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Effects of Drone Radar and Police Enforcement on Travel Speeds: Test on a 65 MPH Freeway and 55 MPH Construction Zone

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16. Abstract

This study examined the effectiveness of drone radar and police presence on the reduction of speeds at a high speed freeway location and on a freeway contstruction zone in Michigan. A full factorial experimental design with two levels of of drone radar, two levels of police presence, and three locations relative to the drone radar installation was carried out. The mean speeds, 85th percentile speeds, and the percentage of vehicles exceeding the speed limit by 10 mph were obtained for cars and trucks in the drive and pass lanes. The effect of the drone radar and police presence on general vehicle speeds, although usually statistically significant, was found to be typically less than 1.5 mph and of little practical difference. A speed reduction effect of drone radar and/or police presence on high speed trucks was found at two of the three test sites, where the percentage of trucks exceeding the speed limit by 10 mph in the pass lane decreased between 30 percent and 70 percent. The findings of the study indicate that drone radar with police patrols can serve as a speeding countermeasure at locations where high speed trucks are a problem.

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EXECUTIVE SUMMARY

Excessive speed is known to influence both the probability and severity of crashes, yet speeding is a common occurrence on many American highways, especially on rural interstate highways. Law enforcement agencies have many demands on their limited resources and consequently are interested in effective, efficient, and economical approaches to discourage speeding. Drone radar, an electronic radar device that transmits in the microwave frequency band, but does not make any use of the return signal, appears to be a promising candidate for such a system. Its purpose in speed control programs is as a decoy, where it is assumed that the detection of a radar signal will cause vehicles equipped with radar detectors to slow down, which, in turn, will cause other vehicles to slow down. In effect, the drone radar would turn radar detectors, usually used to promote speeding, into a means of reducing excessive speeds.

Prior to 1991, the use of drone radar was contrary to the policy of the Federal Communication Commission (FCC), which required that any radar signal reflected from a moving vehicle serve some purpose. At the request of the National Highway Traffic Safety Administration (NHTSA) the FCC revised its policy to permit law enforcement agencies to utilize attended or unattended units, without the requirement that the return signal be used for some specific purpose.

NHTSA issued a set of guidelines to assist the law enforcement community in deciding whether to use drone radar as a component of its law enforcement strategy. At a minimum, the following components are required when developing a department policy on drone radar use:

- It must be part of an agency's speed enforcement efforts.
- The selection of sites should be based on problem identification.

- It must adhere to the Federal Communications Commission rules.
- It must be under local control and supervision.
- Program evaluation must be included as part of this policy.

The Michigan Department of State Police wanted to determine the effectiveness of drone radar technology (with and without patrol car activity) in reducing speed on high speed freeway locations and in freeway construction zones. The Livingston County Cooperative Enforcement Effort and The University of Michigan Transportation Research Institute (UMTRI) were selected to conduct a pilot test.

The high speed freeway site selected for study was located on US-23, just south of its interchange with I-96. Both southbound and northbound directions were studied. The total traffic volume at that site was 51,800 vehicles per day with 4.7 percent trucks. Approximately 5 percent of the cars were using radar detectors. Radar detector use by trucks varied by time of day and was 19 percent during the day and 28 percent at night.

The construction zone studied was on eastbound I-96, just west of its interchange with US-23. The traffic volume was 22,300 vehicles per day with 4.4 percent trucks. The percentage of vehicles using radar detectors was approximately 5 percent for cars and 16.5 percent for trucks. The usage of radar detectors among the trucks did not vary across time of day.

Mean speeds, 85th percentile speeds, and the portion of vehicles exceeding the speed limit by at least 10 mph were measured in the drive and pass lane separately for cars and for trucks. A full factorial experimental design on the factors of drone radar (on and off), police (present and absent), and location relative to the drone radar device was developed, and the experiment was carried out in August and September, 1993.

Analyses of variance of the speed data by three-way analysis and two-way analysis at locations upstream, at, and downstream of the drone radar zone found the effects of the drone, police presence, location, and the interactions of these factors to be statistically significant on the speed measures in almost all cases. The number of observations was very large, resulting in high statistical power, which in many cases will find differences in mean speeds as small as 0.5 mph to be statistically significant. The actual differences in the speed measures were small, typically less than 1.5 mph, and in many cases less than 1 mph. Speed differences of that magnitude are not readily noticeable in the traffic stream and reductions of speed of that magnitude have little practical effect. On the other hand, there is some indication that the highest speed cars reduced their speeds when drone radar signals were present. However, this effect was not observed consistently.

Patterns of speed changes relative to sensor locations were observed at all the sites. There was a decrease of speeds from the sensor located upstream of the drone zone, through the drone zone, and to the sensor located downstream of the drone zone at the northbound US-23 site. This decrease was evident with and without the drone radar signal or the presence of police. The southbound section of US-23 displayed the reverse speed pattern, with small but significant increases of speed from upstream to downstream of the drone zone. This increase was found regardless of the presence of the drone radar signal or police. A pattern of speed increase followed by a decrease was present at the eastbound I-96 site. These results suggest that there are underlying speed changes on the roadways that cannot be attributed to drone radar or police presence, but appear to be a phenomenon of the roadway environment itself.

The findings of this study are consistent with the results of previous studies of drone radar effects, in that speed reductions in general traffic with drone radar present, although sometimes statistically significant, are consistently less than 2 mph.

An interesting finding from this study is that the additional presence of police patrols did not cause practical reductions in the speed of cars. While it can be argued that the portion of cars equipped with radar detectors may be too small to produce the speed reduction effect, this clearly is not the case for police patrols, which can be seen by most drivers.

This study did find that drone radar, police presence, and the combination of drone radar and police presence have a practical effect on the behavior of high speed trucks. This result is also consistent with previous findings that indicate that drone radar has the greatest effect on commercial vehicles. Commercial vehicles are known to use radar detectors more than other vehicles and, therefore, are the ones that can sense the radar signal from the drone. Consequently, it is not surprising that an effect of drone radar and police presence is consistently found for high speed commercial vehicles.

In this study, large reductions of the portion of trucks in the pass lane exceeding the speed limit by at least 10 mph were found at two out of the three test sites. Reductions in this measure were observed at both of the zones on US-23. These varied by time of day and, in some circumstances, were quite large with magnitudes between 30 percent and 70 percent. There was no similar reduction in high speed trucks at the construction zone on I-96.

A study specifically designed to explore the effects of drone radar and police presence on the behavior of high speed commercial vehicles with different levels of radar-detector use would have to be carried out before specific statements on the actual effects on the behavior of high speed trucks can be made. However, it is clear that the drone radar and police presence does affect the speed of the fastest moving trucks. These trucks are particularly hazardous in a traffic stream and it is highly beneficial for safety to modify their speeding behavior. Although the findings about the speed reduction of trucks are not consistent, they do indicate that there are real effects of the drone radar and police patrols on high speed trucks. It can be concluded that drone radar with police presence is a good countermeasure at locations where high speed trucks are a problem.

BACKGROUND

Maintaining safe and legal highway speeds is a vexing problem for highway engineers, law enforcement, and the traffic safety community at large. The accepted policy on the geometric design of highways is that every effort should be made to use as high a design speed as practical to attain a desired degree of safety, mobility, and efficiency (AASHTO, 1990). Consequently, whenever feasible, geometric features, such as sight distance and alignment, exceed the minimum requirements for a specific design speed. Speed limits, on the other hand, are set legislatively. The result is that most of the higher functional classes of roads, such as those in the rural interstate system, are built for speeds much higher than the speed limits.

From the law enforcement perspective, speed poses problems. The public generally sees speed limits as guidelines rather than laws that are strictly enforced and does not perceive exceeding the speed limit by 10 mph as a serious traffic offense (NHTSA, 1989).

However, it has been established that deviation from the mean travel speed of the traffic stream carries with it an increased risk of accident involvement (Solomon, 1964; Cirillo, 1968). One study (Warren and Davey, 1982) estimates that cars going 25-30 mph over the average speed on expressways have about 700 accidents per 100-million vehicle miles, while cars traveling between 5-10 mph over the average speed are involved in about 25 accidents per 100-million vehicle miles. Furthermore, crashes tend to be more severe at high speeds (Gimotty and Chirachavala, 1982) since much more energy has to be dissipated stopping a vehicle from a higher speed than from a lower speed. Thus, speed influences both the probability and severity of crashes.

Law enforcement agencies have many demands on their limited resources and consequently are interested in effective, efficient, and economical approaches to discourage speeding. Drone radar, an electronic radar device that transmits in the microwave frequency band, but is incapable of making any use of the return signal, appears to be a promising candidate for such a system. Its proposed use in speed control programs is that of a decoy. Routine police use of radar in speed enforcement has generated widespread use of radar detectors among drivers. Radar detector use has been reported as high as 52 percent (Freedman et. al., 1993) for commercial vehicles and 14 percent for passenger vehicles (Freedman et. al., 1990). The drone radar strategy is based on the assumption that the detection of a radar signal will cause vehicles equipped with radar detectors to slow down, which, in turn, will cause other vehicles to slow down also. In effect, the drone radar would turn radar detectors, usually used to promote speeding, into a means of reducing excessive speeds.

There have been several studies of the effectiveness of drone radar on speed reduction. The earliest tests of drone radar for speed control were carried out in 1986 (Pigman et. al., 1987) at two high-volume sites on I-75 in northern Kentucky with speed limits of 55 and 50 mph. Speeds were measured in each lane of the study sites, with the radar on and off and with and without police presence.

The study found no statistical difference between the mean speeds with the radar on and off at one of the sites, and statistically significant differences of approximately 1.5 mph in magnitude at the second site. This study also found a significant reduction in speed variability. The study reports a relatively large reduction of 5.7 mph in mean speeds with police presence with no drone radar, and a reduction of 6.4 mph with both police presence and drone radar. This study also reports a reduction of 53 percent in the numbers of vehicles exceeding 70 mph with police presence and no drone radar and a reduction of 78 percent with both police presence and the drone radar turned on.

Another question about drone radar was how far downstream of the radar site the effects of the radar extended. A study that investigated the duration of speed reductions attributable to radar detection was carried out on a level segment of rural interstate highway in Maryland with a speed limit of 55 mph (Teed et. al., 1993) . This study was concerned with reductions in the proportion of vehicles exceeding 65 mph (i.e., 10 miles over the speed limit) immediately after exposure to radar, and at several locations downstream. There was no obvious police enforcement activity present. Unfortunately, the means and variances of the speeds were not presented so the magnitude of their changes cannot be extracted from this publication.

Teed et. al. report initial reduction in the portion of all vehicles exceeding 65 mph from 42 percent to 28 percent. The percentage of tractor trailers traveling over 65 mph decreased from 36 percent to 12 percent. The portions of passenger cars and straight trucks exceeding 65 mph were reported to have been reduced by one fourth and one fifth, respectively. Four to five miles downstream, the speeds of the traffic stream was very similar to that observed upstream of the radar. The only exception was that vehicles with radar detectors did not return to their preradar speed, but to that of vehicles without radar detectors.

Since speeding in work zones is particularly hazardous to the crews working in such locations, there was much interest in the effect of drone radar in work zones. A study reported by Ullman (1991) examined the effect of drone radar on vehicle speeds and conflicts in eight work zones on multilane roads in Texas. The work zones varied with respect to traffic volumes, the type of work zone, and the reduction in normal speed limits. There was no visible police enforcement at any of the sites. Overall, this study found the effect of the radar on speeds to be small. The speed reductions observed were less than 2 mph. In contrast to the Kentucky study, this study did find increases in the variance of speeds and an increase in the frequency of severe braking. Effects of the drone radar were found to be greater on trucks and on high speed vehicles compared to the entire sample of vehicles.

One potential problem with drone radar is that drivers may identify it as a decoy and pay no attention to it. In a study of radar's effects on speeds in work zones, Benekohal et. al. (1993) monitored CB communications and found much interdriver discussion about the nature of the radar. The study consisted of several experiments using one and two radar sources at six work zone sites. When one radar was used, it was quickly identified as a drone and there was little effect on the speed. When two radars were used, drivers were less sure about the nature of the radar and there was some effect on the speeds. At two out of the six sites, there was a reduction of approximately 3 mph in the speed of passenger vehicles, and at five out of the six sites there was a reduction of between 3 to 6 mph in the speed of commercial vehicles.

In the studies of drone radar examined here, greater effects on speeds were observed whenever police presence was apparent or suspected by the drivers. Research in other passive speed control strategies have found that police presence greatly enhanced the speed reduction effects. For example, a study of the effects of mobile roadside speedometers on speeds in urban areas (Casey and Lund, 1993) found that average speeds were reduced by about 10 percent alongside the speedometer and the percentage of vehicles exceeding the speed limit declined from 15-20 percent to 2 percent. However, the effects of the speedometer were limited to the time that it was actually deployed. Associated police enforcement was found to be a key factor in making the speed reduction effects last longer.

In general, the literature indicates that drone radar alone does not have a practical reduction effect on the average speed of vehicles in traffic streams on multilaned roads or in work zones. Some studies do report reductions; however, these are of small magnitude (usually less than 2 mph) and are not meaningful in the practical sense. Different effects of the drone radar on the variance of the speeds have been reported. Pigman et. al. (1987) report reductions in speed variability, but Ullman (1991) reports increases in variability, as well as in the frequencies, of severe braking maneuvers. It should be noted that large variances in vehicle speeds have negative impacts on safety and are not desirable in traffic operations.

There is agreement among the various studies that drone radar has a greater effect on the reduction of speeds of commercial vehicles and of those vehicles traveling much faster than the traffic stream. This finding is reasonable since radar detectors are more common among commercial vehicles and in the vehicles of drivers who routinely speed excessively. The studies also indicate that police presence increases the effect of speed control strategies.

Policy on Drone Radar

Prior to 1991, the use of drone radar was contrary to the policy of the Federal Communication Commission (FCC), which required that any radar signal reflected from a moving vehicle serve some purpose. At NHTSA's request, the FCC revised its policy to permit law enforcement agencies to utilize attended or unattended units, without the requirement that the return signal be used for some specific purpose. The FCC requires that any radar unit used in drone operations must be of the type accepted and licensed for police use by the FCC.

NHTSA prepared a set of guidelines to assist the law enforcement community and police administrators when considering the use of drone radar as a component of their law enforcement strategy (NHTSA,1991). At a minimum the following components are to be considered when developing a department policy on drone radar:

- It must be part of an agency's speed enforcement efforts.
- The selection of sites should be based on problem identification.
- It must adhere to the Federal Communications Commission rules.
- It must be under local control and supervision.
- Program evaluation must be included as part of this policy.

Objectives of this Study

The Michigan Department of State Police wanted to determine the effectiveness of drone radar technology with and without patrol car visibility in reducing speed on freeways. They selected the Livingston County Cooperative Enforcement Effort and

The University of Michigan Transportation Research Institute (UMTRI) to conduct a pilot test.

Livingston County was selected because it is dissected by two major freeways (US-23 and I-96), which are noted for relatively high vehicle speeds. Sections of I-96 were undergoing reconstruction and thus could be used to assess the effects of drone radar in work zones. The intersection of I-96 and US-23 in Livingston County is close enough to UMTRI to be convenient for the required daily maintenance and monitoring tasks associated with this project.

The objectives of the pilot study are to determine the effectiveness of drone radar, police presence, and the combination of police radar and police presence in reducing speeds at high speed locations on Michigan freeways.

METHODS

Experimental Design

The objective of the study is to evaluate the effects of drone radar with and without police presence on the speed of vehicles at two high speed locations. Accordingly, a full factorial design was selected for the experiment. The factors selected were:

- drone operation with two levels, on and off;
- presence of police patrols with two levels, present and not present;
- location with three levels, upstream, at, and downstream of the drone radar installation.

In a full factorial experimental design observations are obtained for every possible combination of the variables. The order of the combinations was randomized over the days of the week to eliminate any possible day-of-week effects.

Three measures of speed were examined, the mean speed, the 85th percentile speed, and the percentage of vehicles exceeding the speed limit by 10 mph. The mean speed is simply the average of the vehicle speeds. The 85th percentile speed is the speed that is exceeded by 15 percent of the vehicles. It is commonly used for setting speed limits and is a good measure for gauging the distribution of speeds in a traffic stream. The percentage of vehicles exceeding the speed limit by 10 mph is a good measure of high speed vehicles. It is hypothesized that these are the vehicles that will respond most readily to the drone radar and police patrols.

Typically, speeds of vehicles in the pass lane are faster than those of vehicles in the drive lane. Therefore, speeds from both lanes were measured separately. It was also expected that there would be a difference between the speeds of cars and trucks, because of different speed limits and different vehicular performance characteristics. Accordingly, the speed data were classified by vehicle type (i.e., car or truck).

Vehicle speeds were measured at a location where the drone radar signals could be received by vehicles with radar detectors and where police patrols were visible (the drone zone), at a location upstream of this site, where the drone radar signal could not be sensed and from where police patrols were not visible, and at a location at least 3400 ft. downstream of the drone.

The speeds at the upstream location were used in determining the presence of a slowing effect and the speeds at the downstream location were used to determine the duration of any slowing effect. The distance of 3400 ft. was selected based on findings from previous studies (Teed et. al., 1993), where it was concluded that any effects of drone radar had disappeared by a distance of 4 to 5 miles downstream. Therefore, a distance shorter than that used by Teed et. al., but long enough for a vehicle to adjust speed was selected for this study.

In an experiment of this type it is important to identify and isolate any longitudinal effects, (i.e., changes that may occur over time) which, if undetected, may confound the results. Therefore, speed data were collected at the sites for a period before the drone radar was deployed and for a time period after the drone radar was removed.
Analysis of variance (ANOVA), a widely used method for examining differences between populations, was selected as the analytical approach for this study. In ANOVA a single dependent variable is measured on several different samples that are suspected of arising from different populations and the "realness" of the differences between the population means is assessed. Accordingly, the three speed measures from the different experimental conditions were compared for statistically significant differences.

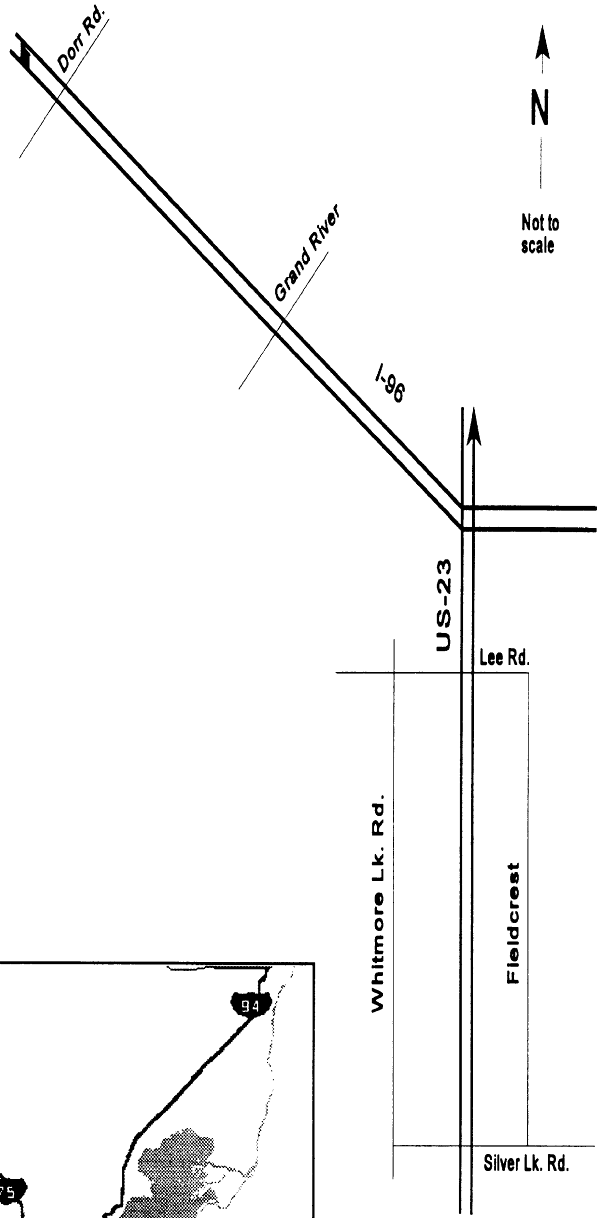
Site Selection

Four sites were selected on I-96 and US-23. Both I-96 and US-23 are limited access, divided freeways. The sites were within close proximity of the interchange of the two freeways near the city of Brighton in Livingston County, Michigan. Figure 1 shows the locations of the study sites on a map of the area.

The sites on US-23 are approximately 4 miles south of I-96 between exits 55 and 58, with one site on the southbound direction and another on the northbound direction. The speed limit in this segment of US-23 is 65 mph for cars and 55 mph for trucks.

The sites on I-96 are located approximately 5 miles west of the interchange with US-23 within a 4.5 mile construction zone, where traffic was restricted to two lanes in each direction. One site was on the eastbound lanes and the other was on the westbound lanes. The speed limit in the construction zone during the time of the project was 55 mph for both cars and trucks.

Several criteria were used in the selection of the exact locations for the sites. First, the sites could not contain an entrance to or exit from the expressway. This was to ensure that the traffic was in a steady state condition and not undergoing merging and diverging maneuvers. Second, the sites had to be on open, tangent sections of roads so that drivers with radar detectors could recognize the presence of speed radar early and not be surprised by a strong signal from their detector and brake suddenly. Third, the approach area had to be preceded by a hill or curve to shield on-coming traffic from the drone radar signal. This was to allow for measurement of the vehicle speeds before they sensed the drone radar signal. The fourth criterion was that there was a safe place on the site suitable for the field crew.



