program to share ASE with local jurisdictions during off-peak times.**

   Discussions with law enforcement revealed that ASE would be desirable in jurisdictions throughout the state, although few jurisdictions have funding to purchase such equipment. Sharing ASE equipment would be an effective way to utilize the equipment throughout the year, and reach out to communities where speeding may be a problem. The Department should work with the Office of Highway Safety to identify steps to be taken to best use ASE equipment.

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Appendix A – Model Legislation

Automated Traffic Enforcement Model Law

The objective of automated traffic law enforcement is reduced traffic crashes and improved adherence to traffic laws through the use of photographic and electronic technology as a substitute for traditional traffic law enforcement. This type of enforcement should be used at high crash sites, at other high-risk locations, or in situations where traffic law enforcement personnel cannot be utilized, either due to the pressing needs of other law enforcement activities or where inherent on-site safety problems make traditional law enforcement difficult.

Automated traffic law enforcement is not intended to replace traditional law enforcement personnel nor to mitigate safety problems caused by deficient road design, construction or maintenance. Rather, it provides enforcement at times and locations when police manpower is unavailable or its use raises safety concerns.

The model law imposes only a civil fine for traffic law violation enforced via the automated traffic law enforcement system and relies on an initial presumption of guilt. This approach is not new as it is typically utilized for the enforcement of parking law violations. As with parking violations, no record of the traffic law violations resulting from automated traffic law enforcement are placed in drivers' licensing files for possible point assessment or licensing action. Indeed, any attempt to unfavorably influence guilty persons' driving privileges, through the use of this system, could raise due process of law concerns.

This model law contains provisions to insure that automated traffic law enforcement is not used as a revenue generator. Compensation paid for an automated traffic law system is to be based only on the value of the equipment or the services provided. Compensation for services or equipment is not to be based on the number of traffic citations issued or the revenue generated by the system.

To help further this goal and improve highway safety, this model law provides that revenue derived from automated traffic law enforcement may be utilized solely to fund highway safety functions.

Automated Traffic Law Enforcement Model Law (draft 11-9-2000)

§ 1- Legislative Purpose

This legislation authorizes automated traffic law enforcement at high crash or other high-risk locations where on-site traffic law enforcement personnel cannot be utilized, either because of insufficient manpower or inherent on-site safety difficulties with enforcement by police officers. The objective of automated traffic law enforcement is reduced traffic crashes resulting from improved adherence to traffic laws achieved by effective deterrence of potential violators which could not be achieved by traditional law enforcement methods.

Automated traffic law enforcement is not intended to replace traditional law enforcement personnel, nor is it intended to mitigate safety problems caused by deficient road design, construction or maintenance. Rather, it provides enforcement at times and locations when police manpower is unavailable, difficult to utilize safely, or needed for other priorities.

§ 2- Applicability of law

The State, a county, or a municipality may utilize an automated traffic law enforcement system to detect traffic violations under State or local law, subject to the conditions and limitations specified in this Act.

§ 3 Limitations on Use of Automated Enforcement

Automated traffic law enforcement systems may be utilized only at locations with high incidences of violations or with high crash rates due to violations, where it is impractical or unsafe to utilize traditional enforcement, or where traditional enforcement has failed to deter violators. In determining deployment of automated traffic law systems, the judgment of the administering agency, when using due diligence in evaluating the suitability of potential deployment sites, including consideration of site violations and crash data, shall be controlling on where and when to install automatic traffic law enforcement systems

Before issuing citations based on surveillance by an automated traffic law enforcement system, a traffic engineering analysis of the proposed site shall be conducted to verify that the location meets highway safety standards. An automated traffic law system may not be used as a means of combating deficiencies in roadway design or environment.

§ 4 - Citation and Warning Notice

(a) An agency shall mail to the owner pursuant to § 4 a citation, which shall include:

(1) The name and address of the registered owner of the vehicle;

(2) The registration number of the motor vehicle involved in the violation;

(3) The violation charged;

(4) The location where the violation occurred;

(5) The date and time of the violation;

(6) A copy of the recorded images;

(7) The amount of the civil penalty imposed and the date by which the civil penalty should be paid;

(8) A signed statement by a technician employed by the agency that, based on inspection of recorded images, the motor vehicle was being operated in violation of a traffic control device;

(9) A statement that recorded images are evidence of a violation of a traffic control device;

(10) Information advising the person alleged to be liable under this Act:

(A) Of the manner, time, and place in which liability as alleged in the citation may be contested; and

(B) Warning that failure to pay the civil penalty or to contest liability in a timely manner is an admission of liability and may result in denial of renewal of vehicle registration.

