

UMTRI-95-9

Evaluation of Airspeed Timing versus Laser "Wolfpack" Speed Enforcement Teams

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February 1995



The University of Michigan
Transportation Research Institute

Technical Report Documentation Page

1. Report No. UMTRI-95-9		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Evaluation of Airspeed Timing versus Laser "Wolfpack" Speed Enforcement Teams				5. Report Date February 1995	
				6. Performing Organization Code	
7. Author(s) Fredrick M. Streff, David W. Eby				8. Performing Organization Report No. UMTRI-95-9	
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, MI 48109				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. PA-94-05	
12. Sponsoring Agency Name and Address Michigan Office of Highway Safety Planning 330 S. Washington Square, Suite 300 Lansing, MI 48913				13. Type of Report and Period Covered 10/1/93-9/30/94	
				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract <p>This report documents a study conducted to assess the cost-effectiveness of two speed enforcement strategies: airspeed timing teams and laser "wolfpack" timing teams. Specifically, the evaluation included an assessment of costs associated with use of the two technologies, police activity levels and use of the enforcement equipment during the evaluation period, and perceived threat and reported effect of threats on speeding behavior among residents near the special enforcement zones.</p> <p>Based on the findings detailed in this report, it is our conclusion that laser speed enforcement teams are a more cost-effective means of speed enforcement than airspeed timing teams for the following reasons:</p> <ul style="list-style-type: none"> • Laser speed enforcement teams appeared to create a greater deterrent to speeding than did airspeed enforcement efforts. • Neither enforcement strategy generated sufficient attention to significantly affect perceived threat of apprehension or knowledge of the special enforcement efforts. • Laser speed enforcement efforts require less administrative overhead than do airspeed timing efforts. • The lifetime per-use cost of purchasing a laser unit is significantly lower than the lifetime per-use cost of an equivalent program (with 17 or more patrols over the lifetime of the unit). 					
17. Key Words airspeed timing, speed, laser, wolfpack, speed enforcement teams			18. Distribution Statement Unlimited		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 39	22. Price

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Michigan Office of Highway Safety Planning nor the U.S. Department of Transportation, National Highway Traffic Safety Administration.

Prepared in cooperation with the
Michigan Office of Highway Safety Planning
and
U.S. Department of Transportation
National Highway Traffic Safety Administration
through Highway Safety Project #PA-94-05

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BACKGROUND

This report documents a study conducted to assess the cost-effectiveness of two speed enforcement strategies: airspeed timing teams and laser "wolfpack" timing teams. Airspeed timing is conducted along roadway segments marked with bright paint identifying the timing zone for the pilot. The pilot and a police officer fly up and down a selected corridor timing suspect vehicles and calling ground units stationed at the roadside along the target corridor to apprehend vehicles identified as speeding. Laser timing teams work in an identical manner with the exception that instead of the timing being accomplished by a pilot and spotter in a plane, these observations are being made by an officer with a laser speed-measuring device and a spotter calling to the chase units along the corridor. Because of ever shrinking resources available for police activities, it is increasingly important that enforcement activities be conducted using the most cost-effective strategies.

The importance of an evaluation of this type was magnified in a letter to the Michigan Department of State Police (MSP) Office of Highway Safety Planning (OHSP) from the National Highway Traffic Safety Administration (NHTSA) Region 5 Administrator (dated 1/20/94). This letter states, "NHTSA approval for the Air Speed Timing . . . is granted, subject to the following understanding. . . an independent evaluation will be conducted to determine the cost benefit and impact of air speed timing activities. Further, we request that the evaluation specifically assess the impact that air speed enforcement actions have on MI speed related crashes, deaths, and injuries. Finally, the evaluation should provide data on the relative costs and benefits as well as impact potential of traditional, laser, and other speed enforcement technologies." Thus, without this evaluation, NHTSA monies could not be allocated to conduct air speed timing enforcement.

A number of meetings occurred between OHSP, MSP, and UMTRI personnel to determine how this cost-effectiveness study would be conducted. Obviously, close cooperation between these parties was essential for the project to work. This cooperative spirit was seen in each of the project meetings. The methods used in this evaluation were selected to balance the requirements of scientific rigor with practical issues of police personnel deployment and availability, data availability and data collection protocol needs, and overall project cost. To minimize evaluation costs, evaluation goals were limited to assessments of costs associated with use of the two technologies, changes in crash, injury, and death frequencies and rates (1993 vs. 1994), police activities and use of the enforcement equipment during the evaluation period, and perceived threat and reported effect of threats on speeding behavior.

METHODS

Placement

The purpose of this evaluation was to assess the cost-effectiveness of two speed enforcement strategies: airspeed timing teams and laser "wolfpack" timing teams. Each of these enforcement strategies was assigned to a single segment of highway identified as having a speed problem. These sites were:

- I-696 air speed timing zone 21-1 near Farmington Hills
- I-75 laser "wolfpack" zone at Grangehall and Holly roads.

The airspeed timing site on I-696 has been used for a number of years for airspeed timing enforcement. Correspondence among participants of these prior airspeed efforts along this road segment testify to the perceived effectiveness of airspeed enforcement. This correspondence also notes that other methods of speed enforcement are difficult and dangerous along this corridor because of the geometrics of the roadway (small shoulder with concrete divider). The site selected for the laser wolfpack teams has been used for a number of years by enforcement personnel for standard microwave radar enforcement as well as occasional airspeed timing enforcement. These sites also had similar traffic speed and volume characteristics.

These two sites are also separated geographically. The sites had to be within a single Michigan State Police (MSP) district jurisdiction (for administrative ease), and located so that survey respondents would be as familiar as possible with the enforcement strategy nearest their home, while remaining relatively unfamiliar with that used at the other site. These sites permitted us to select survey respondents from an eight-mile radius around each of the enforcement sites, while still leaving a space of approximately the same area between the sites.

Timing

The evaluation period was defined as August 1 through September 30, 1994. Within this period, enforcement teams were asked to conduct seven days of enforcement using four or more ground officers for apprehending and citing speeders. If additional enforcement above and beyond seven days was conducted by either of the enforcement teams, the other team was to conduct additional enforcement activities to match.

Promotion

A major component of this evaluation is the extent to which enforcement and accompanying promotion affect the perceived threat of apprehension while speeding. One of the most frequent comments made in support of airspeed timing efforts is that airspeed timing efforts are picked up and given wide attention by the press, thus increasing the threat of enforcement. This perceived threat was a key variable of interest in this study.