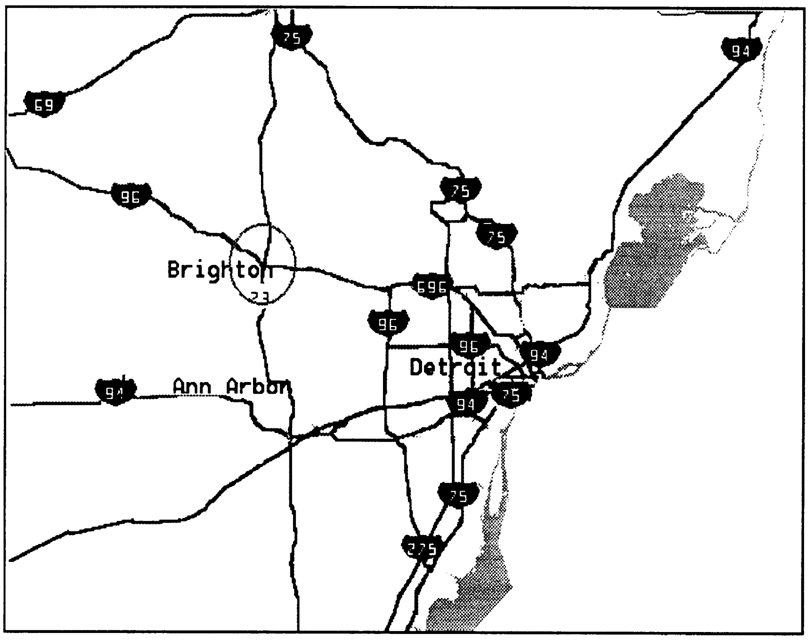


FIGURE 1: STUDY SITE LOCATION & AREA MAP

Police Patrol Presence

Police patrol presence at the sites was provided by Michigan State Police from the Brighton post. Their activities consisted of radar patrol activity at the test locations. The patrols took place between 7:00 a.m. and 9:00 a.m. and 3:00 p.m. and 5:00 p.m. on the days specified in the experimental design.

Drone Radar

The drone radar signals at the study sites were activated according to the experimental design. The drone radar signals were produced by a Decatur Electronics Lifeguard drone radar. The Lifeguard drone transmits a microwave signal on the X-band used by police speed radar. It is encased in a water and weather proof enclosure and has an internal battery for power and an external solar power panel to extend operation. The Lifeguard drone contains timing devices and can be set to turn on and off on a prescribed schedule. Field tests were conducted to determine the appropriate positioning of the drone radar devices. From the field tests it was found that the drone signal strength is very high up to a 1/4 mile and then decreases rapidly.

Figure 2 shows the Lifeguard drone radar and Figure 3 shows the unit mounted in the field. The details of the field tests and procedures of the drone radar can be found in Appendix A-1.

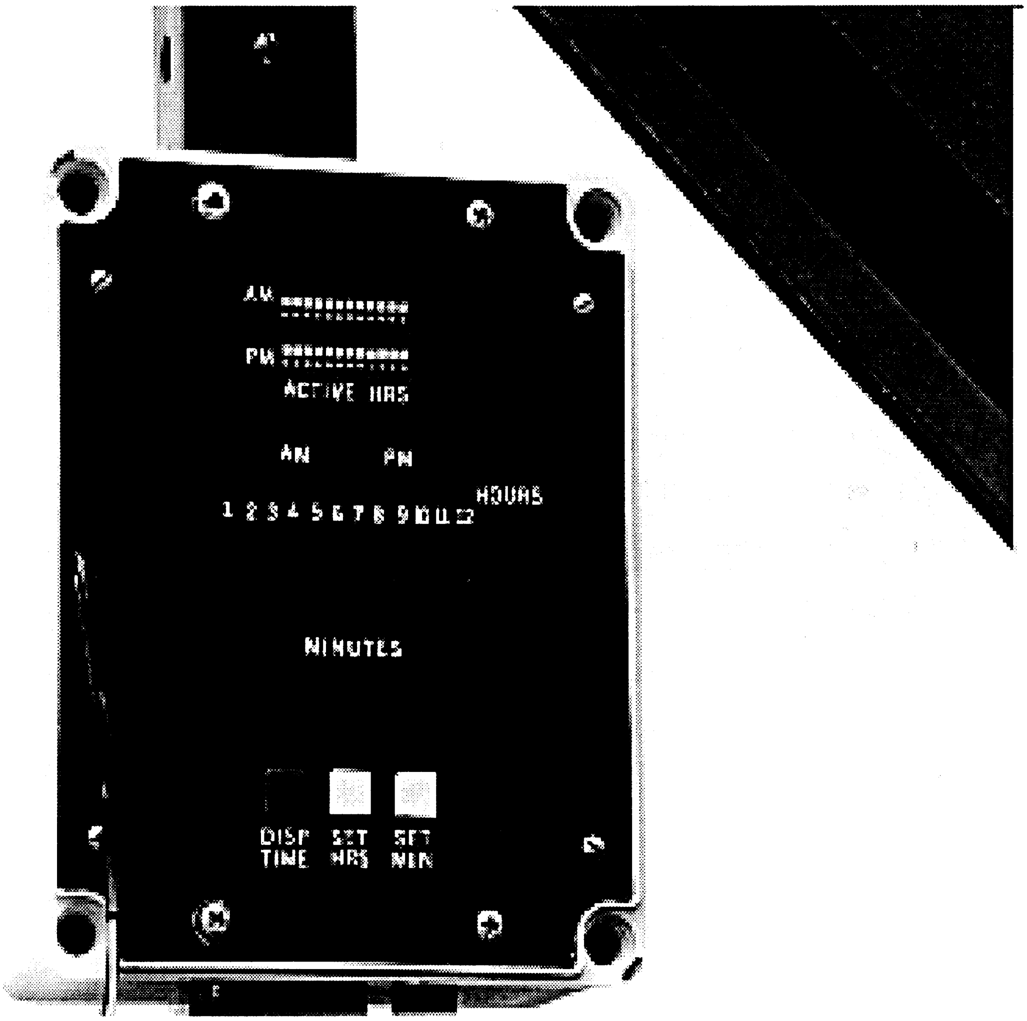


FIGURE 2: LIFEGUARD DRONE RADAR

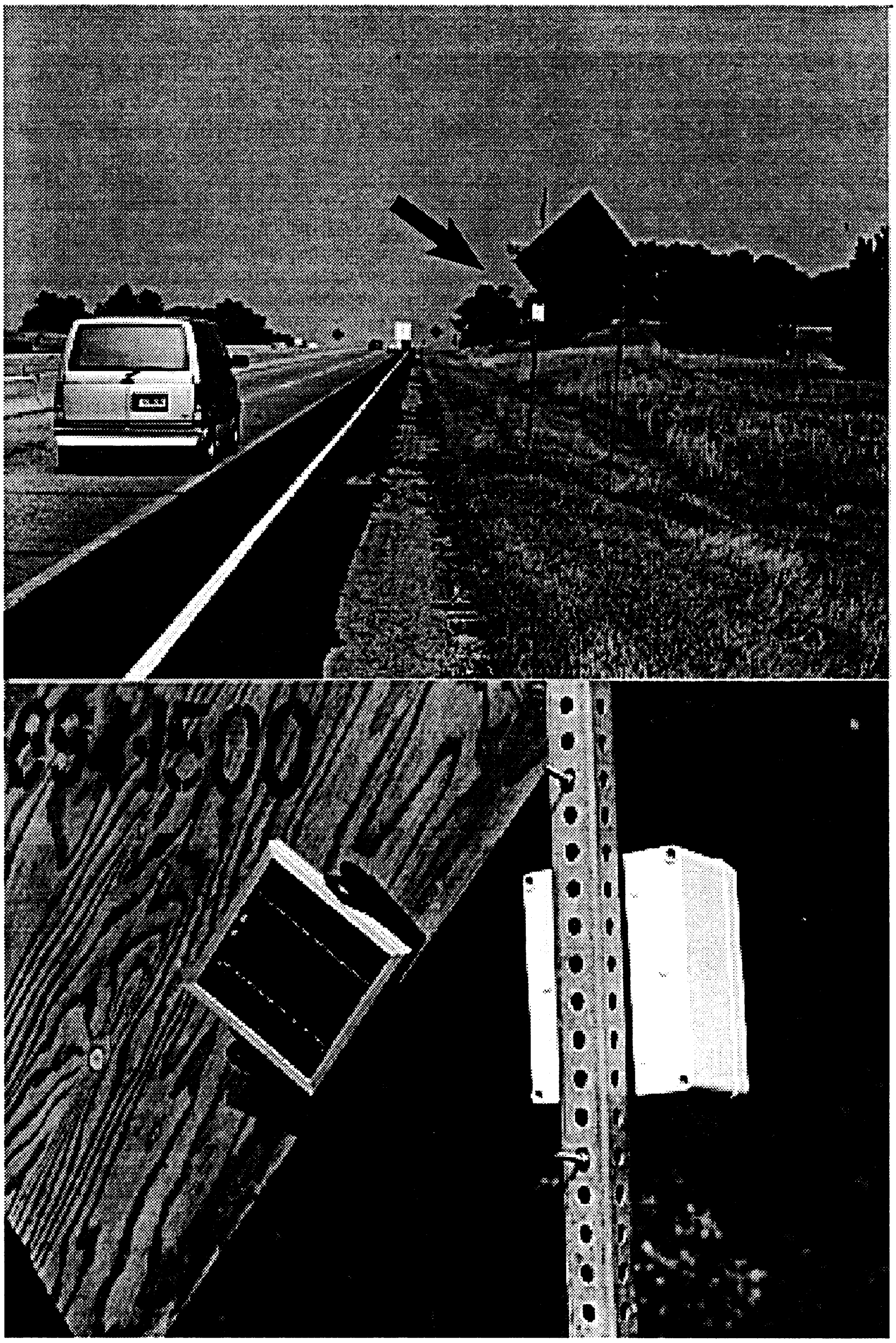


FIGURE 3: MOUNTED FIELD UNIT

Traffic Volume And Speed Measurement

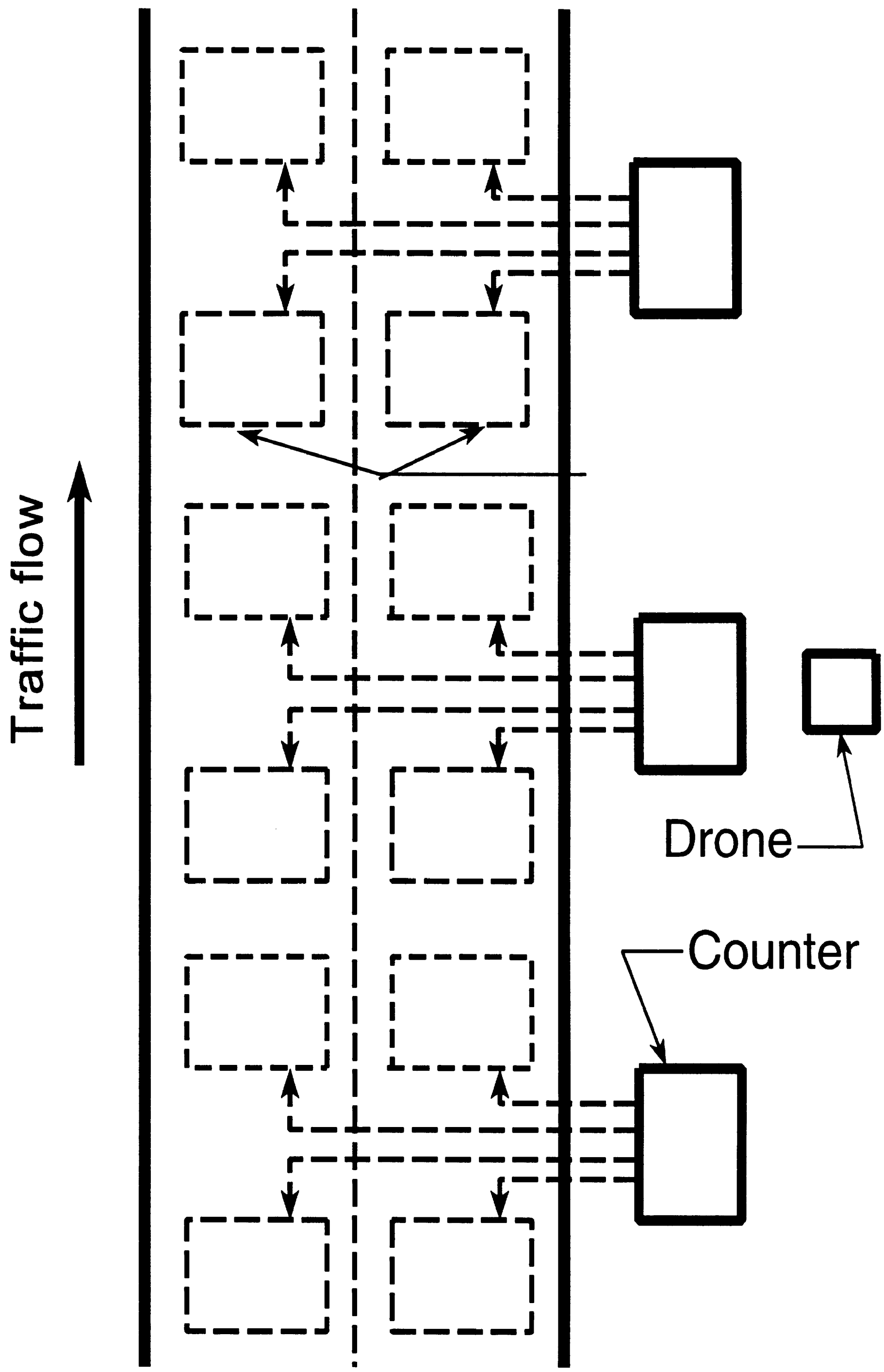
Data on traffic flow were collected by TT-2001 traffic counters. The traffic counter consists of a pair of inductive loops set in the pavement of each lane. The TT-2001 counter monitors the time of day, speed in miles per hour, and vehicle length for each vehicle that passes over the loops. These data were then processed externally to classify all vehicles over 45 ft in length as trucks and to yield traffic volumes and mean speeds by five minute intervals for cars and for trucks.

The traffic data were collected in the drive lane and in the pass lane at three locations in each site: upstream of the drone radar, where there was no detectable drone signal, at the location of the drone radar, and at least 3400 ft downstream of the drone radar. Figure 4 shows a schematic of a typical drone and sensor configuration. Figure 5 shows an aerial view of the two zones on US-23.

The details of the TT-2001 traffic procedures are in Appendix A-2.

Radar-Detector Detection

Since the drone radar strategy relies on the drone radar being received by vehicles in the traffic stream, it is important to know what percentage of vehicles are equipped with radar detectors. Accordingly, the use of radar detectors in the traffic at the study sites was measured with the use of a radar-detector detector. A field crew using an interceptor VG-2 microwave receiver, made by Technisonics Industries Limited, determined the presence of radar detectors in a random sample of vehicles for all time periods throughout the duration of the study. Appendix A-3 contains the description of the VG-2 radar-detector detector instrument and the field tests and procedures used.



Typical drone, traffic counter, and sensor loops configuration for three counters in one direction of traffic flow.

FIGURE 4: DRONE & SENSOR CONFIGURATION SCHEMATIC

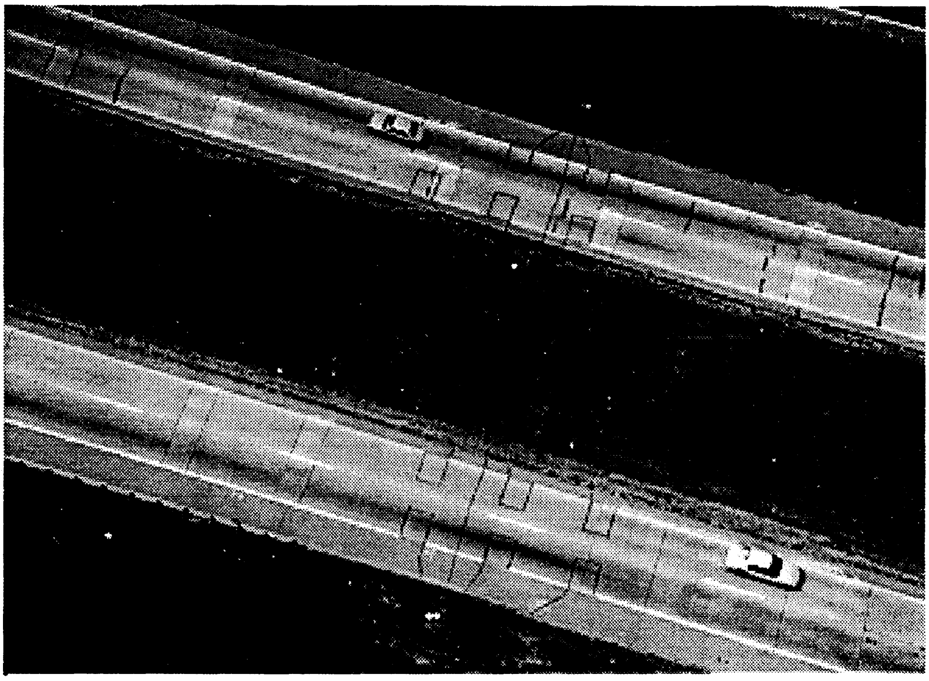


FIGURE 5: AERIAL VIEW OF TWO ZONES ON US-23

RESULTS

The drone radar experiment was conducted in August and in the first eleven days of September, 1993. Figure 6 shows the study schedule, including days when drone radar was turned on, when police patrols were present, and when radar-detector observations were made.

Radar Detector Use

Tables 1 through 4 show the result of the radar detector observations for each test site. Overall, it appears that there is no difference in radar detector use in the time period immediately before drone radar deployment, during the time of the drone deployment, and immediately after the drone deployment. The percentage of all vehicles with radar detectors is consistently about 5 percent to 7 percent at both sites throughout the day. The percentage of passenger cars with radar detectors is 4 percent to 5 percent with little difference between the two sites and for different times of the day.

Radar detector use among trucks was considerably higher than for cars and varied more by site and time of day. On I-96, 16.5 percent of the trucks were equipped with radar detectors and there was little difference in this percentage over the day. On US-23, the percentage of trucks with radar detectors during the morning and afternoon was 19 percent, and at night it rose to 28 percent.