(C) Except as provided in §6 (f) (2), a citation issued under this section shall be mailed no later than 2 weeks after the alleged violation.

(b) A person who receives a citation pursuant to the provisions of this Act may:

(1) Pay the civil penalty;

(2) Elect to stand trial for the alleged violation; or

(3) Specify the person who was operating the vehicle at the time of the violation, including at a minimum the operator's name and current address.

§ 5 - Violations

Unless the driver of the motor vehicle received a citation from a police officer at the time of the violation, the motor vehicle owner, or the driver if subsection 6 (f) is applicable, is subject to a civil penalty not exceeding ($) if the motor vehicle is recorded by an automated traffic law enforcement system. A violation for which a civil penalty is imposed under this Act is not a moving violation for the purpose of assessing points and may not be recorded on the driving record of the owner or driver of the vehicle.

§ 6- Failure to Pay Penalty or Contest Violation

If a person charged with a traffic violation as a result of automated traffic law enforcement does not pay or successfully contest the civil penalty resulting from that violation, the department of motor vehicles may refuse to reregister any motor vehicles owned by that person.

§ 7- Rules of Evidence and Defenses

a)

(1) Based on inspection of recorded images produced by an automated traffic law enforcement system, a citation or copy thereof alleging that the violation occurred and signed by a duly authorized agent of the agency shall be evidence of the facts contained therein and shall be admissible in any proceeding alleging a violation under this section.

(2) Adjudication of liability shall be based on a preponderance of evidence.

(b) The court may consider in defense of a violation:

(1) That the motor vehicle or registration plates of the motor vehicle were stolen before the violation occurred and not under the control of or in the possession of the owner at the time of the violation;

(2) Evidence that the person named in the citation was not operating the vehicle at the time of the violation, or had sold the vehicle and can provide proof of sale;

(3) With respect to an alleged red light violation, the driver of the vehicle passed through the intersection when the light was red:

(A) In order to yield the right-of-way to an emergency vehicle; or

(B) As part of a funeral procession; and

(4) Any other evidence or issues that the Court deems pertinent.

(c) In order to demonstrate that the motor vehicle or the registration plates were stolen before the violation occurred and were not under the control of possession of the owner at the time of the violation, the owner must submit proof that a police report concerning the stolen motor vehicle or registration plates was filed in a timely manner.

(d) In order to demonstrate that the person named in the citation was not the violator, the person so named in the citation shall provide evidence satisfactory to the Court, specifying the person who was operating the vehicle at the time of the violation, including at a minimum the operator's name and current address.

(e) If the person named in the citation is an owner of a commercial vehicle with a registered gross weight of 10,000 pounds or more, a tractor vehicle, a trailer operated in combination with a tractor vehicle or a passenger bus, in order to demonstrate that he or she was not the violator that person shall, in a letter mailed to the Court by certified mail return receipt requested:

(A) Swear that the person named in the citation was not operating the vehicle at the time of the violation; and

(B) Provide the name, address, and driver's license identification number of the person who was operating the vehicle at the time of the violation.

(f)

(1) If the court finds that the person named in the citation was not operating the vehicle at the time of the violation or receives evidence identifying the person who was driving the vehicle at the time of the violation, the clerk of the court shall provide to the agency issuing the citation a copy of the evidence identifying who was operating the vehicle at the time of the violation.

(2) Upon receipt of evidence from the court that a person other than the one initially charged was operating the vehicle at the time of the violation, an agency may issue a citation to that other person so identified. A citation issued under this paragraph shall be mailed no later than 2 weeks after receipt of the evidence from the court.

§ 8 -Public information

A public information campaign must precede the issuance of citations using an automated traffic law enforcement system. An integral part of an automated traffic law enforcement program is a community-wide information campaign to inform the driving public. This public information campaign shall continue throughout the life of automated traffic law enforcement program and may be funded from revenues derived from the program. The goal of the automated traffic law enforcement program is reduced traffic crashes achieved by deterrence of violations, not the issuance of citations or the generation of revenues.