To ensure that the evaluation measured effects that would be caused by police activity alone (not the activity associated with a university-based evaluation), MSP was assigned the responsibility for maintaining an active public information and education effort. It was MSP's responsibility to secure publicity and to record media activity in response to their enforcement efforts.

Measures of Effectiveness

Costs associated with acquisition and use of the two technologies were identified by MSP and delivered to us for this study. The original proposal called for an analysis of crash, injury, and death frequencies and rates on the road segments studied (1993 v. 1994). However, the 1994 crash data are not yet complete and available for analysis. Therefore, to prevent a significant delay in the delivery of this report, these data analyses are not reported here.

Police activities and equipment use during the evaluation period were gathered from the pilot logs and officers' daily activity reports. Perceived threat and reported effects of threat of enforcement on speeding behaviors were gathered using mail-back surveys. The basic design of the survey study is shown in the following table.

	Before enforcement effort	After enforcement effort	
Laser Wolfpack Zip Codes near I-75 site	<u>A</u> attitude/opinion score	<u>B</u> attitude/opinion score	<u>A & B</u>
Airspeed Timing Zip Codes near I-696 site	<u>C</u> attitude/opinion score	<u>D</u> attitude/opinion score	<u>C & D</u>
	<u>A & C</u>	<u>B & D</u>	

This design permits several useful comparisons to help us understand effects of the enforcement project on attitudes, opinions, and self-reported behaviors. To determine effects of the two enforcement efforts taken together one can compare results from cells A & C to results from cells B & D. To determine effects of laser wolfpacks one can compare results from cell A to results from cell B. To determine effects of airspeed timing teams one can compare results from cell C to results from cell D. By comparing cell A with cell B and cell C with cell D, one can assess if there were differences responses based on the type of enforcement strategy the respondents were most exposed to.

RESULTS

Survey

Perhaps most striking in the survey data presented in the following tables is the finding that none of the planned comparisons showed a statistically significant difference. That is:

- there was no difference on any of the measures when one compared results of surveys returned before the enforcement activity began with results of surveys returned after the program was completed, and
- there was no difference on any of the measures when one compared results of surveys from the area nearest to the I-75 Laser timing zone with results of surveys from the area nearest the I-696 air speed timing zone.

Based on these analyses, one could conclude that both the laser and air speed timing teams and their accompanying media attention were equally effective. Unfortunately, these results also show that programs like these appear to have very little impact on perceived likelihood of apprehension, and selected driving speed. Indeed, even though there was media attention given to these two enforcement efforts, the surveys showed that this media attention was frequently not seen by the respondents. If this is true (i.e., that area residents did not see the project media), then the only manner in which respondents could have been made aware of the programs is through actual experience seeing or being stopped by one or both of the special enforcement teams. There is little evidence to suggest that this type of experience had an impact on the perceived threat of enforcement created by the programs.

The following tables present the results from each of the survey groups. The title for each table is the verbatim item wording and the possible responses offered to respondents. The "Before" column shows data gathered prior to the special media and enforcement efforts, the "After" column shows data gathered immediately following the conclusion of the enforcement efforts. The first row of the table, "Laser Wolfpack," includes data from respondents living within an eight mile radius of the laser speed-enforcement team operations, the row labeled "Airspeed Timing" includes only data from respondents living within an eight mile radius of the airspeed timing team operations.

<p>You are driving on I-696 near your home where the speed limit is 55 mph. How fast would you most likely be driving?</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	62.93	63.09
<p>Airspeed Timing Zip Codes near I-696 site</p>	62.24	62.94

<p>If a driver was going 60 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-696 -- 55 mph) (1=no chance -- 7=ticketed every time)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	1.63	1.71
<p>Airspeed Timing Zip Codes near I-696 site</p>	1.71	1.71

If a driver was going 65 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-696 -- 55 mph)
(1=no chance -- 7=ticketed every time)

	Before	After
Laser Wolfpack Zip Codes near I-75 site	2.69	2.77
Airspeed Timing Zip Codes near I-696 site	2.87	2.79

If a driver was going 75 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-696 -- 55 mph)
(1=no chance -- 7=ticketed every time)

	Before	After
Laser Wolfpack Zip Codes near I-75 site	4.64	4.59
Airspeed Timing Zip Codes near I-696 site	4.83	4.68

<p style="text-align: center;">If a driver was going 90 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-696 -- 55 mph) (1=no chance -- 7=ticketed every time)</p>		
	Before	After
Laser Wolfpack Zip Codes near I-75 site	6.02	5.95
Airspeed Timing Zip Codes near I-696 site	6.09	5.85

<p style="text-align: center;">You are driving on I-75 near your home where the speed limit is 55 mph. How fast would you most likely be driving?</p>		
	Before	After
Laser Wolfpack Zip Codes near I-75 site	62.66	62.26
Airspeed Timing Zip Codes near I-696 site	62.16	62.94

<p align="center">If a driver was going 60 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-75 -- 55 mph) (1=no chance -- 7=ticketed every time)</p>		
	Before	After
Laser Wolfpack Zip Codes near I-75 site	1.80	1.87
Airspeed Timing Zip Codes near I-696 site	1.74	1.59

<p align="center">If a driver was going 65 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-75 -- 55 mph) (1=no chance -- 7=ticketed every time)</p>		
	Before	After
Laser Wolfpack Zip Codes near I-75 site	2.74	2.88
Airspeed Timing Zip Codes near I-696 site	2.83	2.77

If a driver was going 75 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-75 -- 55 mph)
(1=no chance -- 7=ticketed every time)

	Before	After
Laser Wolfpack Zip Codes near I-75 site	4.65	4.73
Airspeed Timing Zip Codes near I-696 site	4.86	4.55

If a driver was going 90 mph in this situation, what is the chance that driver would get pulled over and ticketed for speeding? (I-75 -- 55 mph)
(1=no chance -- 7=ticketed every time)

	Before	After
Laser Wolfpack Zip Codes near I-75 site	6.07	6.06
Airspeed Timing Zip Codes near I-696 site	6.12	5.92

Do you favor or oppose the way police currently enforce speed laws on highways? (1=Favor -- 7=Oppose)		
	Before	After
Laser Wolfpack Zip Codes near I-75 site	3.94	4.06
Airspeed Timing Zip Codes near I-696 site	4.05	4.02