AUGUST						
SUN	MON	TUES	WED	THURS	FRI	SAT
1 No Patrol No Drone	2 No Patrol No Drone	3 No Patrol No Drone	4 No Patrol No Drone	5 No Patrol No Drone	6 No Patrol No Drone	7 No Patrol No Drone
8 Patrol No Drone	9 Patrol Drone	10 Patrol Drone	11 Patrol Drone	12 No Patrol Drone	13 Patrol No Drone	14 No Patrol No Drone
15 No Patrol Drone	16 Patrol No Drone	17 No Patrol Drone	18 No Patrol No Drone	19 Patrol No Drone	20 Patrol Drone	21 No Patrol Drone
22 Patrol Drone	23 No Patrol No Drone	24 No Patrol No Drone	25 Patrol No Drone	26 Patrol Drone	27 No Patrol No Drone	28 Patrol Drone
29 No Patrol No Drone	30 No Patrol Drone	31 Patrol No Drone				

SEPTEMBER						
SUN	MON	TUES	WED	THURS	FRI	SAT
			1 No Patrol Drone	2 No Patrol No Drone	3 No Patrol Drone	4 Patrol No Drone
5 No Patrol No Drone	6 No Patrol No Drone	7 No Patrol No Drone	8 No Patrol No Drone	9 No Patrol No Drone	10 No Patrol No Drone	11 No Patrol No Drone

FIELD OBSERVER ACTIVITIES AND SCHEDULE

Field observers performed a wide variety of tasks on different schedules in conducting this study. One of these tasks was monitoring the use of radar detectors with the VG-2 Interceptor. Traffic was observed on only one highway each observation day for 25 minute intervals alternating between the two directions of traffic flow. Five minutes was allowed for travel between the two observation sites. The observation schedule was:

RADAR DETECTOR COUNT SCHEDULES

TIME	US-23	I-96
7:00 - 7:25 am	Southbound US-23	Eastbound I-96
7:30 - 7:55 am	Northbound US-23	Westbound I-96
8:00 - 8:25 am	Southbound US-23	Eastbound I-96
8:30 - 8:55 am	Northbound US-23	Westbound I-96
3:00 - 3:25 pm	Southbound US-23	Eastbound I-96
3:30 - 3:55 pm	Northbound US-23	Westbound I-96
4:00 - 4:25 pm	Southbound US-23	Eastbound I-96
4:30 - 4:55 pm	Northbound US-23	Westbound I-96
9:00 - 9:25 pm	Southbound US-23	Eastbound I-96
9:30 - 9:55 pm	Northbound US-23	Westbound I-96
10:00 - 10:25 pm	Southbound US-23	Eastbound I-96
10:30 - 10:55 pm	Northbound US-23	Westbound I-96

FIGURE 6: STUDY SCHEDULE

TABLE 1 PORTION OF VEHICLES USING RADAR DETECTORS ON I-96 EAST			
	Before Project (N)	During Project (N)	After Project (N)
Morning			
Cars	0.05 (3,949)	0.05 (12,451)	0.05 (1,655)
Trucks	0.18 (168)	0.16 (557)	0.19 (68)
All Vehicles	0.06 (4,124)	0.06 (13,066)	0.06 (1,729)
Afternoon			
Cars	0.05 (3,516)	0.04 (16,591)	0.04 (2,027)
Trucks	0.19 (134)	0.17 (610)	0.14 (138)
All Vehicles	0.06 (3,657)	0.05 (17,251)	0.05 (2,172)
Night			
Cars	0.05 (2,542)	0.05 (10,659)	0.06 (922)
Trucks	0.20 (132)	0.26 (417)	0.30 (71)
All Vehicles	0.06 (2,677)	0.06 (11,089)	0.07 (994)

(N) = Number of vehicles sampled

TABLE 2 PORTION OF VEHICLES USING RADAR DETECTORS ON I-96 WEST			
	Before Project (N)	During Project (N)	After Project (N)
Morning			
Cars	0.04 (2,960)	0.04 (12,030)	0.04 (1,282)
Trucks	0.12 (187)	0.15 (632)	0.12 (86)
All Vehicles	0.05 (3,157)	0.05 (12,709)	0.05 (1,379)
Afternoon			
Cars	0.04 (4,974)	0.04 (20,362)	0.04 (2,642)
Trucks	0.18 (149)	0.20 (560)	0.18 (108)
All Vehicles	0.05 (5,147)	0.05 (20,973)	0.04 (2,756)
Night			
Cars	0.06 (1,930)	0.06 (7,559)	0.06 (800)
Trucks	0.15 (137)	0.27 (444)	0.26 (72)
All Vehicles	0.07 (2,071)	0.07 (8,012)	0.07 (872)

(N) = Number of vehicles sampled

TABLE 3 PORTION OF VEHICLES USING RADAR DETECTORS ON US-23 NORTH			
	Before Project (N)	During Project (N)	After Project (N)
Morning			
Cars	0.04 (3,393)	0.05 (10,409)	0.04 (1,857)
Trucks	0.20 (194)	0.23 (618)	0.18 (85)
All Vehicles	0.05 (3,597)	0.06 (11,054)	0.05 (1,948)
Afternoon			
Cars	0.05 (4,787)	0.04 (18,228)	0.05 (3,344)
Trucks	0.21 (116)	0.21 (441)	0.22 (63)
All Vehicles	0.05 (4,924)	0.05 (18,706)	0.05 (3,412)
Night			
Cars	0.05 (1,166)	0.05 (8,557)	0.06 (1,663)
Trucks	0.28 (67)	0.29 (479)	0.30 (96)
All Vehicles	0.07 (1,237)	0.07 (9,051)	0.08 (1,762)

(N) = Number of vehicles sampled

TABLE 4 PORTION OF VEHICLES USING RADAR DETECTORS ON US-23 SOUTH			
	Before Project (N)	During Project (N)	After Project (N)
Morning			
Cars	0.04 (4,671)	0.04 (14,118)	0.04 (2,417)
Trucks	0.17 (178)	0.18 (485)	0.06 (84)
All Vehicles	0.05 (4,856)	0.05 (14,629)	0.04 (2,506)
Afternoon			
Cars	0.04 (3,633)	0.04 (13,041)	0.05 (3,578)
Trucks	0.20 (148)	0.16 (457)	0.23 (71)
All Vehicles	0.05 (3,792)	0.05 (13,538)	0.05 (3,657)
Night			
Cars	0.05 (1,625)	0.05 (8,742)	0.05 (2,563)
Trucks	0.19 (63)	0.28 (470)	0.31 (93)
All Vehicles	0.05 (1,691)	0.06 (9,220)	0.06 (2,658)

(N) = Number of vehicles sampled

Police Activity

Officers from the Brighton, Michigan State Police post provided radar patrol activity at the study sites on US-23 between Silver Lake Road and I-96, and on I-96 between US-23 and the end of the 4.5 mile construction zone. Patrols took place between 7:00 a.m. and 9:00 a.m. and between 3:00 p.m. and 5:00 p.m. on the 14 days indicated on the study design, shown on Figure 6. Enforcement activities stressed speed, speed within the construction zone, safety restraint use, and O.U.I.L./impaired and drug interdiction arrests. The days of police patrols and drone radar operation were scheduled so that a driver being alerted by a radar detector could not identify the source of the radar as a drone or the police.

During these patrols, the police issued 301 citations and 185 verbal warnings for speed, safety belt, and other violations. Figures 7 and 8 show the distribution of citations and warnings at the I-96 and US-23 sites, respectively.

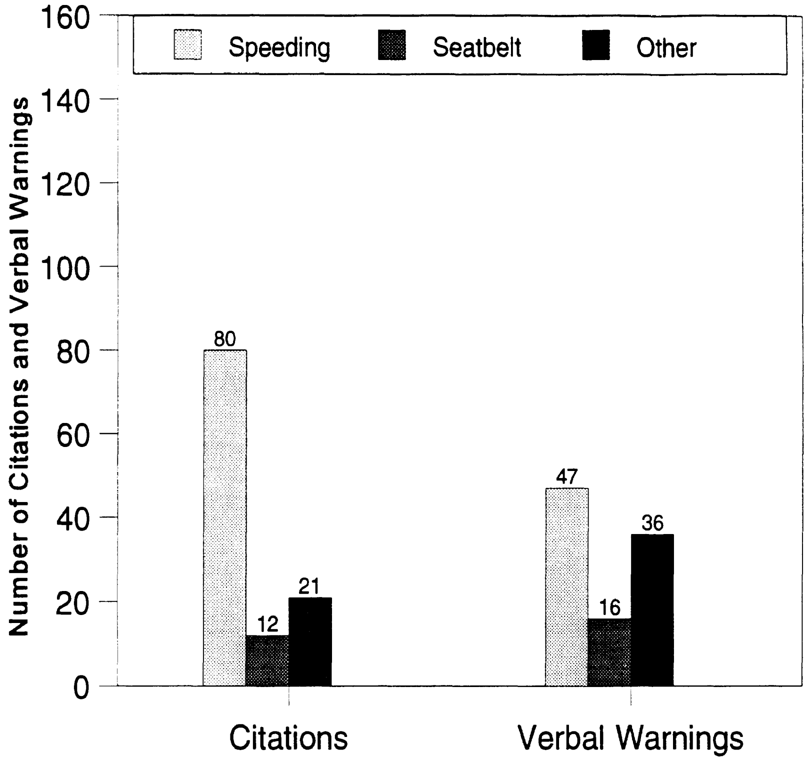


FIGURE 7: US-23 DRONE RADAR POLICE ACTIVITIES

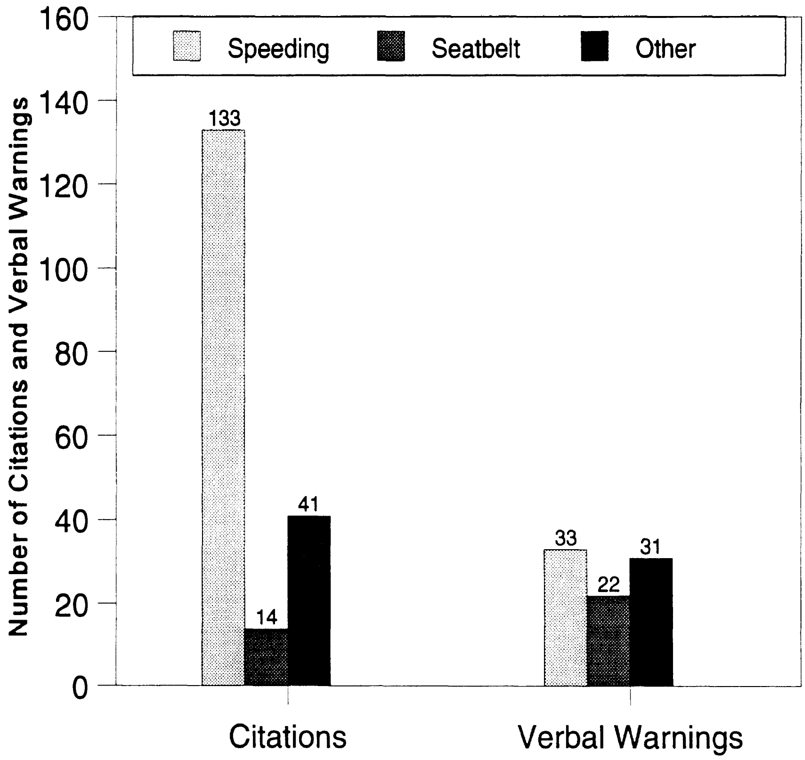


FIGURE 8: I-96 DRONE RADAR POLICE ACTIVITIES

Speed Measurements

Speeds were obtained at the two US-23 zones and for the eastbound I-96 zone for each vehicle in the drive lane and in the pass lane upstream of the drone signal (sensor 1), in the drone radar zone (sensor 2) and approximately 3,400 ft downstream of the drone radar signal (sensor 3).

The traffic measurement equipment (pavement loops) on the I-96 zone was repeatedly damaged by the construction activity. The frequent failures of the loops in the westbound I-96 lanes rendered the speed data not usable and consequently no speeds from westbound I-96 will be presented or analyzed. The failures on the eastbound I-96 lanes were not as frequent, and it was possible to collect enough data for analysis.

The speed data from each sensor were processed to give the mean speed, the 85th percentile speed, and the percentage of vehicles exceeding the speed limit by 10 mph by the following times of day:

11p.m. - 7 a.m.
7 a.m. - 9 a.m.
9 a.m. - 3 p.m.
3 p.m. - 5 p.m.
9 p.m. - 11 p.m.

for each of the following conditions:

pre-project period
no drone radar - no police
drone radar - no police
drone radar - police
no drone radar - police
post-project period.

The following sets of figures and accompanying tables show the three speed measures for each of the conditions and time periods at each of the three sensors in the driving and pass lane for cars and for trucks at southbound and northbound US-23 and eastbound I-96.

Site 1 - US-23 Southbound

The volume on southbound US-23 was measured by this study on August 8th and is typical of this location for the entire study period. There was a total of 28,543 vehicles in 24 hours. Of this, 1,402 or 4.9 percent of the vehicles were trucks. The distribution of vehicles by lane was 49 percent in the drive lane and 51 percent in the pass lane. Of the vehicles in the drive lane, 8.8 percent were trucks. In the pass lane this percentage was 1.2 percent.

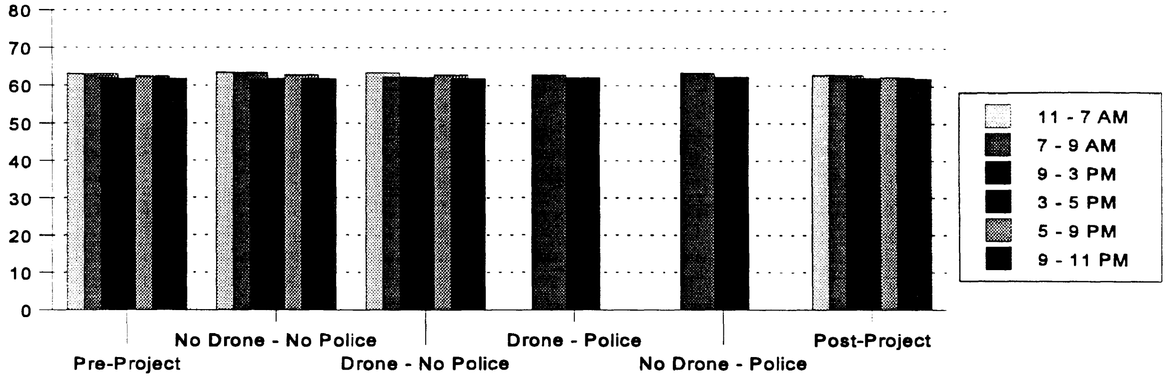
Cars

Figures 9 - 14 show the mean speed, 85th percentile speed, and the percentage of cars exceeding the speed limit by 10 mph at sensor 1 (i.e., upstream of the drone zone in the drive lane and in the pass lane).

It can be seen that the mean speed of cars in the drive lane for all the times of day and experimental conditions was between 61.6 mph and 63.4 mph. The mean speed of cars in the pass lane was consistently about 66.5 mph and 68.7 mph. No effect of the drone or police presence was obvious. This, of course, was expected, since the zone is upstream of the drone zone, and the drivers should not be aware of any drone radar signals or police patrols.

The 85th percentile speed of cars in the drive lane was consistently between 66.7 mph and 69 mph and between 71.1 mph and 73.5 mph in the pass lane. The percentage of cars exceeding 75 mph (10 mph over the speed limit) was approximately 1 percent to 2 percent in the drive lane and between 4 percent and 7.5 percent in the pass lane.

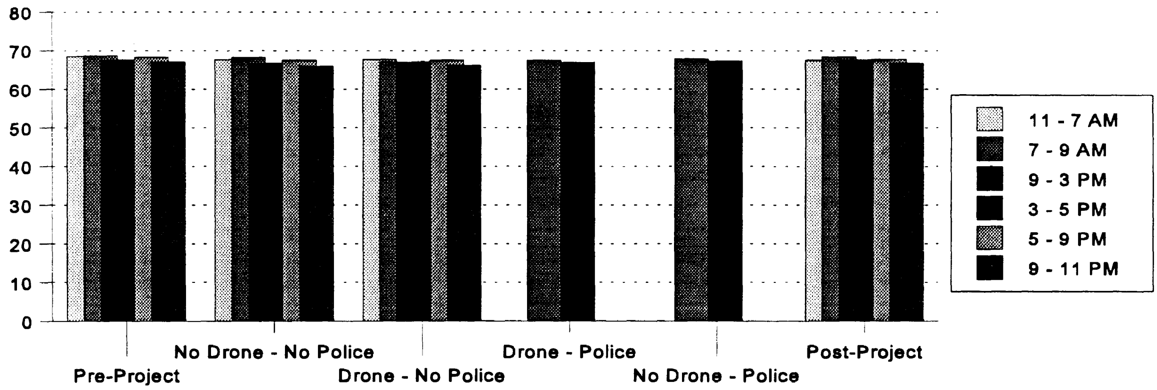
US-23 Southbound -- Drive Lane
Sensor 1 -- Mean Speed -- Cars



11 - 7 AM	63.05	63.38	63.33			62.79
7 - 9 AM	63.07	63.38	62.27	62.75	63.41	62.77
9 - 3 PM	61.87	61.66	62.17			61.84
3 - 5 PM	61.65	61.77	62.19	62.19	62.44	62.08
5 - 9 PM	62.43	62.82	62.82			62.34
9 - 11 PM	61.8	61.77	61.81			61.99

Figure 9. US-23 Southbound, Drive Lane, Sensor 1, Mean Speed, Cars

US-23 Southbound -- Pass Lane
Sensor 1 -- Mean Speed -- Cars

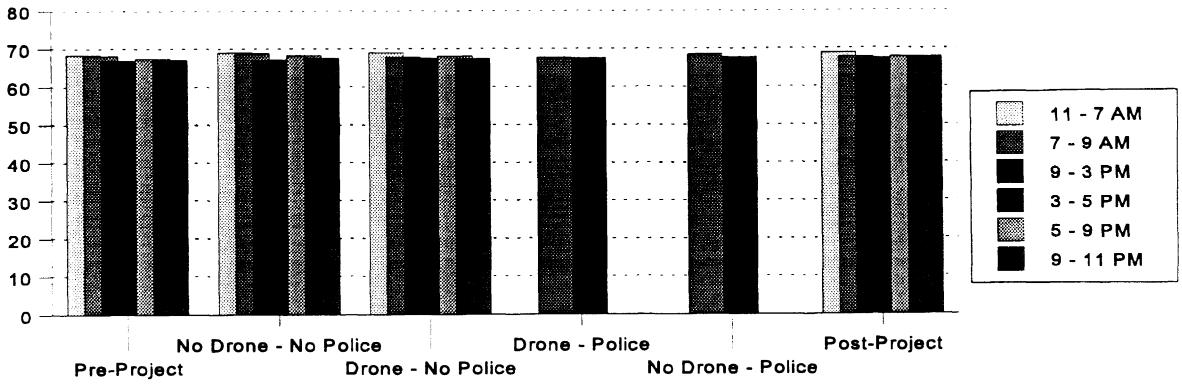


11 - 7 AM	68.49	67.63	67.68			67.51
7 - 9 AM	68.68	68.19	67.06	67.48	67.93	68.37
9 - 3 PM	67.37	66.51	66.83			67.34
3 - 5 PM	67.61	66.73	67.11	66.93	67.3	67.62
5 - 9 PM	68.34	67.53	67.51			67.68
9 - 11 PM	67.13	65.98	66.15			66.76

Figure 10. US-23 Southbound, Pass Lane, Sensor 1, Mean Speed, Cars

US-23 Southbound -- Drive Lane

Sensor 1 -- 85th Percentile Speed -- Cars

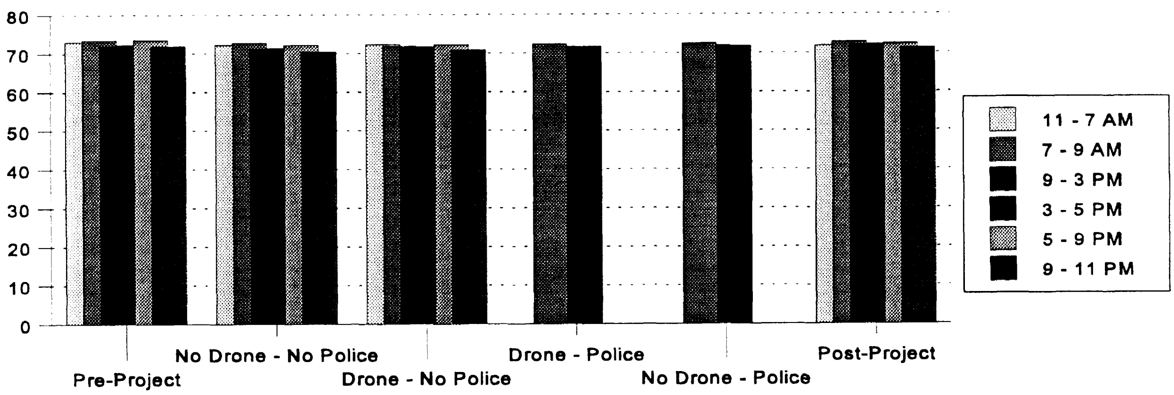


11 - 7 AM	68.39	69.03	68.97			68.73
7 - 9 AM	68.12	68.86	67.76	67.69	68.46	67.75
9 - 3 PM	66.94	66.93	67.55			67.09
3 - 5 PM	66.66	67.13	67.41	67.5	67.75	67.36
5 - 9 PM	67.46	68.22	68.12			67.76
9 - 11 PM	67.06	67.55	67.36			67.76

Figure 11. US-23 Southbound, Drive Lane, Sensor 1, 85th Percentile Speed, Cars

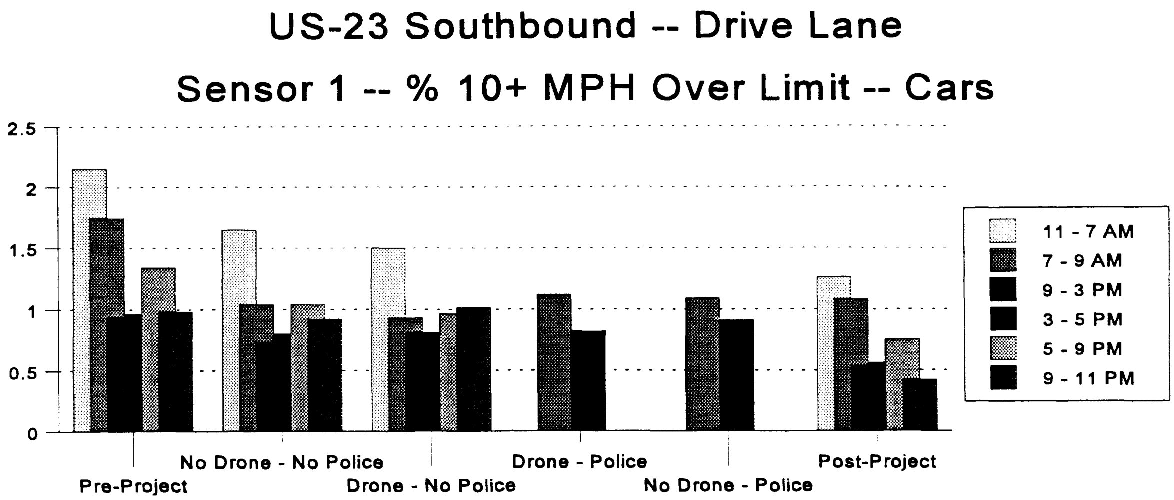
US-23 Southbound -- Pass Lane

Sensor 1 -- 85th Percentile Speed -- Cars



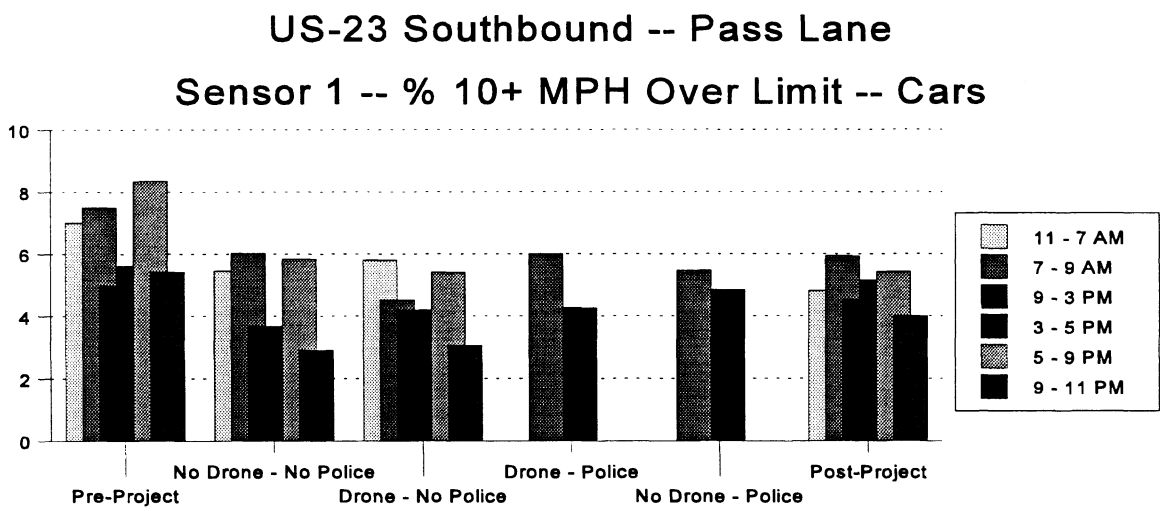
11 - 7 AM	73.07	72.21	72.26			71.86
7 - 9 AM	73.38	72.7	71.68	72.25	72.42	72.78
9 - 3 PM	71.93	71.13	71.49			71.76
3 - 5 PM	72.16	71.28	71.62	71.63	71.86	72.06
5 - 9 PM	73.49	72.08	72.1			72.3
9 - 11 PM	71.85	70.33	70.78			71.23