§ 9- Payment for Automated Traffic Enforcement System

The compensation paid for an automated traffic law system shall be based on the value of the equipment or the services provided. It may not be on the number of traffic citations issued or the revenue generated by the system.

§ 10 - Use of Revenues Derived from Automated Enforcement

No portion of any fine collected through the use of automated traffic law system may be utilized as general revenue of the implementing jurisdiction. Revenue derived from automated traffic law enforcement shall be utilized solely to fund highway safety functions and projects, which may include automated enforcement programs costs. Automated enforcement program costs that may be funded by revenues derived from citation fines are limited to equipment acquisition, installation and replacement, program administration, public information campaigns and education, and periodic program evaluations of compliance, public awareness and safety.

§ 11 - Failure to Pay Penalty or Contest Violation

If a person charged with a traffic violation as a result of automated traffic law enforcement does not pay or successfully contest the civil penalty resulting from that violation, the department of motor vehicles may refuse to reregister any motor vehicles owned by that person.

§ 12 - Adoption of Implementing Procedures

In consultation with local governments, the chief judge of the (insert name of the appropriate state, county or municipal court) shall adopt procedures for the issuance of citations, the trial of civil violations, and the collection of civil penalties under this Act. Thresholds established for determining violations and protocols for establishing acceptable evidence of committed violations shall be established and documented by the public agency responsible for administering the automated enforcement program. This authority may not be delegated to equipment vendors, service providers or other private sector institutions or employees.

§13- Program Evaluation

Within three years of the establishment of an automated traffic law enforcement program, the implementing jurisdiction shall initiate a formal evaluation of the program to determine if driver behavior has improved. That evaluation shall be completed within (one year). If reductions in traffic violations or crashes have not occurred as a result of the implementation of the automated traffic enforcement program, the program shall be terminated.

§14 - Definitions

"Agency" means any public organization of the State or a political subdivision that is authorized to issue citations for a violation of State vehicle law or of local traffic laws or regulations.

"Automated traffic law enforcement system," means a device with one or more motor vehicle sensors working in conjunction with:

(1) A red light signal to produce recorded images of motor vehicles entering an intersection against a red signal indication; or

(2) A speed measuring device to produce recorded images of motor vehicles traveling at a prohibited rate of speed; or

(3) A device to produce recorded images of motor vehicles violating railroad grade crossing signals; or

(4) Any other traffic control device designed to enhance highway safety.

"Automated traffic law enforcement program" means the utilization of one or more automated traffic law enforcement systems to issue citations for civil violations of traffic law.

The "Manual on Uniform Traffic Control Devices" means the national standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel in accordance with 23 U.S.C. 109(d) and 402(a).

"Owner" means the registered owner of a motor vehicle or a lessee of a motor vehicle under a lease of 6 months or more, but does not include a motor vehicle rental or leasing company.

"Recorded images" means images recorded by an automated traffic law enforcement system on:

A Two or more photographs;

B Two or more microphotographs;

C Two or more electronic images; or

D A videotape, showing the motor vehicle, and on at least one image or portion of tape, clearly identifying the registration plate number of the motor vehicle.

A "traffic control device" means any sign, signal, marking, channelizing and other device in conformance with the Manual on Uniform Traffic Control Devices and used to regulate, warn or guide traffic, placed on, over, or adjacent to a street, highway, roadway, pedestrian facility, or bicycle path by authority of a public body or official having jurisdiction.

Appendix B – DOT COP Legislation

32-33-14.1. Agent or employee of Department of Transportation authorized to act in capacity of law enforcement officer to enforce speed limits in areas of highway construction. An agent or employee of the Department of Transportation authorized by the secretary of transportation may, after receiving appropriate training, act in the capacity of a law enforcement officer within the state for the sole purpose of enforcing speed limits in areas of highway construction as authorized by § 32-25-19.1 when highway construction workers are present. Any authorized agent or employee may stop and issue a citation on a form promulgated pursuant to § 23-1A-2 to the driver of any vehicle for a speeding violation in a highway work area which occurred in the presence of the agent or employee. The agent or employee is not considered a law enforcement officer for the purposes of § 23-3-27.