How often are these Laser timing teams used on highways in your area? (1=Never -- 7=Almost every day)		
	Before	After
Laser Wolfpack Zip Codes near I-75 site	4.03	4.39
Airspeed Timing Zip Codes near I-696 site	4.13	3.92

<p>In general, do you favor or oppose enforcing speed laws on highways using Laser timing teams like the one described earlier? (1=Favor -- 7=Oppose)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	3.76	4.18
<p>AirSpeed Timing Zip Codes near I-696 site</p>	3.75	3.84

<p>How often are these AirSpeed timing teams used on highways in your area? (1=Never -- 7=Almost every day)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	3.52	3.88
<p>AirSpeed Timing Zip Codes near I-696 site</p>	3.60	3.05

<p>In general, do you favor or oppose enforcing speed laws on highways using AirSpeed timing teams like the one described earlier? (1=Favor -- 7=Oppose)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	4.10	4.45
<p>Airspeed Timing Zip Codes near I-696 site</p>	4.25	4.17

<p>In the last month, how often did you reduce your speed while driving on a local highway because you were concerned about being ticketed by a Laser patrol team? (1=Never -- 7=Almost every day)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	2.90	2.94
<p>Airspeed Timing Zip Codes near I-696 site</p>	3.11	3.03

<p>In the last month, how often did you reduce your speed while driving on a local highway because you were concerned about being ticketed by an AirSpeed timing team? (1=Never -- 7=Almost every day)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	1.87	2.17
<p>AirSpeed Timing Zip Codes near I-696 site</p>	2.21	1.99

<p>Have you seen or heard about laser patrol teams or similar speed enforcement programs in local newspapers, television or radio in the last month? (1=Yes -- 2=No)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	1.79	1.71
<p>AirSpeed Timing Zip Codes near I-696 site</p>	1.69	1.79

<p>Have you seen or heard about AirSpeed timing teams or similar speed enforcement programs in local newspapers, television or radio in the last month? (1=Yes -- 2=No)</p>		
	Before	After
<p>Laser Wolfpack Zip Codes near I-75 site</p>	1.88	1.74
<p>AirSpeed Timing Zip Codes near I-696 site</p>	1.87	1.94

Police Activity

The following tables show activity summaries provided by MSP for the enforcement teams. Because incomplete data were received for two days of operations for each of the enforcement types, these data are not included in the tables. However, the extant data are quite consistent from day to day, minimizing concern that the missing data would affect the ultimate results or conclusions. It appears that there is a higher rate of stops per officer-hour in the airspeed timing group than the laser speed enforcement group. Possible explanations for this finding include greater time efficiency for the airspeed timing teams (a positive indicator for airspeed timing) or superior specific deterrent effect for laser speed enforcement resulting in fewer stops being possible (a positive indicator for laser speed measurement teams).

Laser Speed Enforcement Team Activity					
	8/19/94	8/23/94	8/31/94	9/7/94	9/20/94
Number of Stops	37	68	66	80	43
Number of Citations Issued	33	66	65	77	40
Number of Officers on Site	5	5	7	9	6
Enforcement time (hours)	2.0	4.0	4.0	4.0	3.0
Stops per Officer-Hour	3.7	3.4	2.4	2.2	2.4

AirSpeed Enforcement Team Activity					
	8/10/94	8/17/94	9/6/94	9/14/94	9/22/94
Number of Stops	65	75	84	90	84
Number of Citations Issued	69	82	91	95	92
Number of Officers on Site	4	5	5	5	6
Enforcement time (hours)	4.0	4.0	4.0	4.0	3.5
Stops per Officer-Hour	4.1	3.8	4.2	4.5	4.0

In addition to these data, several program participants took the time to prepare project summaries. Each of these summaries testifies to the usefulness of the technology being used by the participant writing the letter. These letters can be found in Appendix A.