Figure 12. US-23 Southbound, Pass Lane, Sensor 1, 85th Percentile Speed, Cars



11 - 7 AM	2.15	1.65	1.5			1.26
7 - 9 AM	1.75	1.04	0.93	1.12	1.09	1.08
9 - 3 PM	0.94	0.73	0.81			0.54
3 - 5 PM	0.96	0.8	0.59	0.82	0.91	0.56
5 - 9 PM	1.34	1.04	0.96			0.75
9 - 11 PM	0.98	0.92	1.01			0.42

Figure 13. US-23 Southbound, Drive Lane, Sensor 1, % 10+ MPH Over Limit, Cars



11 - 7 AM	7	5.45	5.8			4.81
7 - 9 AM	7.5	6.02	4.51	6	5.46	5.94
9 - 3 PM	4.97	3.67	4.19			4.52
3 - 5 PM	5.62	3.5	3.95	4.25	4.84	5.15
5 - 9 PM	8.35	5.84	5.4			5.42
9 - 11 PM	5.41	2.9	3.05			4

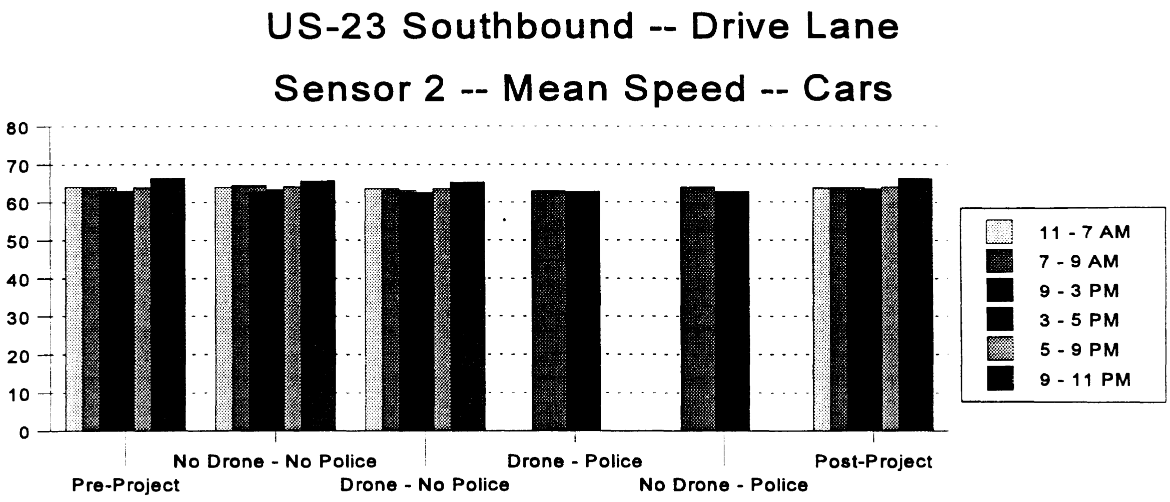
Figure 14. US-23 Southbound, Pass Lane, Sensor 1, % 10+ MPH Over Limit, Cars

Figures 15 - 20 show the mean speed, 85th percentile speed, and the percentage ofcars exceeding the speed limit by 10 mph at sensor 2 (i.e., the drone zone, in the drive lane and in the pass lane).

The mean speeds of cars were consistently between 62.5 mph and 66.3 mph in the drive lane and between 66 mph and 68.3 mph in the pass lane. There was no obvious practical difference in mean speeds across conditions with or without police presence or drone radar at the drone zone. There was no noticeable reduction in mean speeds between sensor 1, upstream of the drone zone and sensor 2, at the drone zone.

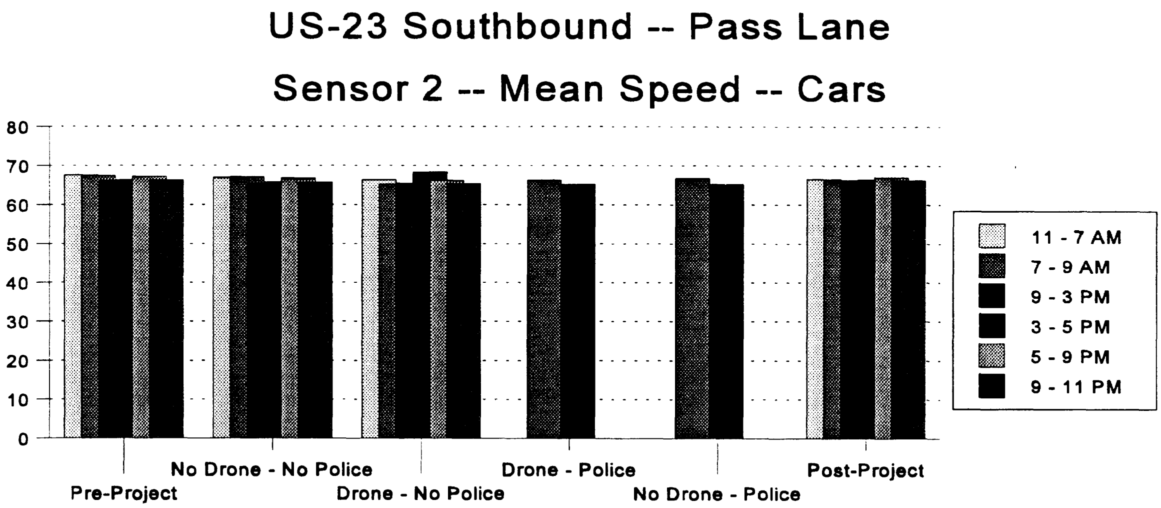
The 85th percentile speed of cars in the drive lane was between 67.5 mph and 69.5 mph, with the lowest values occurring for conditions with the drone signal on with and without police presence. However, it should be noted that these speeds were not noticeably different from those observed upstream at sensor 1. The 85th percentile speed for cars in the pass lane varied from 69.7 mph to 71.8 mph across the times of day and experimental conditions, which was slightly lower than at sensor 1, upstream of the drone zone. However, there was no noticeable difference in this speed measure at sensor 2 between conditions when the drone radar was turned off with no police presence, and when the drone radar was on with and without police presence.

The percentage of cars exceeding 75 mph in the drive lane at sensor 2 was between 0.9 percent and 2.3 percent. The lowest values were noted for conditions with the drone radar on. However, overall the portion of cars in the drive lane exceeding 75 mph was higher at the drone site than upstream. In the pass lane the portion of vehicles exceeding the speed limit by at least 10 mph was between 1 percent and 4 percent. This was noticeably lower than upstream. Furthermore, the lowest percentages were measured for conditions where the drone radar was on.



11 - 7 AM	64.09	64.02	63.55			63.67
7 - 9 AM	64.04	64.37	63.09	62.96	63.95	63.77
9 - 3 PM	62.7	62.6	62.5			62.89
3 - 5 PM	62.86	63.25	62.53	62.7	62.76	63.4
5 - 9 PM	63.87	64.04	63.55			63.96
9 - 11 PM	66.32	65.69	65.33			66.29

Figure 15. US-23 Southbound, Drive Lane, Sensor 2, Mean Speed, Cars

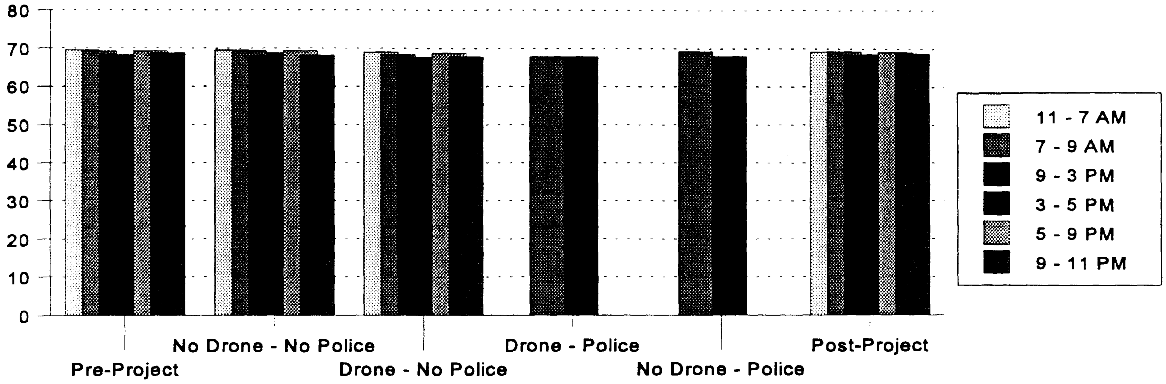


11 - 7 AM	67.58	66.88	66.38			66.6
7 - 9 AM	67.45	67.13	65.18	66.31	66.79	66.32
9 - 3 PM	66.07	65.49	65.48			65.85
3 - 5 PM	66.41	65.83	68.31	65.21	65.31	66.47
5 - 9 PM	67.2	66.73	66.21			67.06
9 - 11 PM	66.32	65.69	65.33			66.29

Figure 16. US-23 Southbound, Pass Lane, Sensor 2, Mean Speed, Cars

US-23 Southbound -- Drive Lane

Sensor 2 -- 85th Percentile Speed -- Cars

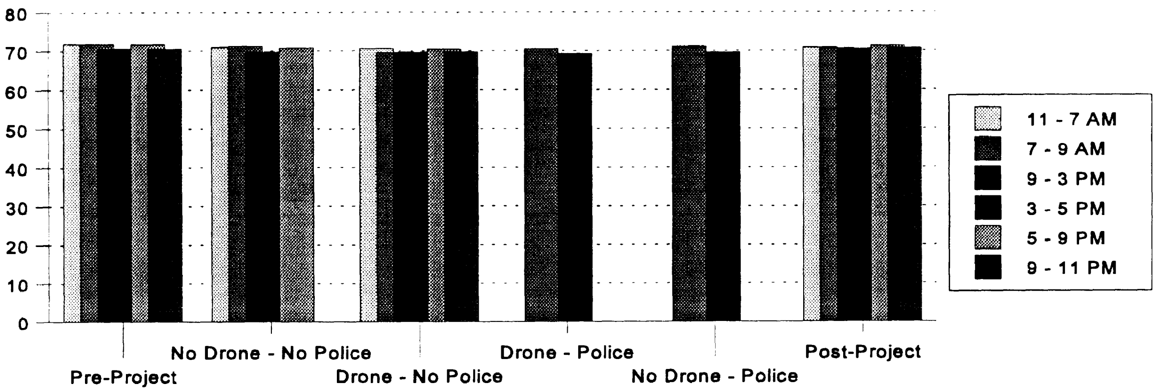


11 - 7 AM	69.52	69.5	68.94			69.2
7 - 9 AM	69.29	69.4	68.27	67.85	69.21	69.22
9 - 3 PM	68.19	67.96	67.71			68.18
3 - 5 PM	68.01	68.76	67.53	67.8	68.02	68.5
5 - 9 PM	69.26	69.36	68.72			69.09
9 - 11 PM	68.75	68.11	67.86			68.69

Figure 17. US-23 Southbound, Drive Lane, Sensor 2, 85th Percentile Speed, Cars

US-23 Southbound -- Pass Lane

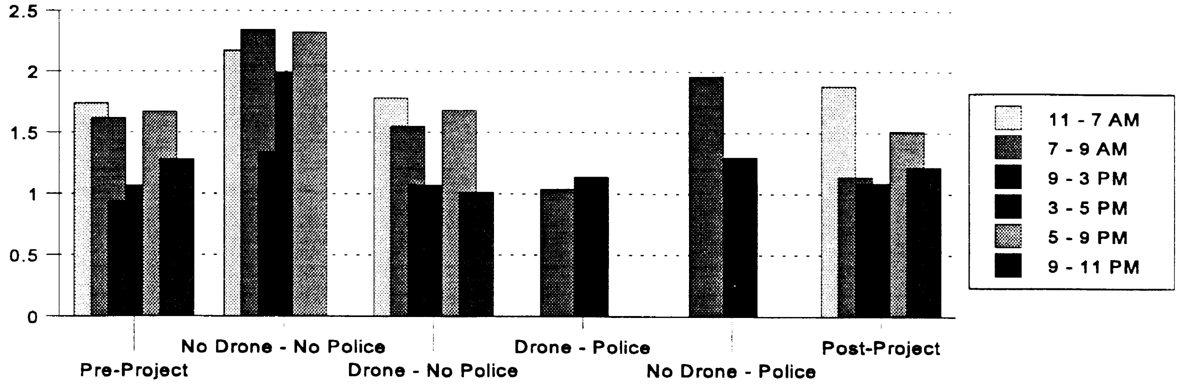
Sensor 2-- 85th Percentile Speed -- Cars



11 - 7 AM	71.8	71.02	70.6			70.83
7 - 9 AM	71.8	71.3	69.55	70.43	71.09	70.54
9 - 3 PM	70.42	69.68	69.63			70.06
3 - 5 PM	70.62	69.7	69.37	69.29	69.52	70.43
5 - 9 PM	71.7	70.8	70.44			71.21
9 - 11 PM	70.49		69.68			70.68

Figure 18. US-23 Southbound, Pass Lane, Sensor 2, 85th Percentile Speed, Cars

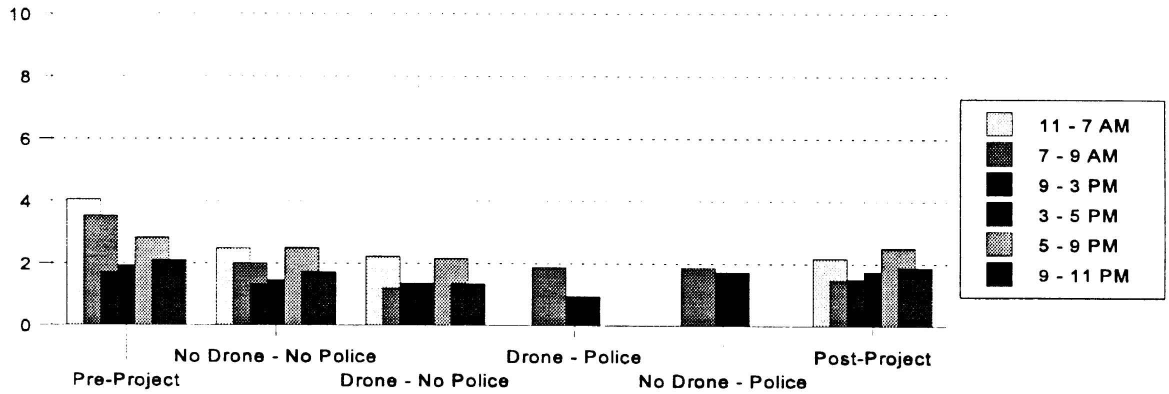
US-23 Southbound -- Drive Lane
Sensor 2 -- % 10+ MPH Over Limit -- Cars



11 - 7 AM	1.74	2.17	1.78			1.88
7 - 9 AM	1.62	2.34	1.55	1.04	1.96	1.14
9 - 3 PM	0.94	1.34	1.07			1.09
3 - 5 PM	1.07	1.99	0.98	1.14	1.3	1.03
5 - 9 PM	1.67	2.32	1.68			1.51
9 - 11 PM	1.28		1.01			1.22

Figure 19. US-23 Southbound, Drive Lane, Sensor 2, % 10+ MPH Over Limit, Cars

US-23 Southbound -- Pass Lane
Sensor 2 -- % 10+ MPH Over Limit -- Cars



11 - 7 AM	4.05	2.48	2.22			2.17
7 - 9 AM	3.53	2	1.19	1.88	1.87	1.47
9 - 3 PM	1.69	1.33	1.36			1.5
3 - 5 PM	1.93	1.46	1.29	0.95	1.73	1.75
5 - 9 PM	2.83	2.5	2.16			2.51
9 - 11 PM	2.1	1.72	1.35			1.88

Figure 20. US-23 Southbound, Pass Lane, Sensor 2, % 10+ MPH Over Limit, Cars

Figures 21 - 26 show the mean speed, 85th percentile speed, and the percentage ofcars exceeding the speed limit by 10 mph at sensor 3 (i.e., about 3,400 ft. past the drone zone, in the drive lane and in the pass lane).

The mean speed of cars in the drive lane ranged from 64.1 mph to 67.5 mph. The highest mean speeds were measured in the post-project period. If the post-project speeds are not considered, then the range of mean speeds was between 64.1 mph and 66.2 mph. This is slightly faster than at sensor 2. If the post-project period is disregarded, there is no noticeable difference in mean speed for the drive lane across the other conditions of the experiment.

The mean speed of cars in the pass lane ranged from 67.8 mph to 70 mph. There was no noticeable effect of the drone across the various experimental conditions. Overall the mean speed in the pass lane was slightly faster than at sensor 2.

The 85th percentile speeds of cars at sensor 3 were 69.2 mph to 72.8 mph in the drive lane and 73.1 mph to 75.1 mph in the pass lane. As indicated earlier, the measurements in the drive lane in the post-project period were consistently higher than in the before-project and project periods. No such speed increase was observed in the pass lane. If the post-project period speeds in the drive lane are disregarded, the range for the 85th percentile speeds in the drive lane is 69.2 mph to 71.8 mph. The 85th percentile speeds for both lanes at sensor 3 were slightly faster downstream of the drone radar zone than in the drone radar zone. No effects of the drone on the 85th percentile speeds of cars are noticeable downstream of the drone zone.

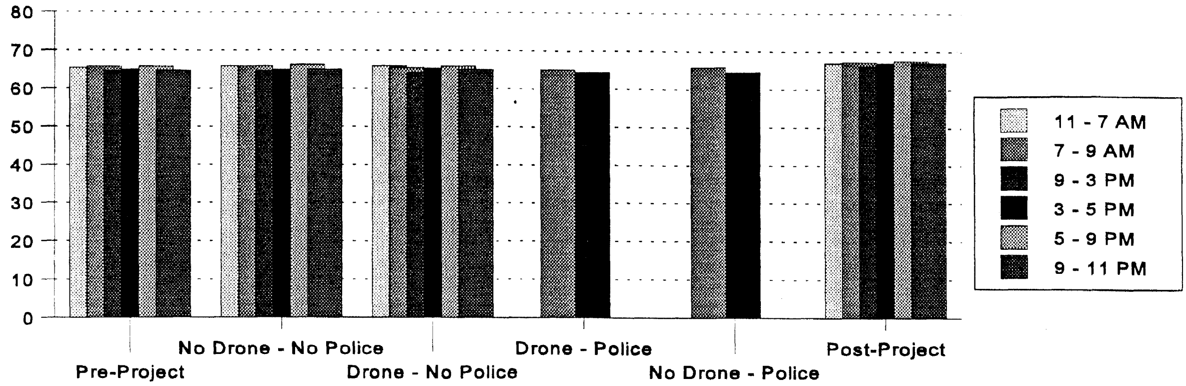
The portion of cars in the drive lane downstream of the drone zone exceeding 75 mph ranged from 2.1 percent to 5.2 percent. If the post-project values are not considered, the range is between 2.1 percent and 4.8 percent, which is higher than at sensor 2 in the drone radar zone. No effect of the drone on the portion of cars exceeding 75 mph was apparent across the various conditions of the experiment.

In the pass lane, the portion of cars exceeding the speed limit by at least 10 mph ranged from 5.8 percent to 12.2 percent. The lowest percentages were associated with conditions where the drone radar is on. However, overall the portion of cars in the pass lane exceeding 75 mph has increased noticeably from that in the drone radar zone.

Overall, there was no decrease in the mean and 85th percentile speeds of cars attributable to the drone radar at this site. Furthermore, the speeds of cars were increasing from sensor 1 through sensor 3. There was, however, a noticeable decrease in the portion of cars in the pass lane exceeding 75 mph between sensor 1, upstream of the drone zone, and sensor 2, in the drone zone, when the drone was on. This was followed by an increase in this measure between sensors 2 and 3, approximately 0.6 mile downstream. This pattern suggests that despite the overall increase in average speeds, the fastest moving cars (i.e., those in the pass lane exceeding the speed limit by at least 10 mph) are reacting to the drone radar, but only for a very short distance).