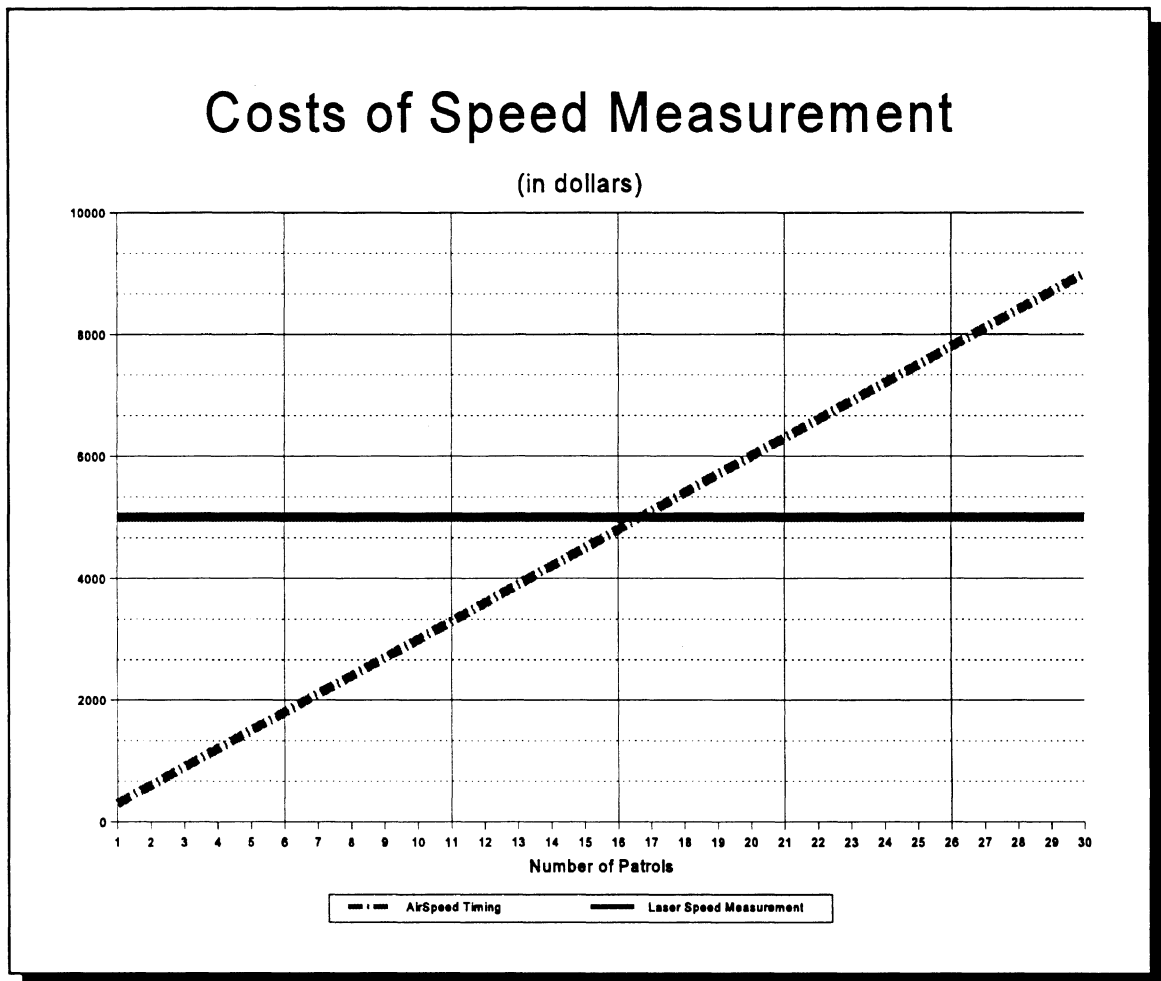
Cost

For all practical purposes, both of the enforcement team strategies are identical with the exception of the means used to measure speed (airspeed timing by a pilot versus speed timing by an officer using a laser speed measuring device). Therefore, we will examine only costs associated with speed measurement.

Airspeed timing. An airplane suitable for use in airspeed timing operations can be rented for a cost of about \$50 per hour (as quoted by the Michigan State Police Comprehensive Traffic Safety Initiative FY93/94). For the I-696 airspeed timing component, the pilot spent about two hours per six-hour patrol traveling to and from the airport, thus spending about four hours on patrol over the target corridor. Adding it all up, each four hour airspeed timing patrol costs about \$300 for plane rental.

Laser. Unlike the airspeed timing costs which accrue with every enforcement patrol, the costs associated with laser speed measuring devices are fixed. That is, a laser speed measuring device suitable for law enforcement activity costs about \$5,000 whether a department uses it only once or every day (provided it isn't damaged). This creates an evaluation quandary: How does one assess the relative costs of the two competing technologies?

Perhaps the easiest way to compare the relative costs of the two technologies is to determine the "break-even" point between the costs of the two technologies. When examining the break-even point, we find that 16 four-hour airspeed timing patrols would cost less than 16 laser patrols (\$4,800 to \$5,000). However, if costs associated with 20 patrols are examined, the cost advantage goes to the laser device (\$5,000 to \$6,000), and this cost advantage continues to grow linearly with the number of patrols conducted. The following chart shows the "lifetime" costs for up to 30 enforcement patrols, graphically depicting the nature of the cost-patrol frequency relationship for both technologies.



DISCUSSION

Let's consider the results of this study in the wider context of the goals for any speed enforcement program. These goals generally fit into one of five broad categories: behavior, attitude/opinion, knowledge, administration, and cost. Some of the primary goals of speed enforcement programs are listed in the following table.

Speed Enforcement Program Goals	
Behavior	<ul style="list-style-type: none"> • Reduce and maintain vehicle speeds at or below speed limit
Attitude/Opinion	<ul style="list-style-type: none"> • Create and maintain public impression that speeds are rigorously enforced • Create and maintain public impression that violating speed laws decreases personal safety
Knowledge	<ul style="list-style-type: none"> • Increase public knowledge of efforts to enforce speed laws • Increase public knowledge of safety problems associated with excessive speed
Administration	<ul style="list-style-type: none"> • Conduct speed enforcement programs so that police resources are complementary, not duplicative • Gather data to support problem identification and decision making
Cost	<ul style="list-style-type: none"> • Utilize the most cost-effective strategies to achieve other program goals <small>(i.e., speed enforcement programs also provide an opportunity for safety belt use enforcement, warrant checks, and other misdemeanor and felony arrests resulting from the initial traffic stops)</small> • Reduce the number of crashes related to excess speed¹ • Reduce the number and severity of injuries caused by speed-related crashes¹

Behavior

Was either program more or less successful than the other in reducing and maintaining vehicle speeds at or below the speed limit? This question cannot be answered directly in the current study because no direct, behavioral measures of speed were taken. However, survey respondents did report their driving speeds along the target roadways. Analyses of these survey items showed that there was no effect of the programs on reported speeds (the mean of which exceeded the speed limit by seven mph). In addition, survey items that

¹These could also fit into the **Behavior** category or in their own category, **Outcomes**.

measured the likelihood of being pulled over and ticketed showed neither program had a measurable effect on perceived probability of apprehension for speeding. However, these survey items are not the only indicants of possible program effects on speed.

When one examines the police activity results, it can be seen that police officers on I-75 made fewer stops per officer hour than those patrolling I-696. One explanation for this result is that the laser timing team had a greater deterrent effect on speed (i.e., speeds were maintained nearer the speed limit), resulting in fewer opportunities to make stops. There is no independent information available to verify or contradict this hypothesis. However, letters received from participants in the program (pilot and command officers) are quite informative (Appendix A). Lt. Hay of the Troy Police Department (which operated as part of the laser enforcement team) reports he believed the laser enforcement team was effective because of its visibility: "The high visibility of the operators and chase cars on the shoulder of the road created an overwhelming sense of police presence in the area, thereby achieving a significant deterrent effect. We had many southbound cars that were passing the operation flashing their lights to warn northbound cars so we had traffic slowed in both directions." This evidence would support the hypothesis that the laser team was effective in creating a deterrent environment (at least for the time of the enforcement). What is known about the operation of the airspeed timing team?

Reports from two of the participants of the airspeed timing effort are also consistent with the hypothesis that the airspeed timing team was not achieving a significant deterrent to speeding. MSP Trooper (and project pilot) Halliday reported that while 555 speeding targets were stopped, 280 violators travelling at least 25 mph over the speed limit could not be stopped because of the limits placed on the number of ground personnel used. In addition, Sgt. Cranston of the Farmington Hills Police Department reports, "The aircraft is rarely detected . . . Several drivers during the study period indicated that they had heard the radio announcements about the speed enforcement program but indicated they had forgotten."

Based on the information presented in this report, we conclude that while neither enforcement strategy showed a strong deterrent effect on speeding, the laser teams may have had a slightly more pronounced effect than the airspeed timing teams. This is based on subjective evaluation of the participant letters and police activity during the project. Given the statements of Sgt. Cranston, one should not have expected the airspeed timing teams to have had an effect on speeds. Without active, visible enforcement there is no reason for anyone's speeding to be deterred because there is no threat perceived.

Attitude/Opinion and Knowledge

The focus of both enforcement efforts was on increasing public impressions that speeds are enforced rigorously and that special efforts were underway to enforce speed laws in their home area. The sites used in the project are in the same media market, therefore one may expect little difference in perceptions of the two enforcement efforts. However, perceptions in the two project areas may differ if the amount of emphasis given to each by the media differs (e.g., more attention to airspeed), or may differ because of personal experience with the enforcement teams (e.g., seeing the teams at work, getting caught by the teams, friend tells story about the teams). Letters from project participants (Appendix A) and copies of media material collected during the project (Appendix B) testify to the efforts made to ensure active media participation and maximize public knowledge of the programs.

Unfortunately, the survey results show that nearly three-quarters of respondents did not recall having seen or heard about the project in the local media. This was true both before the media attention was emphasized by the projects and after the projects had been operating with full media coverage. Clearly there is not a one-to-one correspondence between getting coverage and the public being aware of the programs. There is good reason to expect that a strong sense of enforcement threat can only be generated with a long-term perspective. In his letter (Appendix A), Sgt. Cranston puts it well: "Regardless of the system adopted for enforcement, it is very clear that the only way to achieve speed reduction . . . is the commitment of sufficient human resources on a protracted basis, coupled with a strong public awareness campaign so as to create a public perception of enforcement."

Sgt. Cranston brings out two highly salient points with respect to public opinions and their effect on behavior. First, attitude change doesn't occur overnight. We tend to learn through repeated experience, and only through repeated experience do we change old opinions and replace them with new ones. Second, opinion and behavior change requires specific, direct rationale. Opinions will change more quickly when one is exposed directly to a new situation (e.g., you get ticketed during the program) than when one is exposed indirectly (e.g., a friend got ticketed, you heard about the program on the radio but never saw it). However, with repeated indirect exposure (e.g., news stories about enforcement team presence and offender tally) and occasional direct exposure (e.g., in the form of seeing the enforcement teams on the road), even persons who are never ticketed will begin to change their opinion about enforcement levels and should then begin to behave accordingly. More general pleas for rational and safe driving may be important supplements so not to create too much of a "we-they" conflict, but for enforcement programs like those evaluated here to be effective, the majority of media attention should be focused on increasing perceived threat of being stopped and ticketed.

Administration

The administrative goals of this project were to conduct cooperative, multiagency enforcement teams that could work together effectively. It is clear from the correspondence from the various agencies that interagency cooperation was excellent for both enforcement team types. Although administration of both projects went well, characteristics of each make for an interesting comparison.

Airspeed timing efforts require close cooperation between ground and air units. The air unit generally has to travel from a site geographically removed from the enforcement zone. This travel time does not contribute to the enforcement effort, thus is lost time. Airspeed timing is seasonal and highly weather dependent, resulting in scheduling difficulties. Airspeed timing is zone dependent; that is, enforcement can only be conducted at sites that have been prepared with special roadway markings for timing.

While laser team enforcement requires close interagency cooperation, the number and types of units being called on streamlines somewhat the communication burden on the organizing agency. Weather and zone location are not significant concerns for laser team enforcement, thereby increasing the planning flexibility of the organizing agency. All in all, it would appear that the effectiveness edge goes to laser team enforcement for administrative ease.

Cost

When examining the break-even point, we find that 16 four-hour airspeed timing patrols would cost less than 16 laser patrols (\$4,800 to \$5,000). However, if costs associated with 20 patrols are examined, the cost advantage goes to the laser device (\$5,000 to \$6,000), and this cost advantage continues to grow linearly with the number of patrols conducted. In addition, we must consider that costs associated with airspeed timing provide only that single service (i.e., an airplane at the enforcement site for a given period of time), whereas when an agency purchases a laser speed measurement device they can use that device for individual enforcement efforts as well as team enforcement efforts. Thus there are more opportunities to amortize the cost of the laser across multiple enforcement efforts, reducing the cost per use.

CONCLUSION

It is our conclusion that laser speed enforcement teams are a more cost-effective means of speed enforcement than airspeed timing teams for the following reasons:

- Laser speed enforcement teams appeared to create a greater deterrent to speeding than did airspeed enforcement efforts.
- Neither enforcement strategy generated sufficient attention to significantly affect perceived threat of apprehension or knowledge of the special enforcement efforts.
- Laser speed enforcement efforts require less administrative overhead than do airspeed timing efforts.
- The lifetime per-use cost of purchasing a laser unit should be significantly lower than the lifetime per-use cost of an equivalent program (with 17 or more patrols over the lifetime of the unit).

APPENDIX A
PROGRAM PARTICIPANT LETTERS



City of Farmington Hills

31655 ELEVEN MILE ROAD, FARMINGTON HILLS, MICHIGAN 48018-4005

October 19, 1994

1st Lt. Dan Smith
Special Operation
Michigan State Police
E. Lansing, MI

Dear Lt. Smith:

During the last 24 months, the Farmington Hills Police Department has participated in Air speed Timing activities with the Michigan State Police. The heaviest concentration of this activity occurred in August and September of 1994. The August and September activities produced 486 violations, 2 arrests and a number of warnings.

Interstate 696 in Farmington Hills provides some unique challenges for traffic enforcement. First, a concrete barrier wall in the median, commences west of Halsted Road and runs easterly, without interruption to the eastern city limits, (Inkster Road) and for many miles beyond. Secondly, only one bridge crosses Interstate 696 at a point where the roadbed below is straight enough to allow officers positioned on the bridge to view both approaching and departing vehicles. This bridge has an insufficient distance between the road lanes and the concrete bridge barrier walls to allow the parking of a vehicle. Officers operating hand held radar then must be on foot and would be exposed to traffic passing within three feet at a speed of 40 mph. Third, the roadbed of Interstate 696 crosses rolling terrain which includes not only hills but major curves as well. Finally, there is only one exit from the interstate within the city. Officers who fail to stop vehicles prior to reaching this exit are compelled to drive easterly five and a half miles to Telegraph Road in the City of Southfield and an equal distance to return to the exit. (The Airspeed Timing Zone is two miles west of the described exit.)