US-23 Southbound -- Drive Lane

Sensor 3 -- Mean Speed -- Cars

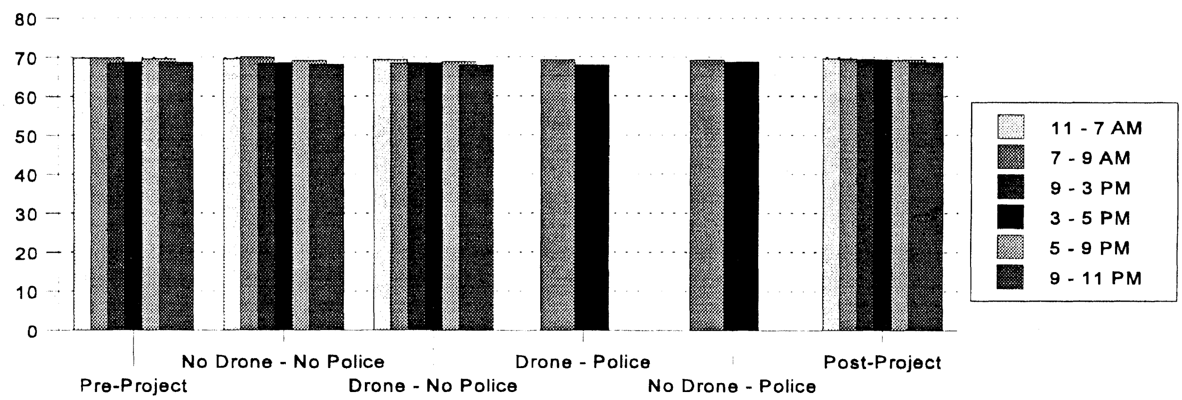


11 - 7 AM	65.41	65.86	65.9			66.86
7 - 9 AM	65.7	65.87	65.45	65.07	65.8	67.11
9 - 3 PM	64.52	64.53	64.11			66.01
3 - 5 PM	64.86	64.9	65.17	64.33	64.52	66.77
5 - 9 PM	65.69	66.19	65.85			67.49
9 - 11 PM	64.6	64.94	64.99			67.02

Figure 21. US-23 Southbound, Drive Lane, Sensor 3, Mean Speed, Cars

US-23 Southbound -- Pass Lane

Sensor 3 -- Mean Speed -- Cars

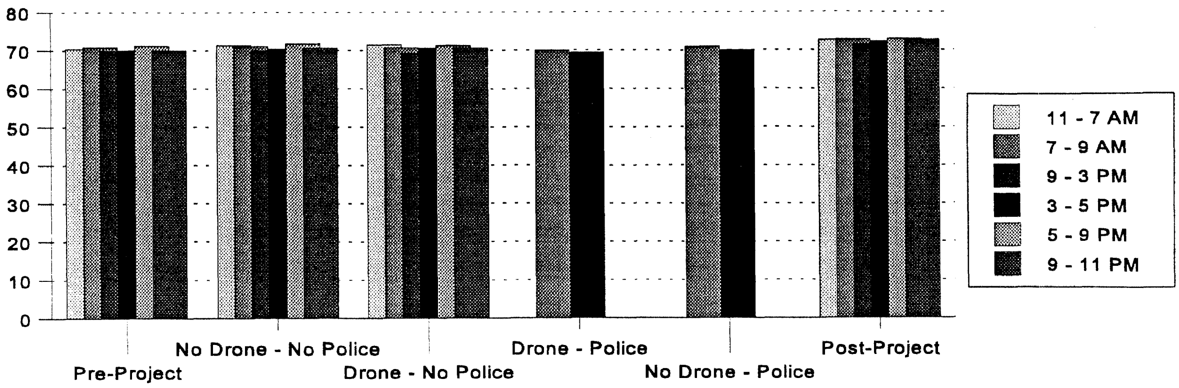


11 - 7 AM	69.83	69.59	69.27			69.61
7 - 9 AM	69.9	70.06	68.37	69.2	69.28	69.47
9 - 3 PM	68.4	68.38	68.46			69.36
3 - 5 PM	68.74	68.6	68.29	67.84	68.75	69.18
5 - 9 PM	69.61	69.08	68.84			69.25
9 - 11 PM	68.68	68.1	67.9			68.57

Figure 22. US-23 Southbound, Pass Lane, Sensor 3, Mean Speed, Cars

US-23 Southbound -- Drive Lane

Sensor 3 -- 85th Percentile Speed -- Cars

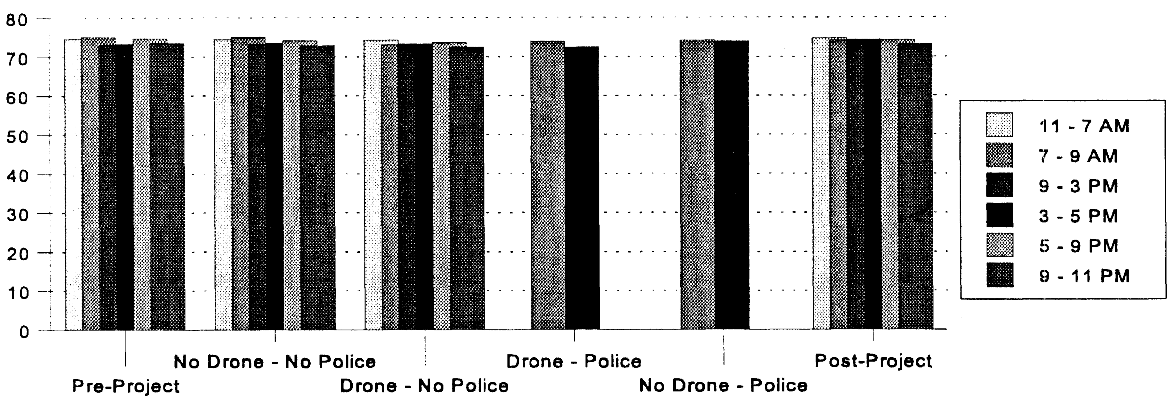


11 - 7 AM	70.38	71.33	71.39			72.6
7 - 9 AM	70.8	71.02	70.66	69.93	70.97	72.8
9 - 3 PM	69.79	69.82	69.2			71.47
3 - 5 PM	70.02	70.35	70.54	69.39	69.92	72.18
5 - 9 PM	71.14	71.78	71.25			72.85
9 - 11 PM	70.02	70.67	70.62			72.67

Figure 23. US-23 Southbound, Drive Lane, Sensor 3, 85th Percentile Speed, Cars

US-23 Southbound -- Pass Lane

Sensor 3 -- 85th Percentile Speed -- Cars

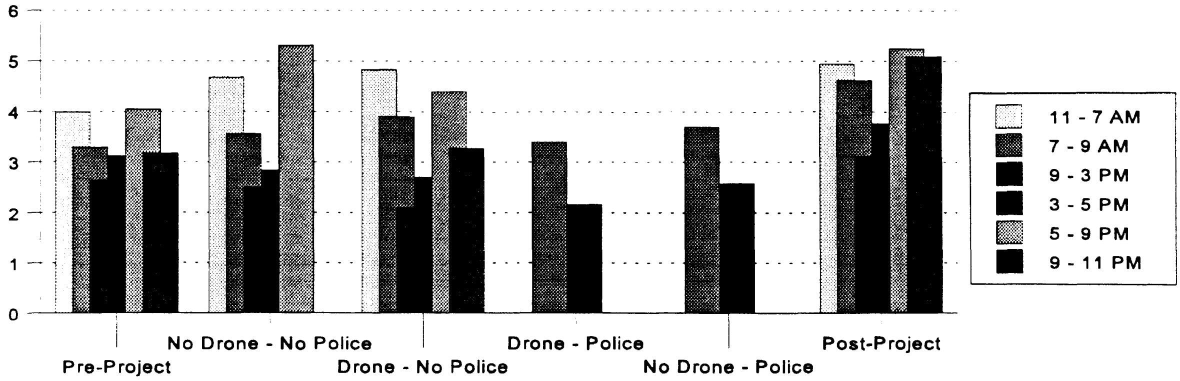


11 - 7 AM	74.61	74.45	74.25			74.69
7 - 9 AM	75.16	75.09	73.04	73.99	74.23	74.17
9 - 3 PM	73.13	73.27	73.31			74.35
3 - 5 PM	73.41	73.57	72.99	72.5	74	74.14
5 - 9 PM	74.72	74.16	73.7			74.24
9 - 11 PM	73.51	72.86	72.49			73.15

Figure 24. US-23 Southbound, Pass Lane, Sensor 3, 85th Percentile Speed, Cars

US-23 Southbound -- Drive Lane

Sensor 3 -- % 10+ MPH Over Limit -- Cars

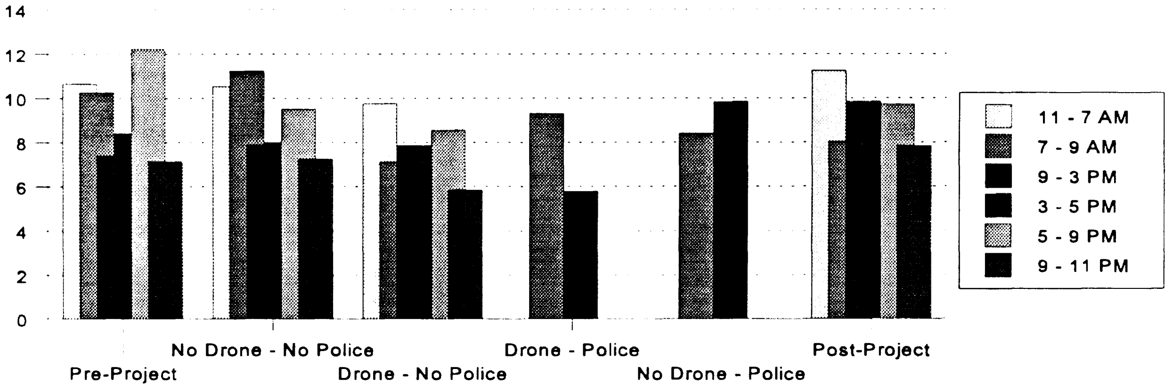


11 - 7 AM	3.99	4.68	4.83			4.94
7 - 9 AM	3.29	3.56	3.9	3.4	3.7	4.62
9 - 3 PM	2.63	2.5	2.1			3.11
3 - 5 PM	3.12	2.84	2.7	2.16	2.57	3.77
5 - 9 PM	4.05	5.31	4.4			5.25
9 - 11 PM	3.18		3.27			5.09

Figure 25. US-23 Southbound, Drive Lane, Sensor 3, % 10+ MPH Over Limit, Cars

US-23 Southbound -- Pass Lane

Sensor 3 -- % 10+ MPH Over Limit -- Cars



11 - 7 AM	10.67	10.54	9.77			11.25
7 - 9 AM	10.26	11.23	7.1	9.3	8.4	8.02
9 - 3 PM	7.39	7.88	7.85			9.83
3 - 5 PM	8.4	8	6.36	5.78	9.83	9.18
5 - 9 PM	12.23	9.52	8.55			9.72
9 - 11 PM	7.14	7.25	5.83			7.82

Figure 26. US-23 Southbound, Pass Lane, Sensor 3, % 10+ MPH Over Limit, Cars

Trucks

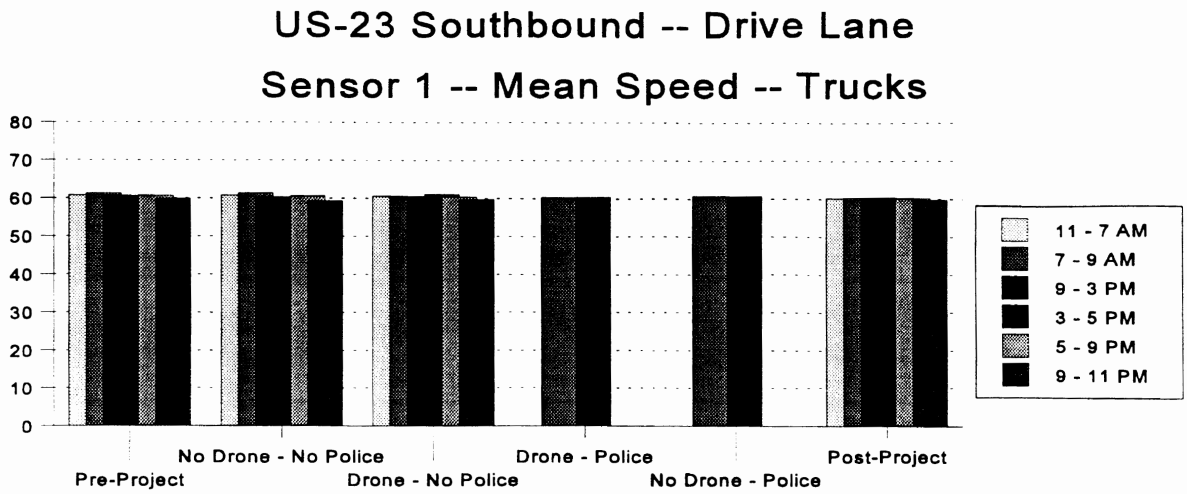
The next set of figures is concerned with the speed of trucks at the southbound US-23 site. Figures 27 - 32 show the mean speed, 85th percentile speed, and the percentage oftrucks exceeding the speed limit by 10 mph at sensor 1, i.e., upstream of the drone zone, in the drive and pass lanes.

The mean speed of trucks in the drive lane at sensor 1 was approximately 60 mph for all conditions and times of day. The actual range was from 58.9 mph to 61.4 mph. The mean speed of trucks in the pass lane ranged from 64.1 mph to 68.8 mph. The highest speeds were observed in the preproject period. The only pattern that was discernible from these observations was that the slowest speeds were recorded between 9:00 p.m. and 7:00 a.m. The speed of the trucks upstream of the drone zone is just slightly slower than that of cars. However, it should be noted that the speed limit for trucks is 55 mph.

The 85th percentile speeds at sensor 1 were lower for trucks than for cars and were approximately 65 mph for all conditions in the drive lane, and ranged from 65.5 mph to 70.6 mph in the pass lane.

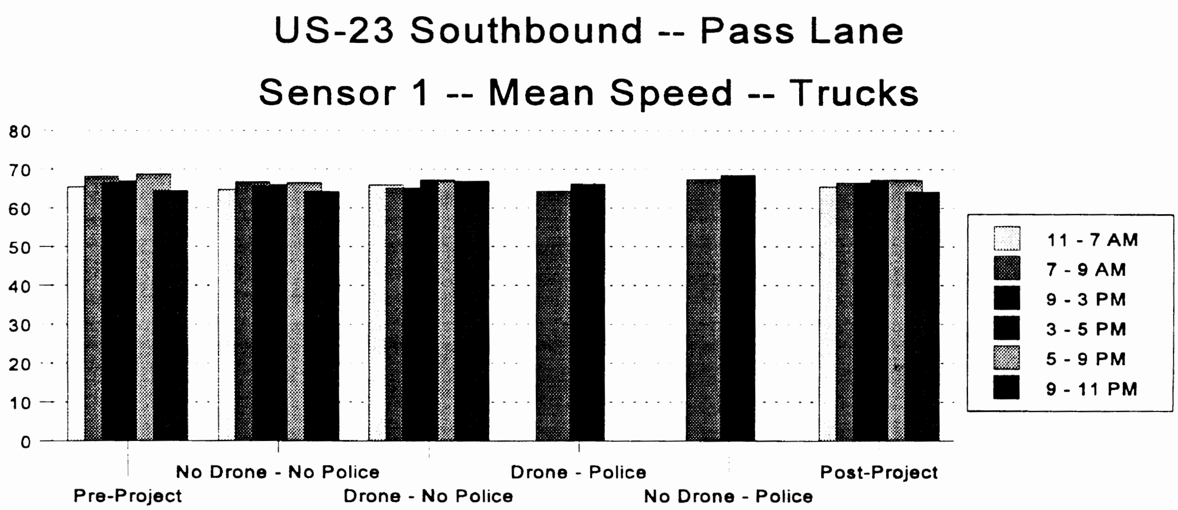
The percentage oftrucks exceeding the speed limit by 10 mph (i.e., exceeding 65 mph) was 9.7 percent to 20.4 percent in the drive lane and from 28.6 percent to 78 percent in the pass lane.

There were no obvious differences in the various speed measures of trucks across the experimental conditions at sensor 1. As indicated before, this is expected since this location is upstream and not visible from the drone zone and drivers should not be aware of drone radar signals or of police patrols.



11 - 7 AM	60.78	60.85	60.53			60.3
7 - 9 AM	61.26	61.37	60.22	60.34	60.77	60.47
9 - 3 PM	60.6	60.28	60.44			60.44
3 - 5 PM	60.46	58.92	61.08	60.49	60.65	60.27
5 - 9 PM	60.74	60.63	60.42			60.2
9 - 11 PM	59.85	59.31	59.77			59.77

Figure 27. US-23 Southbound, Drive Lane, Sensor 1, Mean Speed, Trucks

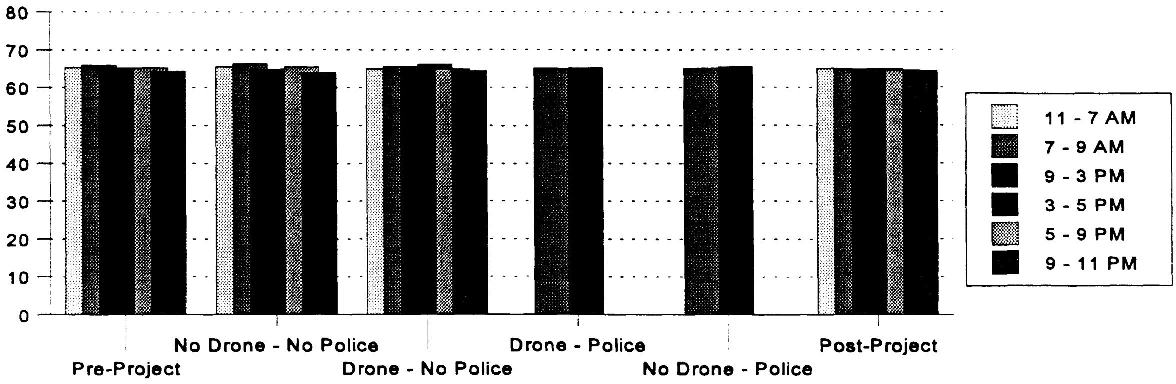


11 - 7 AM	65.44	64.8	65.91			65.58
7 - 9 AM	68.21	66.7	65.07	64.39	67.43	66.5
9 - 3 PM	66.45	65.45	65.13			65.93
3 - 5 PM	66.96	66	67.12	66.22	68.41	67.2
5 - 9 PM	68.84	66.56	66.84			67.21
9 - 11 PM	64.42	64.14	66.86			64.14

Figure 28. US-23 Southbound, Pass Lane, Sensor 1, Mean Speed, Trucks

US-23 Southbound -- Drive Lane

Sensor 1 -- 85th Percentile Speed -- Trucks

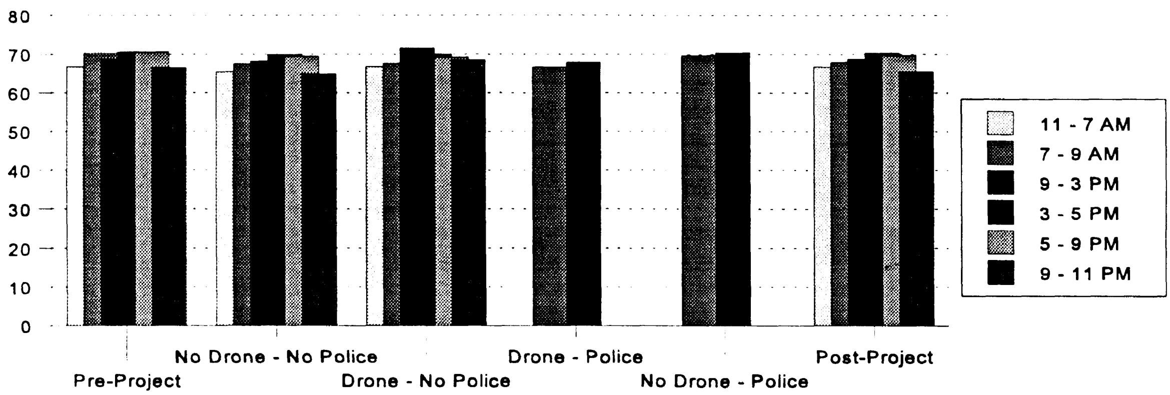


11 - 7 AM	65.38	65.53	64.98			64.99
7 - 9 AM	65.91	66.28	65.62	65.14	65.11	64.83
9 - 3 PM	65.29	64.83	65.25			64.97
3 - 5 PM	65.18	63.65	66.16	65.28	65.51	65.04
5 - 9 PM	65.28	65.46	64.94			64.7
9 - 11 PM	64.34	63.89	64.39			64.5