During the studies conducted in August and September, several restrictive conditions were placed on the activities in order to have the study areas in Troy and Farmington Hills function in a similar manner. First, the number of ground units were restricted to five when the normal number used is seven with an occasional

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eighth. Secondly, only one eastbound zone was used, often both the east and west bound zone, across the barrier wall from each other are operated simultaneously. This reduces the "unavailable" time for cars forced to exit the interstate at Orchard Lake Road and then return westbound back to the original staging location.

The use of an aircraft for speed enforcement has both tangible and intangible benefits. The tangible benefits include a system that allows the aircraft operator to identify a violator and remain with that vehicle for several miles, if necessary, until a ground unit can intercept the vehicle. This scenario happens frequently with high speed violators, when ground units have completed multiple stops and are far down the roadway from the planned staging area (the "chute") or when heavy concentrations of traffic move through the area effectively surrounding an identified violator.

The aircraft is rarely detected. Many violators, when asked, indicated they had not detected the aircraft's presence, in fact only one motorcyclist admitted to seeing the aircraft. Several drivers, during the study period, indicated that they had heard the radio announcements about the speed enforcement program but indicated that they had forgotten. Very few indicated that they were not speeding, didn't believe they were the right car or that the method was anything but fair. Interestingly, several drivers commented that they thought the officers would be so busy with other cars that they would still "slip through" (a perception that was not totally without foundation).

It is perhaps the intangible portion of Airspeed Timing that is the most beneficial. First, media coverage has been excellent. The articles from the local paper have been positive. Local radio media were enthralled by the concept that the enforcement agencies were telling the public, not only where they were taking enforcement action but when and what the results of the efforts were. Letters to the editor of the Detroit print media praised both the local jurisdiction and the State Police for "finally doing something about the speeders on 696," a road that is clearly perceived as having a speeding problem.

Within the Farmington Hills Police Department, officers as well as civilians, were actually excited about the activity. Officers who were often received as reluctant to do speed enforcement, volunteered for assignment to the detail. Other officers eagerly volunteered to adjust their shift hours to participate and expressed disappointment if the allotted number of slots were full (Incidentally, these shift adjustments did not include any increased compensation). A walk through the Department during the activities usually revealed a half dozen or more civilian employees listening

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in on the activities as they worked and most could recant the highest speed violator stopped and the other significant events of the day.

Experience has shown great support for the program by our local courts. A thorough briefing of the judiciary prior to activities, as well as, the fact that drivers are not stopped until they are operating at 25 mph over the posted limit, 80 mph in a 55 mph zone, has made their decisions relatively easy. This is further supported by the simplicity of the system and the time honored acceptance of the measuring method, i.e. time over a known distance. To date, not a single Air Speed Timing violation has been lost in the 47th District Court.

As a community, the city cannot deny the economic benefits of the program. During August and September, the City's operating costs were \$3,828.22 to conduct the program. The potential revenues to the City for that same period of time was \$37,475.00 after factoring the mandated contributions to state funds.

Air Speed Timing provides a method to reach the most flagrant speeders. With the technological advances of today, it is only a matter of time before the detection of laser beams is as readily accomplished as is other forms of radar today. Current laser units are bulky and weighty. Their inability to be used while the patrol unit is moving, the refraction of the laser beam when emitted through curved glass and the difficulty of aiming the unit for long distance speed detection drastically limit their usefulness and renders the laser operator more detectable to the public. Conversely, the remoteness of the aircraft from the violator's vision and the lack of emitted detectable electronics or light beams render it advantageous. In short, when operating at excessive speeds, the violator is forced to focus on the roadway ahead. The laser operator is within the potential focused view of the violator whereas the aircraft is not.


Regardless of the system adopted for enforcement, it is very clear that the only way to achieve speed reduction in the test area or anywhere on Interstate 696 is the commitment of sufficient human resources on a protracted basis, coupled with a strong public awareness campaign so as to create a public perception of enforcement. At the present time these needs are not being met on a regular basis and the public perception that high speed operation, 20+ mph over the posted limited, is tolerated is well founded. This agency is not equipped to deliver the needed service on a long term basis given its existing resources nor I suspect are the Michigan State Police.

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In conclusion, I believe that Air Speed Timing, on a frequent basis, offers the best possible solution to the problem, given the constraints that are in place today.

If I can be of further assistance, please contact me at your earliest convenience.

Sincerely,

A handwritten signature in cursive script, appearing to read "R. A. Cranston".

Sgt. R. A. Cranston
Traffic Section Supervisor

mw

MEMORANDUM

STATE OF MICHIGAN

DEPARTMENT OF STATE POLICE

DATE: October 5, 1994

TO: F/Lt. Dan Smith, Traffic Services Section, Special Operations
Division

FROM: Tpr. David W. Halliday, Aviation Section

SUBJECT: Airspeed Timing UMTRI Study

The 7 dates for the UMTRI study have been completed. I have included copies of the daily air speed timing reports that we normally use. The program was very successful and I would like to point out some highlights.

During 27.3 hours of zone time (actual clocking of targets) Air 3 stopped 555 targets. The SLOWEST was 25 mph over the speed limit. The FASTEST was 105 mph in a 55 mph zone. You will note there are numerous targets over 100 mph. Due to the scientific nature of the study we were limited in the number of ground personnel available for use. Air 3 clocked a total of 835 targets, which means we let go an additional 280 violators that were doing at least 25 mph over the limit. The work done by the the Farmington Hills Police ground crews was excellent. They were enthusiastic in their approach and ready to help in any way possible. The MEDIA participated EVERYDAY we used AIRSPEED TIMING. EVERYDAY At least 2 representatives from the media broadcast our efforts to the public thru radio, television, or newspapers regardless if they were invited to or not. They are obviously attentive to the program. A variety of news spots were done on the program and all were positive in their approach to our enforcement efforts.

There currently is a 100 percent conviction rate on AST and F.H.P.D. has kept close track of each citation issued, including final disposition and fines.

Please contact me if I can be of assistance, Thank You.

cc: F/Lt. King

October 24, 1994

To Whom It May Concern,

This memo is sent to provide you insight into our overall opinion of the joint laser speed enforcement operations conducted by the MSP and Troy Police Dept. on I-75 during August and September.