Figure 29. US-23 Southbound, Drive Lane, Sensor 1, 85th Percentile Speed, Trucks

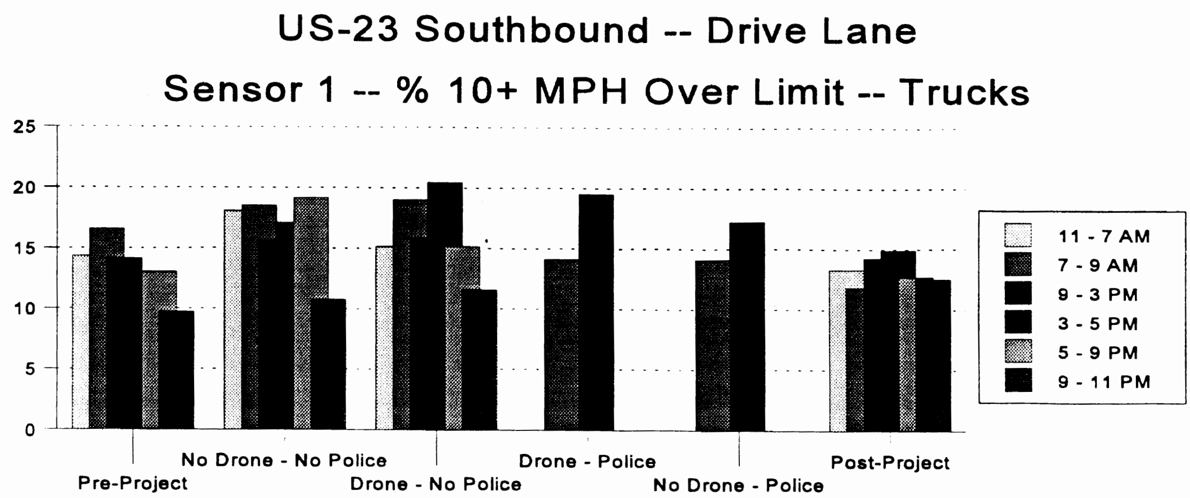
US-23 Southbound -- Pass Lane

Sensor 1 -- 85th Percentile Speed -- Trucks



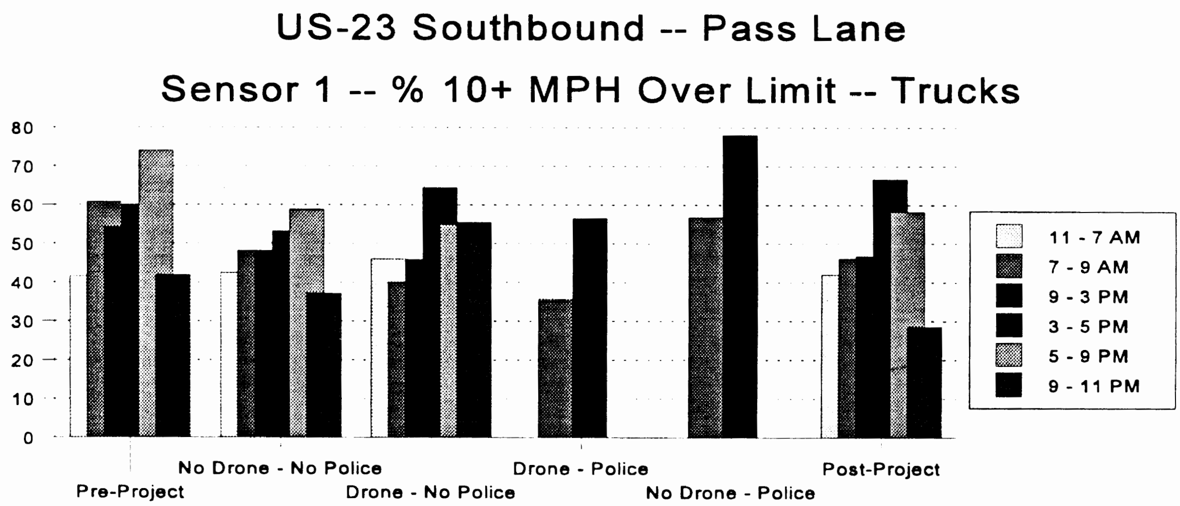
11 - 7 AM	66.83	65.45	66.79			66.68
7 - 9 AM	70.36	67.52	67.57	66.64	69.66	67.85
9 - 3 PM	68.77	68.11	71.49			68.74
3 - 5 PM	70.6	69.86	69.93	67.87	70.41	70.27
5 - 9 PM	70.56	69.45	69.26			69.72
9 - 11 PM	66.48	64.97	68.48			65.5

Figure 30. US-23 Southbound, Pass Lane, Sensor 1, 85th Percentile Speed, Trucks



11 - 7 AM	14.33	18.05	15.14			13.32
7 - 9 AM	16.57	18.51	19	14.13	14.09	11.83
9 - 3 PM	14.16	15.66	15.84			14.26
3 - 5 PM	12.9	17.12	20.44	19.52	17.23	14.89
5 - 9 PM	13.03	19.15	15.14			12.68
9 - 11 PM	9.72	10.76	11.56			12.5

Figure 31. US-23 Southbound, Drive Lane, Sensor 1, % 10+ MPH Over Limit, Trucks



11 - 7 AM	41.67	42.52	46.15			42.11
7 - 9 AM	60.71	48.15	40	35.72	56.83	46.16
9 - 3 PM	54.16	47.62	45.95			46.83
3 - 5 PM	60	53.27	64.47	56.52	78.05	66.67
5 - 9 PM	74	58.8	55.02			58.21
9 - 11 PM	41.94	37.14	55.56			28.56

Figure 32. US-23 Southbound, Pass Lane, Sensor 1, % 10+ MPH Over Limit, Trucks

Figures 33 - 38 show the mean speed, 85th percentile speed, and the percentage oftrucks exceeding the speed limit by 10 mph at sensor 2 (i.e., the drone radar zone).

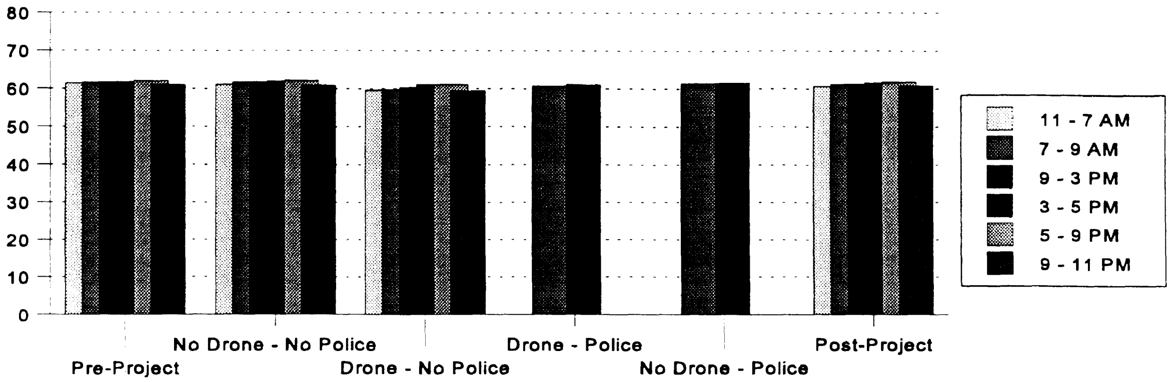
The mean speed of trucks in the drive lane was 59.4 mph to 62.1 mph and 57.2 mph to 63.0 mph in the pass lane across the various conditions. The lowest mean speeds in the pass lane were measured when police patrols and/or drone radar were present. There was no apparent change in mean speeds of trucks between sensor 1 and sensor 2 in the drive lane, but there was a noticeable decrease in mean speeds of trucks in the pass lane.

The 85th percentile speed of trucks at sensor 2 ranged from 63.8 mph to 67.6 mph in the drive lane and from 60.4 mph to 65.4 mph in the pass lane. Again, the lowest 85th percentile speeds in the pass lane corresponded to times of police and/or drone radar.

The percentage oftrucks exceeding 65 mph at sensor 2 ranged from 12.7 percent to 28.8 percent in the drive lane and 3.2 percent to 27.7 percent in the pass lane. The lowest portions of trucks exceeding the speed limit in the drive zones were measured at times when the drone radar was on. In the pass lane the lowest percentages were measured when drone radar and/or police were present.

US-23 Southbound -- Drive Lane

Sensor 2 -- Mean Speed -- Trucks

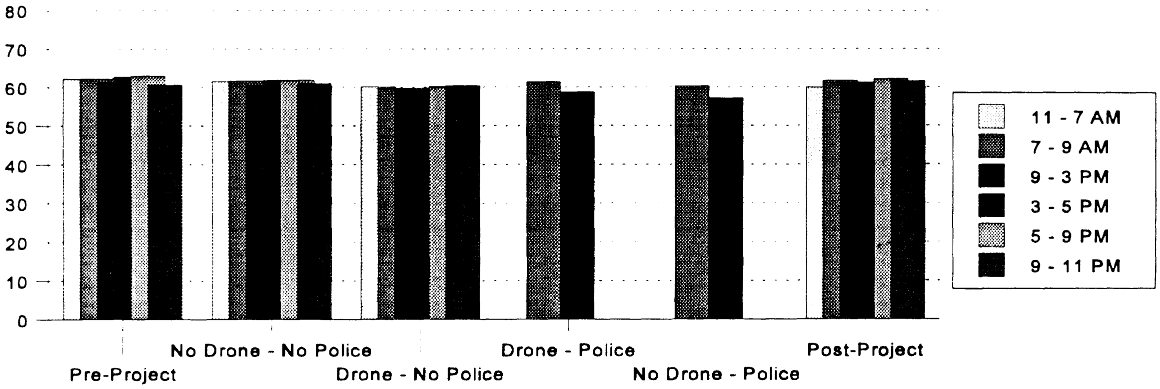


11 - 7 AM	61.39	61.1	59.64			60.73
7 - 9 AM	61.65	61.7	59.8	60.71	61.44	61.25
9 - 3 PM	61.16	61.32	60.38			61.18
3 - 5 PM	61.72	62	61.09	61.12	61.5	61.59
5 - 9 PM	62.08	62.13	61.12			61.87
9 - 11 PM	61.02	60.94	59.44			60.91

Figure 33. US-23 Southbound, Drive Lane, Sensor 2, Mean Speed, Trucks

US-23 Southbound -- Pass Lane

Sensor 2 -- Mean Speed -- Trucks

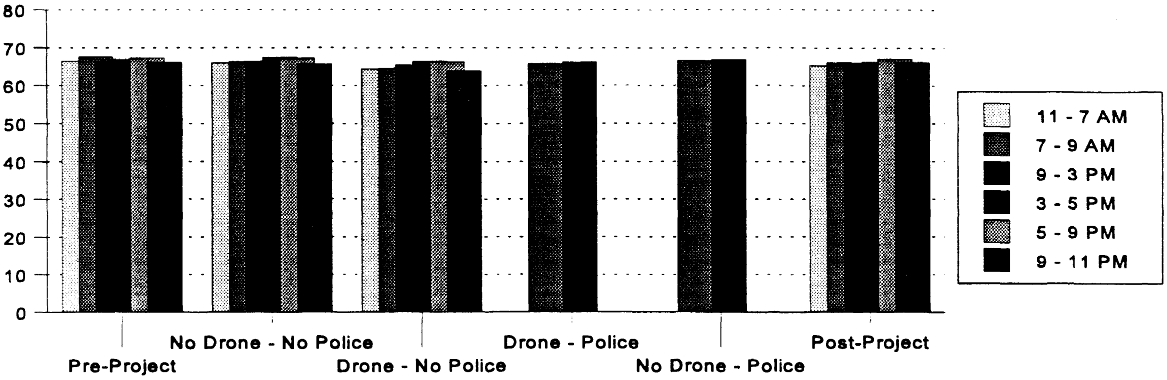


11 - 7 AM	62.26	61.5	60.13			60
7 - 9 AM	62.26	61.67	59.66	61.4	60.38	61.76
9 - 3 PM	61.24	60.55	59.4			60.94
3 - 5 PM	62.69	61.87	59.62	58.79	57.19	61.23
5 - 9 PM	62.96	61.87	60.14			62.12
9 - 11 PM	60.59	60.91	60.44			61.54

Figure 34. US-23 Southbound, Pass Lane, Sensor 2, Mean Speed, Trucks

US-23 Southbound -- Drive Lane

Sensor 2 -- 85th Percentile Speed -- Trucks

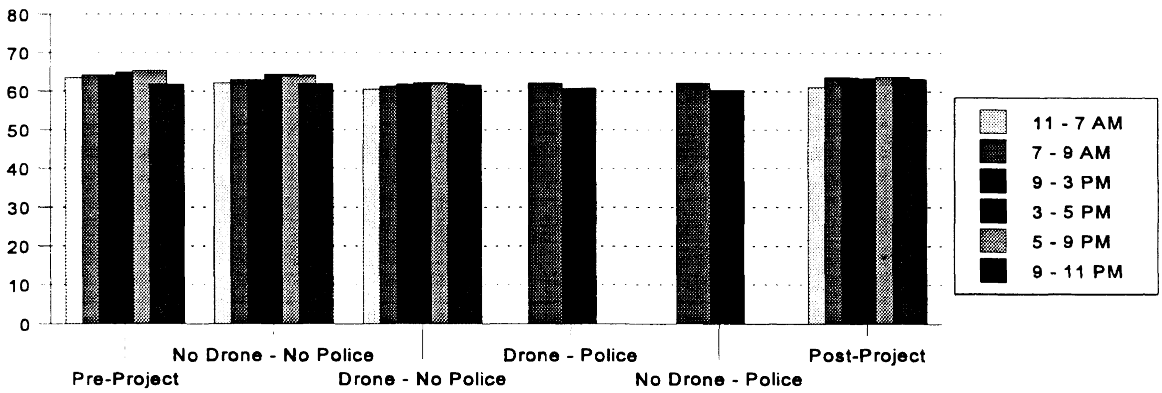


11 - 7 AM	66.48	65.92	64.34			65.27
7 - 9 AM	67.62	66.24	64.53	65.64	66.56	66.05
9 - 3 PM	66.33	66.39	65.41			66.1
3 - 5 PM	66.95	67.47	66.32	66.17	66.8	66.23
5 - 9 PM	67.29	67.17	66.07			67.04
9 - 11 PM	66.12	65.56	63.81			66.22

Figure 35. US-23 Southbound, Drive Lane, Sensor 2, 85th Percentile Speed, Trucks

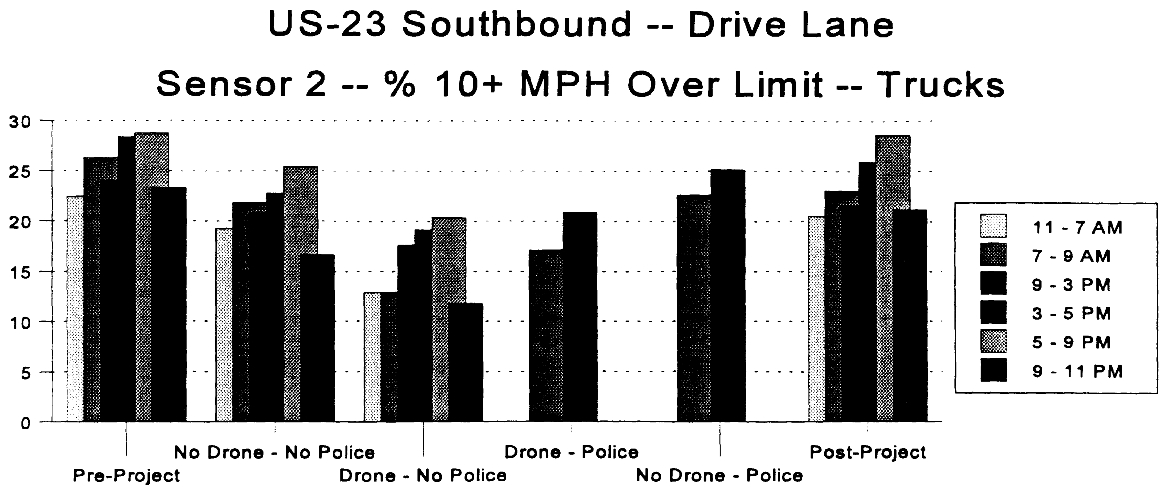
US-23 Southbound -- Pass Lane

Sensor 2-- 85th Percentile Speed -- Trucks



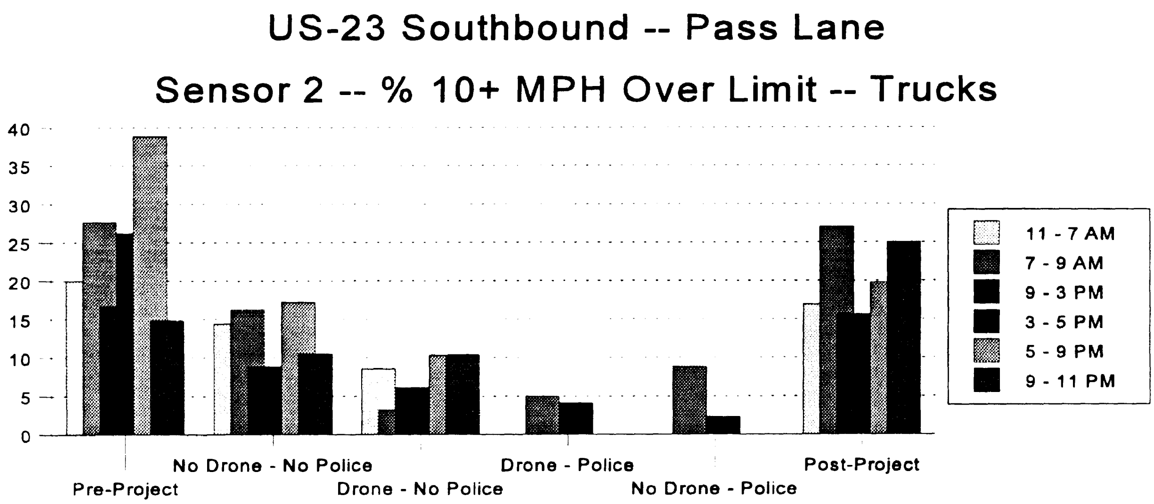
11 - 7 AM	63.53	62.13	60.59			61.12
7 - 9 AM	64.2	62.93	61.27	62.15	62.15	63.59
9 - 3 PM	63.87	62.77	61.75			63.33
3 - 5 PM	65.01	64.4	62.24	60.85	60.36	63.15
5 - 9 PM	65.38	64.03	61.98			63.68
9 - 11 PM	61.78	61.81	61.57			63.21

Figure 36. US-23 Southbound, Pass Lane, Sensor 2, 85th Percentile Speed, Trucks



11 - 7 AM	22.45	19.27	12.89			20.54
7 - 9 AM	26.33	21.82	12.7	17.14	22.59	23.06
9 - 3 PM	24	20.75	17.64			21.6
3 - 5 PM	28.37	22.75	19.18	20.94	25.14	25.94
5 - 9 PM	28.78	25.43	20.38			28.62
9 - 11 PM	23.32	16.67	11.77			21.21

Figure 37. US-23 Southbound, Drive Lane, Sensor 2, % 10+ MPH Over Limit, Trucks



11 - 7 AM	20	14.42	8.6			16.95
7 - 9 AM	27.69	16.27	3.22	5	8.82	27.03
9 - 3 PM	16.72	8.82	6.11			15.61
3 - 5 PM	26.25	7.27	5.55	4.16	2.38	13.84
5 - 9 PM	38.84	17.28	10.32			19.78
9 - 11 PM	14.81	10.53	10.39			25

Figure 38. US-23 Southbound, Pass Lane, Sensor 2, % 10+ MPH Over Limit, Trucks

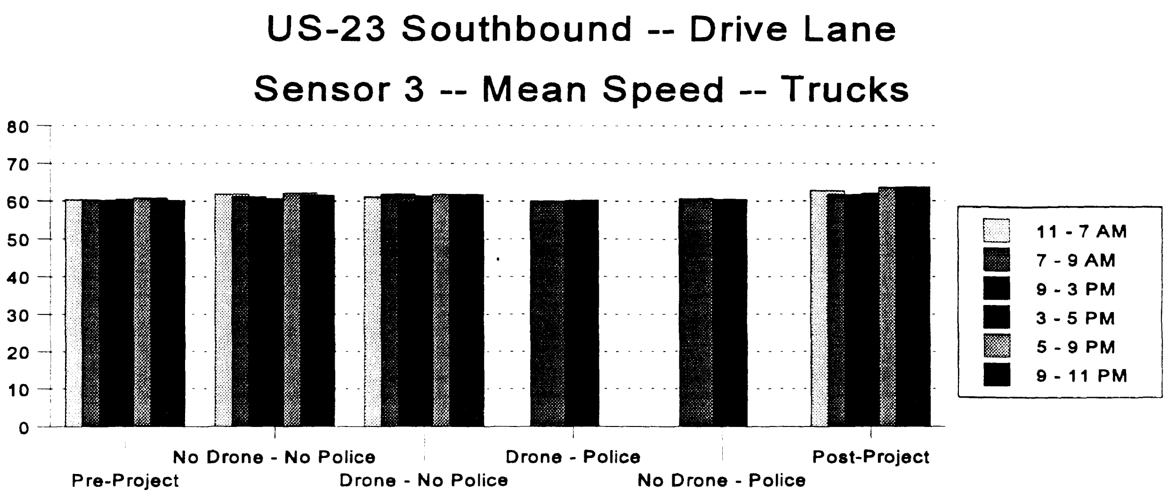
Figures 39 - 44 show the mean speed, 85th percentile speed, and the percentage oftrucks exceeding the speed limit by 10 mph at sensor 3 (approximately 3,400 ft. past the drone zone).

At sensor 3 the mean speed of trucks ranged from 59.8 mph to 63.8 mph in the drive lane and 62.9 mph to 70.4 mph in the pass lane. There is no obvious evidence of a slowing effect from the drone or from police presence upstream at sensor 2.

The 85th percentile speeds ranged from 64.6 mph to 69 mph in the drive lane and were not much different from those upstream at sensor 2. There was an increase in the 85th percentile speeds of trucks in the pass lane at sensor 3. The range was from 64.3 mph to 73.9 mph. The 85th percentile speeds in the pass lane for conditions of drone radar with and without police presence increased noticeably.

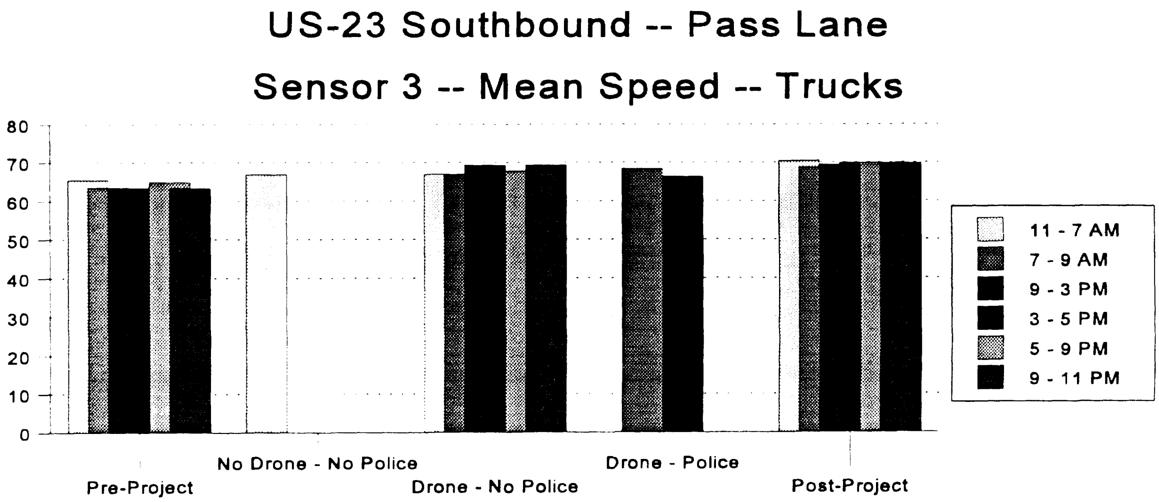
The percentage of trucks at sensor 3 in the drive lane exceeding 65 mph ranged from 11.3 percent to 39.8 percent in the drive lane and from 5 percent to 88.7 percent in the pass lane. There was no apparent effect of police or drone presence on this measure in the drive lane. The lowest percentages of trucks exceeding 65 mph in the pass lane were measured for conditions with drone radar and/or police presence. However, this was observed in only one of the two time periods where these conditions existed.

The observations of the speed of trucks at the southbound US-23 site show that trucks do not obey the 55 mph truck speed limit, but travel at a speed approaching that of cars. The speeds of trucks in the pass lane appear to be somewhat lowered by the drone radar or by police presence in the drone radar zone, and the percentage of trucks exceeding the speed limit by more than 10 mph clearly decreased. This effect was not evident for cars or for trucks in the drive lane at this site. This effect, however was not as apparent by the time the trucks traveled about 3,400 ft past the drone zone.



	Pre-Project	No Drone - No Police	Drone - No Police	Drone - Police	No Drone - Police	Post-Project
11 - 7 AM	60.36	61.79	61.08			62.96
7 - 9 AM	60.28	61.07	61.91	60.02	60.73	61.89
9 - 3 PM	60.13	60.29	59.8			61.82
3 - 5 PM	60.46	60.64	61.35	60.17	60.46	62.17
5 - 9 PM	60.69	62.16	61.81			63.62
9 - 11 PM	60.17	61.57	61.76			63.78

Figure 39. US-23 Southbound, Drive Lane, Sensor 3, Mean Speed, Trucks

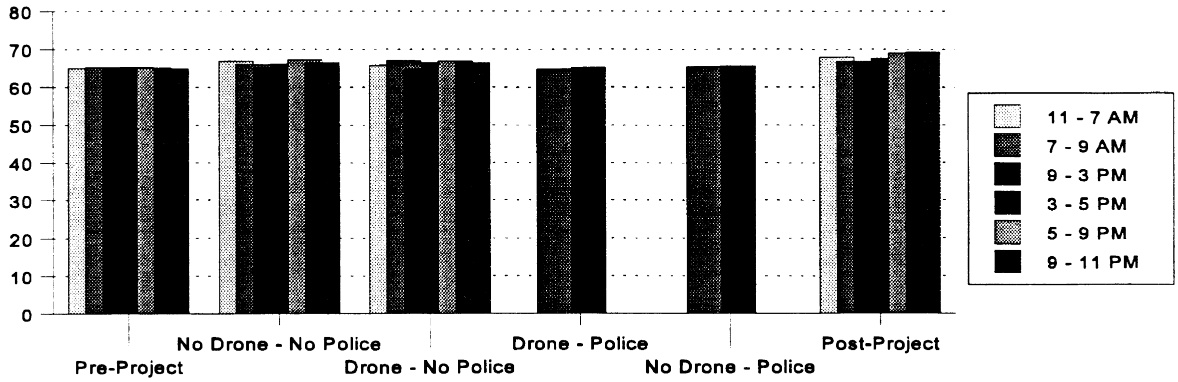


	Pre-Project	No Drone - No Police	Drone - No Police	Drone - Police	Post-Project
11 - 7 AM	65.44	66.91	67.02		70.44
7 - 9 AM	63.45		66.93	68.33	68.71
9 - 3 PM	62.94		69.23		69.34
3 - 5 PM	63.35		67.06	66.32	69.83
5 - 9 PM	64.91		67.76		69.86
9 - 11 PM	63.26		69.2		69.78

Figure 40. US-23 Southbound, Pass Lane, Sensor 3, Mean Speed, Trucks

US-23 Southbound -- Drive Lane

Sensor 3 -- 85th Percentile Speed -- Trucks

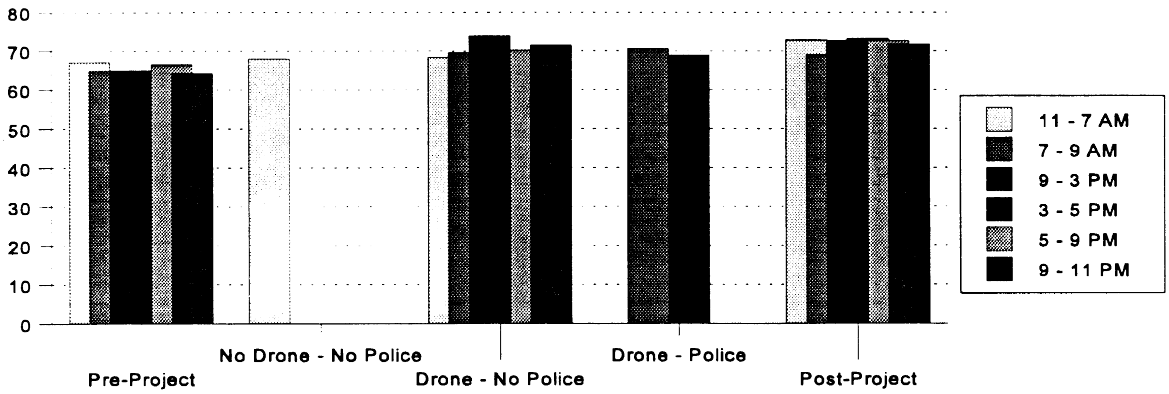


11 - 7 AM	64.93	66.91	65.7			67.98
7 - 9 AM	65.15	65.91	67	64.74	65.42	66.79
9 - 3 PM	64.69	65.13	64.61			66.68
3 - 5 PM	65.32	66.02	66.43	65.18	65.52	67.53
5 - 9 PM	65.07	67.2	66.9			69.04
9 - 11 PM	64.86	66.44	66.38			69.23

Figure 41. US-23 Southbound, Drive Lane, Sensor 3, 85th Percentile Speed, Trucks

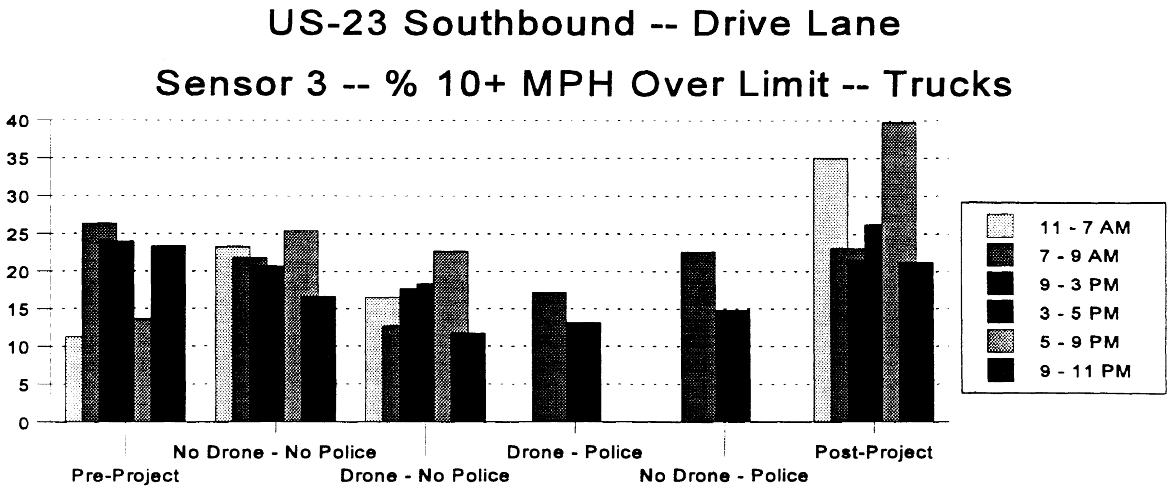
US-23 Southbound -- Pass Lane

Sensor 3 -- 85th Percentile Speed -- Trucks



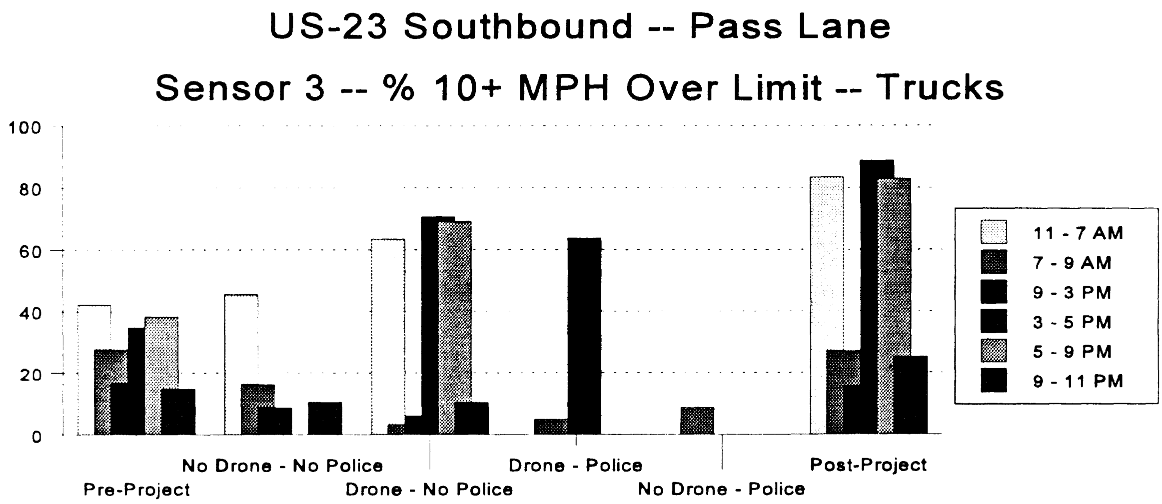
11 - 7 AM	67.08	67.91	68.39		72.89
7 - 9 AM	64.81		69.6	70.61	69
9 - 3 PM	64.98		73.95		72.82
3 - 5 PM	64.88		69	68.89	73.23
5 - 9 PM	66.5		70.2		72.67
9 - 11 PM	64.32		71.55		71.78

Figure 42. US-23 Southbound, Pass Lane, Sensor 3, 85th Percentile Speed, Trucks



11 - 7 AM	11.26	23.22	16.46			35
7 - 9 AM	26.33	21.82	12.7	17.14	22.59	23.06
9 - 3 PM	24	20.75	17.64			21.6
3 - 5 PM	12.88	16.47	18.31	13.1	14.81	26.29
5 - 9 PM	13.59	25.41	22.68			39.76
9 - 11 PM	23.32	16.67	11.77			21.21

Figure 43. US-23 Southbound, Drive Lane, Sensor 3, % 10+ MPH Over Limit, Trucks



11 - 7 AM	42.25	45.46	63.41			83.33
7 - 9 AM	27.69	16.27	3.22	5	8.82	27.03
9 - 3 PM	16.72	8.82	6.11			15.61
3 - 5 PM	34.94		70.58	63.64		88.68
5 - 9 PM	38.31		69.05			82.76
9 - 11 PM	14.81	10.53	10.39			25

Figure 44. US-23 Southbound, Pass Lane, Sensor 3, % 10+ MPH Over Limit, Trucks

Site 2, US-23 Northbound

The next series of figures presents the speed measures for the study site on the northbound section of US-23. The 24 hour volume at this site, as measured on August 8th was 23,225 vehicles. Of these vehicles, 1,016, or 4.4 percent, were trucks. The drive lane was used by 45 percentage ofthe vehicles and the pass lane was used by 55 percent. The portion of vehicles classified as trucks was 8.3 percent in the drive lane and 1.1 percent in the pass lane. This volume and distribution is typical of the volume at this site during the entire study period.

The speed of vehicles at sensor 1 and sensor 2 in the drive lane in the post-project period appear to be different for those observed before and during the project. The pattern of speeds indicates sensor malfunction rather than real changes in the speed of the traffic stream, and the problems in two sensors and not the third suggest damage to the sensors, most likely from a vehicle dragging some object over the road. Thus, the measurements from the post-project period will not be included in the comparisons at this site.

<u>Cars</u>

Figures 45 - 50 show the mean speed, 85th percentile speed, and the percentage of cars exceeding the speed limit by 10 mph at sensor 1 (i.e., upstream of the drone zone, in the drive lane and in the pass lane).

At sensor 1 the mean speed of cars in the drive lane was between 64.4 mph and 67.6 mph, and between 68.3 mph and 71.8 mph in the pass lane for the various conditions of the experiment. The 85th percentile speed of cars in the drive lane did not vary much across the various experimental conditions or times of day, and was between 70.1 mph and 73.3 mph in the drive lane and between 73 mph and 77.6 mph in the pass lane. The percentage of cars exceeding 75 mph ranged from 3 percent to 10 percent in the drive lane and 7.7 percent to 24.9 percent in the pass lane. There was no evidence of an effect on the speed of the drone radar or of police presence at sensor 1, which was expected, since the sensor is upstream of the drone zone and the police were not visible from this location.

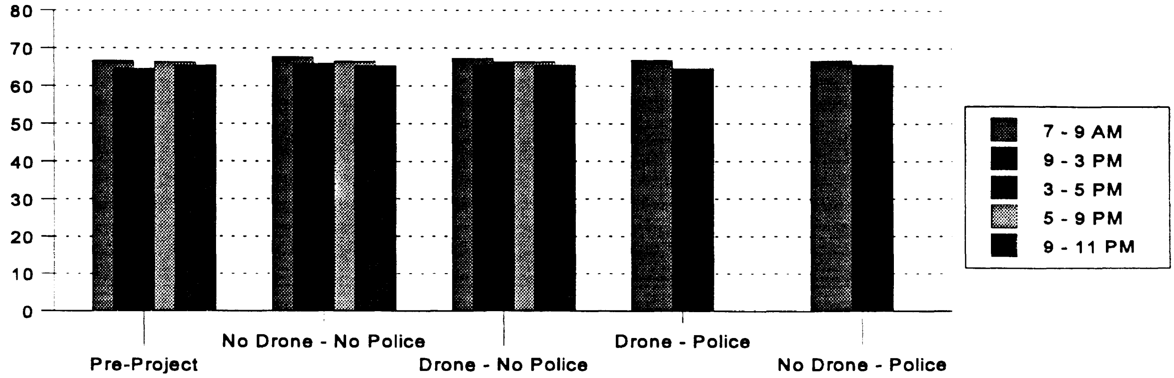
Figures 51 - 56 show the mean speed, 85th percentile speed, and the percentage of cars exceeding the speed limit by 10 mph at sensor 2 (i.e., the drone radar zone).

The mean speed of cars at sensor 2 was between 62.1 mph and 65.2 mph in the drive lane and between 66.7 mph and 70.2 mph in the pass lane. The 85th percentile speed varied from 67.5 mph to 70.7 mph in the drive lane and 71.6 mph and 75.4 mph in the pass lane. The percentage of cars exceeding 75 mph ranged from 0.6 percent to 2.8 percent in the drive lane and from 3.8 percent to 13 percent in the pass lane.

There was a general decrease in speeds in both lanes from sensor 1 to sensor 2. However, the decrease occurred for all conditions, those with drone radar and police, as well as those without, which suggests that the drone radar and/or police presence were not the causes of the speed reduction. However, it should be noted that the lowest portions of cars exceeding 75 mph in the drive lane were recorded in conditions when police were present.

US-23 Northbound -- Drive Lane

Sensor 1 -- Mean Speed -- Cars

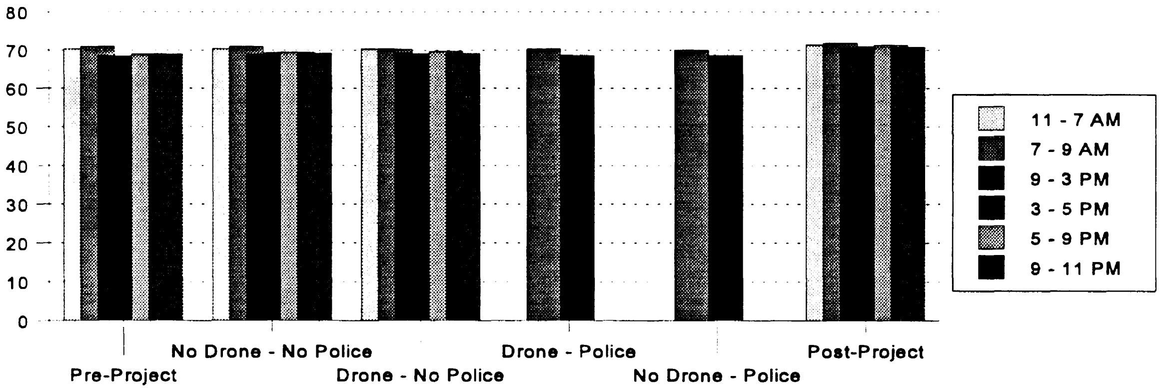


7 - 9 AM	66.6	67.57	67.26	66.81	66.67
9 - 3 PM	64.55	65.75	65.56		
3 - 5 PM	64.43	65.94	66.29	64.69	65.6
5 - 9 PM	66.25	66.5	66.41		
9 - 11 PM	65.46	65.34	65.45		

Figure 45. US-23 Northbound, Drive Lane, Sensor 1, Mean Speed, Cars

US-23 Northbound -- Pass Lane

Sensor 1 -- Mean Speed -- Cars

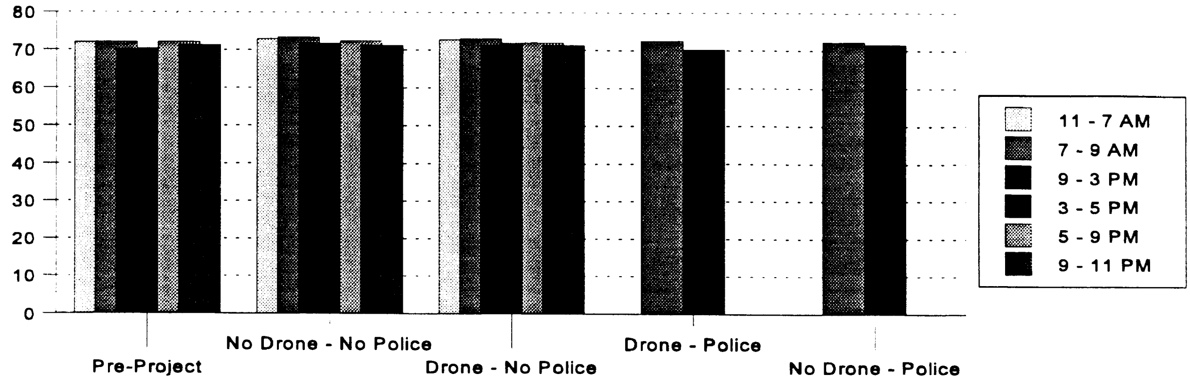


11 - 7 AM	70.32	70.38	70.3			71.41
7 - 9 AM	71.04	71	70.25	70.27	70.08	71.83
9 - 3 PM	68.54	68.92	69.05			70.53
3 - 5 PM	68.31	69.41	68.93	68.64	68.64	70.99
5 - 9 PM	69	69.43	69.7			71.31
9 - 11 PM	68.92	69.17	69.08			70.78