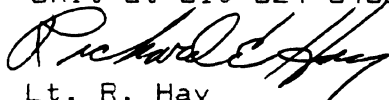
The Troy Police Department was pleased to participate in your evaluation of the laser, and found it to be a highly effective speed enforcement tool. Once the troopers and our officers got comfortable with using the device they were able to target speeders at long ranges as well as to isolate speeders maneuvering through packs of cars. The high visibility of the operators and chase cars on the shoulder of the road created an overwhelming sense of police presence in the area, thereby achieving a significant deterrent effect. We had many southbound cars that were passing the operation flashing their lights to warn northbound cars so we had traffic slowed in both directions.

We also received tremendous publicity from the electronic and print media after we put out a press release announcing the operation. We had every Detroit TV station do a story on it, and we got a lot of attention from the major radio stations. In fact, we did three live interviews with WWJ and WJR about laser enforcement, and one music radio station was offering prizes to callers if they reported where and when we were operating. The Detroit News, Free Press, Eccentric, Daily Tribune, Somerset Gazette, and Troy Times newspapers also did stories on the operation. From comments and letters I received the public was overwhelmingly grateful for our efforts, and EVERYBODY was watching their speed when they came down I-75 through Troy. Nonetheless, we wrote a whole bunch of tickets (See Attached tally sheet), and we did not stop anyone for less than 20 mph over the limit.

We found the laser to be more flexible than air speed. We were able to operate under adverse weather conditions and anywhere we chose rather than an established zone, and yet we found that as the operators got familiar with the device they were targeting speeders as rapidly as the air speed pilot and observers had in past joint efforts. As indicated by the above comments we also found that the laser operations had a much better deterrent effect on speeders than air speed operations because the laser operations are more visible. I am impressed enough that I am going to propose that Troy PD purchase a laser next budget year so that we can enhance our enforcement efforts on some of our major roads on which radar operations are difficult.

Lastly, we have had several laser tickets contested in court, and we have not lost one yet so we feel this tool is as effective as air speed and radar in that regard.

If anyone has any questions, or would like to discuss this issue further please call me at the Troy Police Dept. Traffic Safety Unit at 810-524-3432.


Lt. R. Hay

APPENDIX B

ARTICLES



MICHIGAN DATELINE

I-696 sky watch nails 90 drivers

FARMINGTON HILLS — The eye in the sky was over I-696 Wednesday, and 90 people were busted with the pedal *way down* to the metal. The slowest driver ticketed was doing 80 m.p.h.

"They're really flying out there," said State Police Lt. Jerry Allaire. "And with lots of radar detectors. They figure it keeps them safe. Not with the aircraft."

Police stopped the speeders with calculations from the sky, where cars were timed between two points with a stopwatch. State police and officers from Farmington Hills teamed up between 10 a.m. and 3:30 p.m. on the freeway between I-275 and Orchard Lake Road, where the limit is 55 m.p.h.

The speediest vehicle was moving along at 105 m.p.h.

Police look down on speeding



APRIL 11, 1978 STAFF PHOTOGRAPHER

Over Farmington Hills: Trooper David Halliday of the Michigan State Police flies over I-696 at Halsted Road on the scout for speeders.

Police add air pressure to get up to speed(ers)

BY BILL COUTANT
STAFF WRITER

Farmington Hills and Troy police are comparing notes on how to more effectively control speeding on I-696 — from the air or from the ground.

After results of seven days of comparing laser speed timing (in Troy) and air speed timing in Farmington Hills, one thing is clear, there are

still plenty of speeders.

Farmington Hills and Troy, in conjunction with the Michigan State Police and the state Office of Highway Safety Planning, participated in seven days of testing over a two month period to see which method was more efficient and cost-effective.

In Farmington Hills, state police

provided a pilot and trooper on the ground and Hills police added three ground units and an observer in the air, to ticket speeders. Instead of writing tickets going in both directions on I-696 between Orchard Lake and Haggerty, traffic was only checked going east, to get a more consistent sample of motorists' speeds.

In addition, police did not do any air speed timing before August and did not intensely patrol the highway to see how motorists were doing before police began intensive enforcement efforts.

'Major speed problem'

"We still have a major speed

See **SPEED**, 3A

Speed *from page 1A*

problem on that road," said Sgt. Ray Cranston, traffic supervisor with the Hills police.

Cranston took his turn along with other officers, pulling over speeders on the ground after Michigan State Police pilot Doc Halliday and Hills traffic officer Skip Crump timed the offenders from the air, a practice that radar detectors cannot touch.

What officers found were plenty of motorists "in the zone," the mile between Halsted and Drake roads traveling anywhere from 25 (80 mph) to 50 miles above the speed limit of 55.

Halliday, who spots drivers who are well above the posted speed limit, tells the ground troops to be careful out there.

"Your safety is paramount," he says as he reads off the rules of engagement from about 1,000 feet skyward. "The decision (to pursue) is up to you."

With that, the police cruisers "step up to the plate" and the operation begins on a sunny Thursday morning.

Claimed he was late

Cranston pulls a gray Dodge Caravan over that was doing 82 mph, returns to his car and writes a ticket.

"'I'm late,' is what she said," he says of the speeding motorist. "Very seldom do they contend that they weren't speeding."

And a good thing in this case. A speeding ticket detected by air speed timing has yet to be overturned in court.

A few minutes later, Cranston pulls over a Corvette with a radar detector. Despite radio announcements of the police presence, this motorist is more than a little surprised when Cranston points up to the plane, and the driver looks at his radar detector like it had been his favorite pet that just died.

Cranston catches Hills resident David Barman going 82 mph, who sheepishly admits that he was out of line.

"I'm late for a funeral," he says. Cranston doesn't ask if the person who died had been killed in an auto accident by speeding, although he probably thinks it. He does remind Barman that he was in excess of 25 mph over the limit and lets him go with a warning.



Keeping track: In the aircraft, Skip Crump, a Farmington Hills police officer, records information on speeding cars below.

"He was humble," Cranston says, adding that officers can let a motorist off the hook, and do sometimes.

"Sometimes they don't realize that the speed limit here is 55," he says. "But they are still well over the limit (at 65)."

Speeders stand out

The pilot has to stay between 700 and 1,000 feet, much lower than he'd like, because of low clouds. It makes it harder to spot potential speeders. During the afternoon, it becomes easier as the speeders stand out more because they are running faster. Try 105 mph.

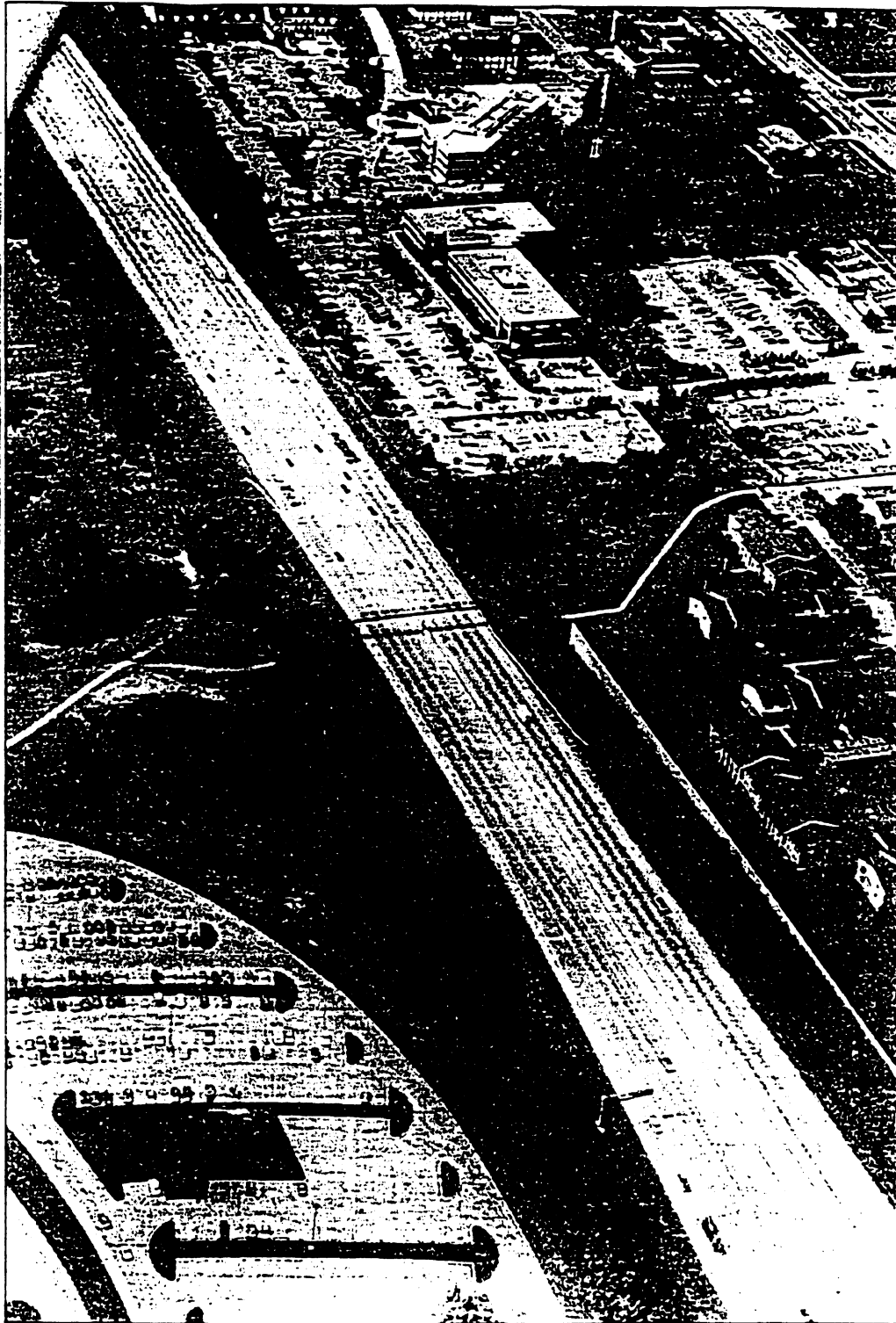
In fact, over the seven-day period, police timed three drivers at 105 mph, two more in excess of

100 mph, ticketed several in the 90s and wrote more than 400 tickets. They also arrested two motorists for reckless driving and made six arrests for outstanding warrants.

"I'm impressed," said Mike Prince, program coordinator of police traffic services for the Office of Highway Safety Planning in Lansing. Prince oversees about \$1.3 million in grant money for traffic enforcement and observed the operation from the plane.

"Our dollars are being squeezed," he said. "So we have to find the most efficient way to spend traffic enforcement money. That's why we're doing this comparison."

Cranston, himself a pilot, says



STAFF PHOTOS BY ANN HEALEY

High above Farmington Hills: *This air-speed controlled stretch of I-696 just west of Orchard Lake Road shows light traffic.*

both methods have drawbacks. The laser, which has been accurate, cannot be put in a police car because of its bulk, unlike normal radar.

Readings usually are taken from a bridge. Air speed timing

requires an airplane, but can be very cost effective because of the quickness in which officers can be dispatched.

Although there are devices claiming to be laser detectors,

police doubt their effectiveness.

"We'll take a look at how the two methods compare," Cranston said.

Either way, there doesn't seem to be a scarcity of guinea pigs for this test.



SHARON LEMIEUX/STAFF PHOTOGRAPH

Down to earth: Ray Cranston (left) of the Farmington Hills Police Department and David "Doc" Halliday of the Michigan State Police return from a flight during which 23 speeders were nabbed from the air.

Air patrol takes speeders by surprise

BY BILL COUTANT
STAFF WRITER

The sun is shining, it's a beautiful day, and the radio is cranked up as a motorist zooms by everyone else on the interstate like they're standing still. The radar detector is on and the only police car in sight is pulled over ticketing someone else.

Just then, another police car pulls up from behind and puts on its overhead lights, signaling to pull over. Michigan State Police pilot David "Doc" Halliday then reads out the speed and other details to the officer behind the speeder from a small airplane about 1,500 feet in the air. No "Fuzz Buster" is going to

save this motorist from a fat speeding ticket.

It's called air speed timing, and it is one of the most effective ways to catch speeders.

"We've never lost a case in court," Halliday said.

Halliday, two other Michigan State troopers, Farmington Hills

Police traffic specialist Sgt. R. Cranston, and five Farmington Hills officers worked together Friday for less than two hours and ticketed motorists who were clocked at between 80 and 101 miles on eastbound I-696 between Halsted and

See **SPEEDERS**, 1