Figure 46. US-23 Northbound, Pass Lane, Sensor 1, Mean Speed, Cars

US-23 Northbound -- Drive Lane

Sensor 1 -- 85th Percentile Speed -- Cars

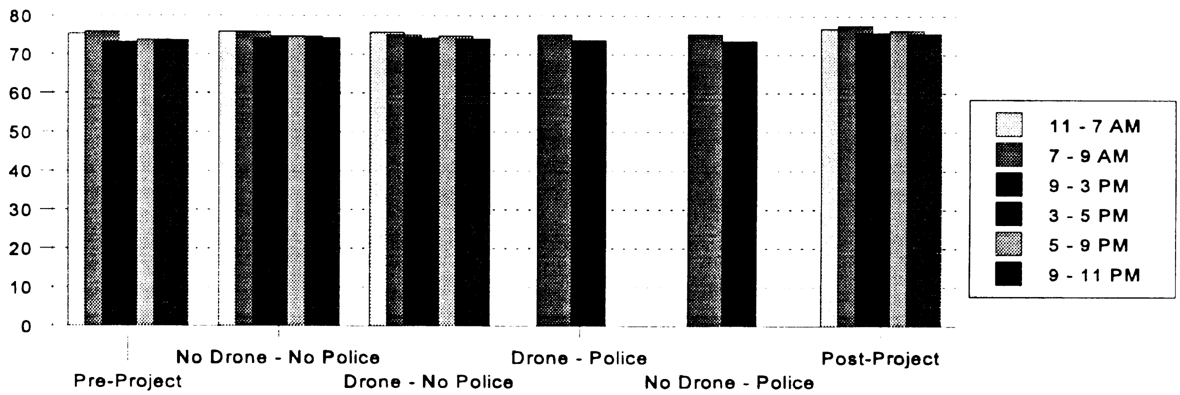


11 - 7 AM	71.91	72.95	72.78		
7 - 9 AM	72.09	73.29	73.06	72.51	72.3
9 - 3 PM	70.09	71.55	71.22		
3 - 5 PM	70.24	71.73	71.87	70.19	71.55
5 - 9 PM	72.09	72.35	71.96		
9 - 11 PM	71.28	71.19	71.29		

Figure 47. US-23 Northbound, Drive Lane, Sensor 1, 85th Percentile Speed, Cars

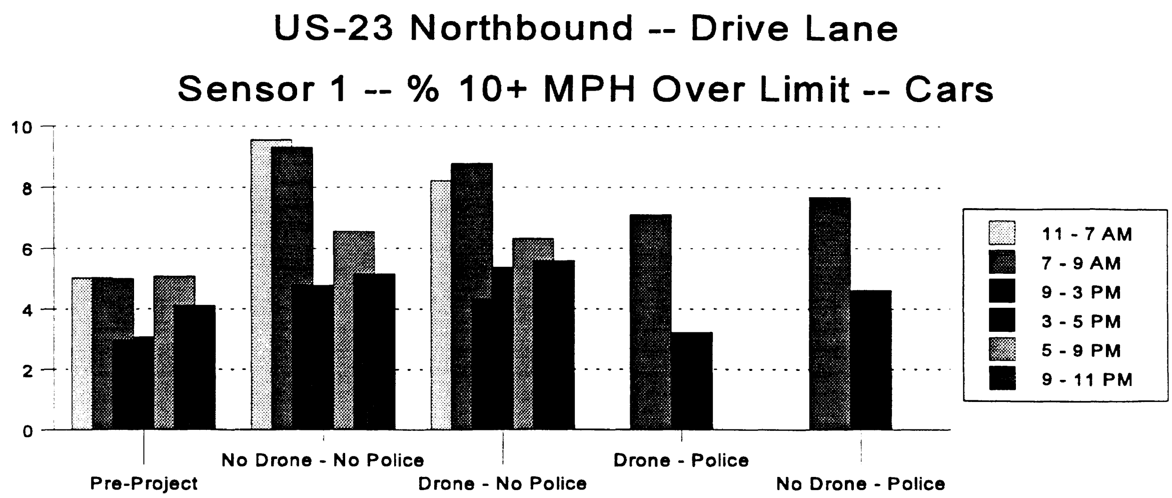
US-23 Northbound -- Pass Lane

Sensor 1 -- 85th Percentile Speed -- Cars



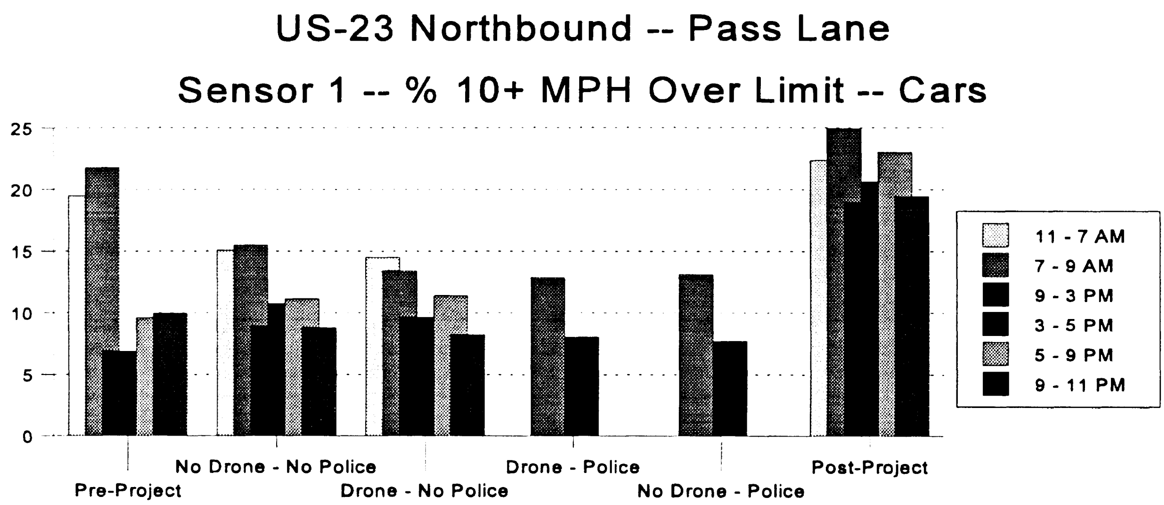
11 - 7 AM	75.4	75.89	75.75			76.76
7 - 9 AM	75.93	75.9	75.18	75.25	75.28	77.57
9 - 3 PM	73.19	74.08	74.25			75.7
3 - 5 PM	73.05	74.79	74.12	73.71	73.51	75.76
5 - 9 PM	73.83	74.68	74.89			76.25
9 - 11 PM	73.71	74.28	74.07			75.42

Figure 48. US-23 Northbound, Pass Lane, Sensor 1, 85th Percentile Speed, Cars



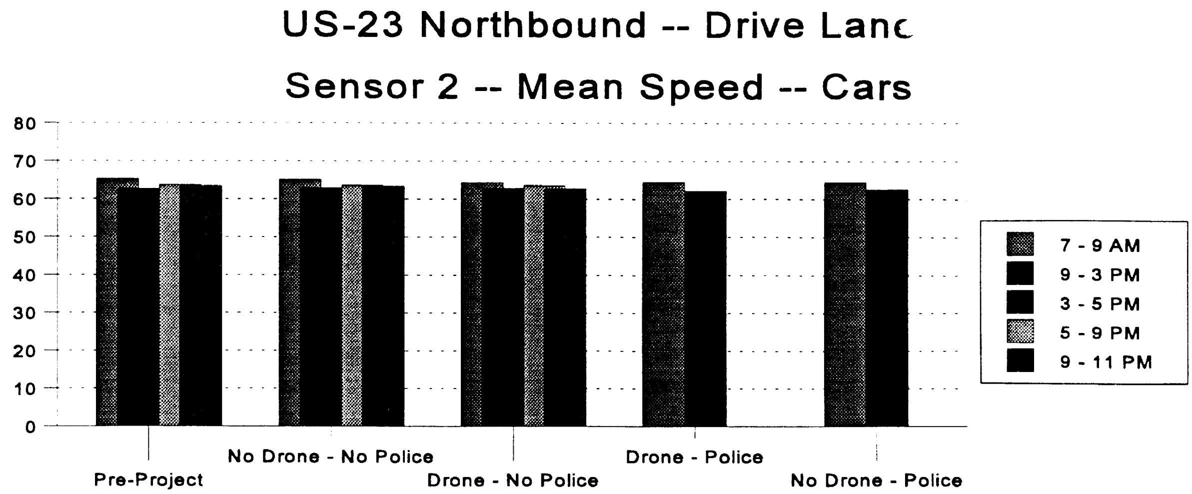
11 - 7 AM	5.03	9.55	8.22		
7 - 9 AM	5	9.29	8.77	7.1	7.68
9 - 3 PM	2.96	4.78	4.31		
3 - 5 PM	3.08	4.59	5.38	3.22	4.62
5 - 9 PM	5.08	6.56	6.32		
9 - 11 PM	4.11	5.16	5.59		

Figure 49. US-23 Northbound, Drive Lane, Sensor 1, % 10+ MPH Over Limit, Cars



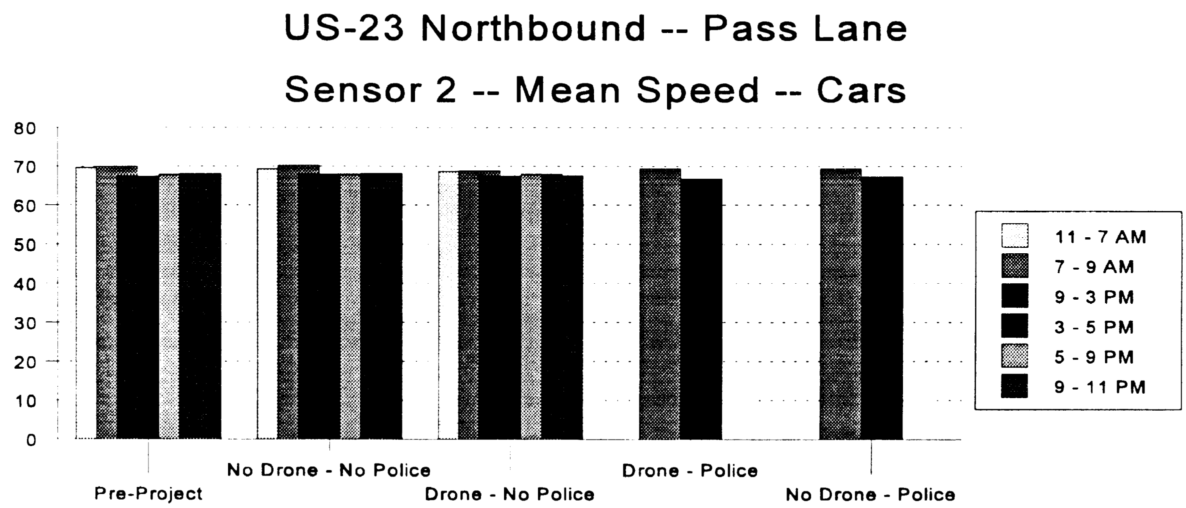
11 - 7 AM	19.48	15.06	14.49			22.36
7 - 9 AM	21.76	15.49	13.41	12.86	13.13	24.92
9 - 3 PM	6.88	8.89	9.63			18.96
3 - 5 PM	6.15	10.76	8.88	8.03	7.71	20.61
5 - 9 PM	9.62	11.13	11.39			23.02
9 - 11 PM	9.93	8.78	8.22			19.42

Figure 50. US-23 Northbound, Pass Lane, Sensor 1, % 10+ MPH Over Limit, Cars



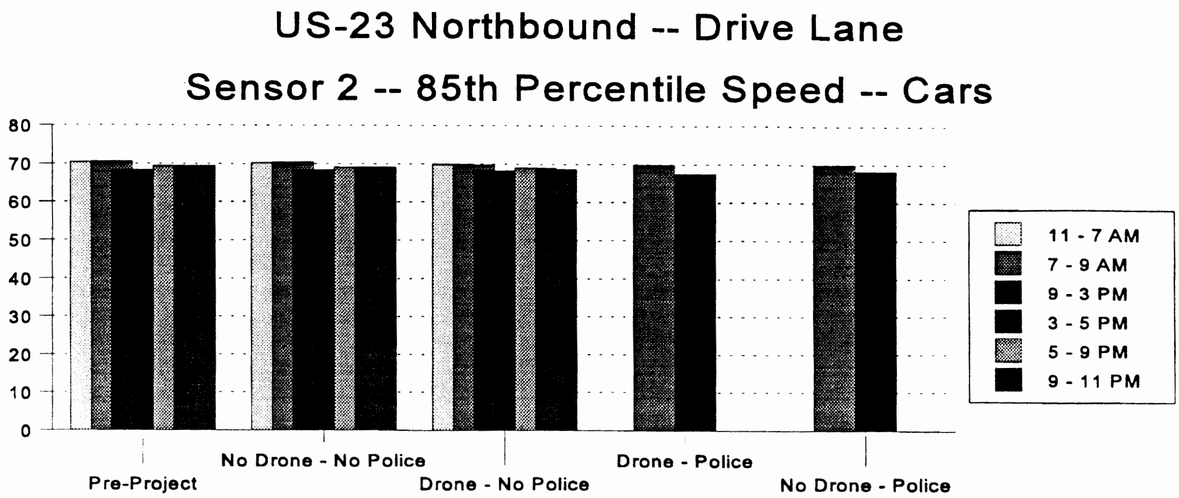
7 - 9 AM	65.25	65.08	64.31	64.52	64.45
9 - 3 PM	62.65	62.89	62.8		
3 - 5 PM	62.42	62.92	62.68	62.15	62.48
5 - 9 PM	63.67	63.58	63.55		
9 - 11 PM	63.35	63.4	62.68		

Figure 51. US-23 Northbound, Drive Lane, Sensor 2, Mean Speed, Cars



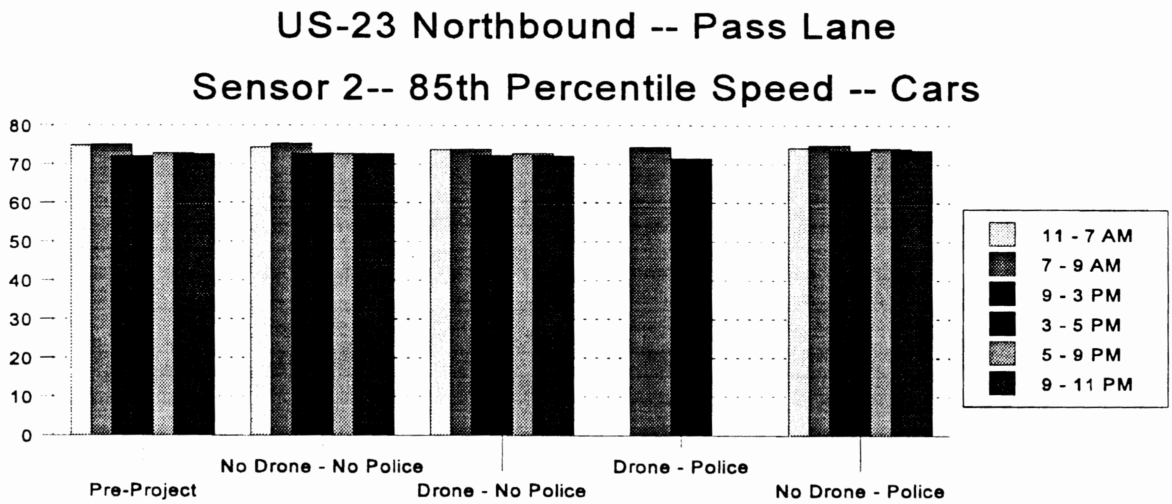
11 - 7 AM	69.61	69.31	68.65		
7 - 9 AM	69.97	70.25	68.79	69.37	69.41
9 - 3 PM	67.36	67.86	67.45		
3 - 5 PM	67.11	67.94	67.19	66.66	67.22
5 - 9 PM	67.79	67.74	67.93		
9 - 11 PM	67.97	68.07	67.49		

Figure 52. US-23 Northbound, Pass Lane, Sensor 2, Mean Speed, Cars



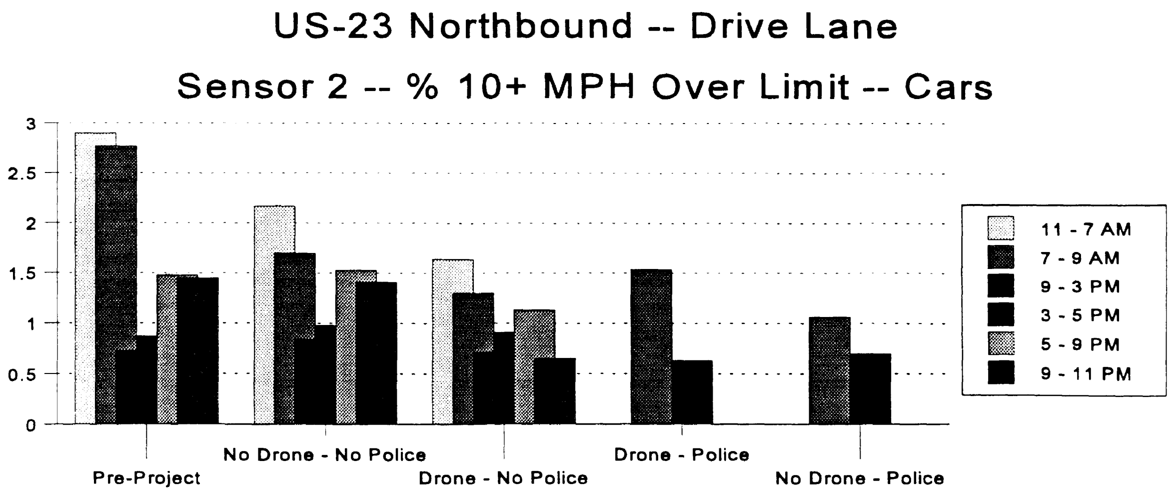
11 - 7 AM	70.5	70.26	69.87		
7 - 9 AM	70.69	70.44	69.82	69.75	69.89
9 - 3 PM	68.3	68.38	68.25		
3 - 5 PM	68.19	68.38	68.24	67.49	68.2
5 - 9 PM	69.43	69.06	68.92		
9 - 11 PM	69.42	69.15	68.6		

Figure 53. US-23 Northbound, Drive Lane, Sensor 2, 85th Percentile Speed, Cars



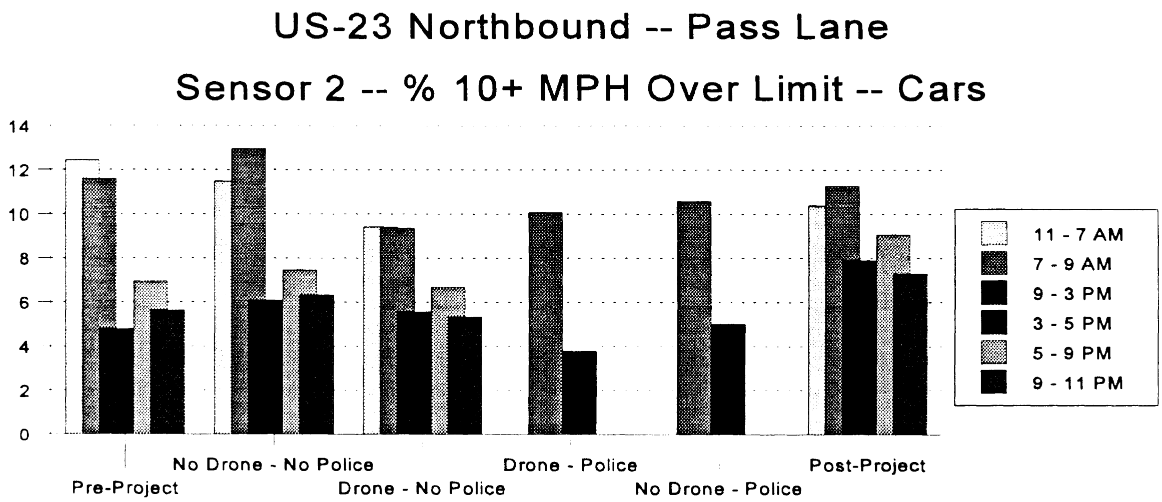
11 - 7 AM	74.94	74.45	73.83		74.2
7 - 9 AM	75.08	75.38	73.9	74.41	74.97
9 - 3 PM	71.99	72.57	72.23		73.42
3 - 5 PM	72.04	72.76	72.09	71.58	73.55
5 - 9 PM	72.88	72.8	72.76		74.07
9 - 11 PM	72.59	72.79	72.2		73.69

Figure 54. US-23 Northbound, Pass Lane, Sensor 2, 85th Percentile Speed, Cars



11 - 7 AM	2.9	2.17	1.64		
7 - 9 AM	2.77	1.7	1.3	1.54	1.06
9 - 3 PM	0.73	0.84	0.71		
3 - 5 PM	0.87	0.98	0.91	0.63	0.7
5 - 9 PM	1.48	1.53	1.13		
9 - 11 PM	1.45	1.41	0.65		

Figure 55. US-23 Northbound, Drive Lane, Sensor 2, % 10+ MPH Over Limit, Cars



11 - 7 AM	12.44	11.47	9.42			10.37
7 - 9 AM	11.59	12.95	9.37	10.06	10.58	11.26
9 - 3 PM	4.79	6.07	5.55			7.88
3 - 5 PM	4.39	6.08	5.41	3.79	4.99	7.42
5 - 9 PM	6.95	7.45	6.67			9.08
9 - 11 PM	5.62	6.33	5.32			7.29

Figure 56. US-23 Northbound, Pass Lane, Sensor 2, % 10+ MPH Over Limit, Cars

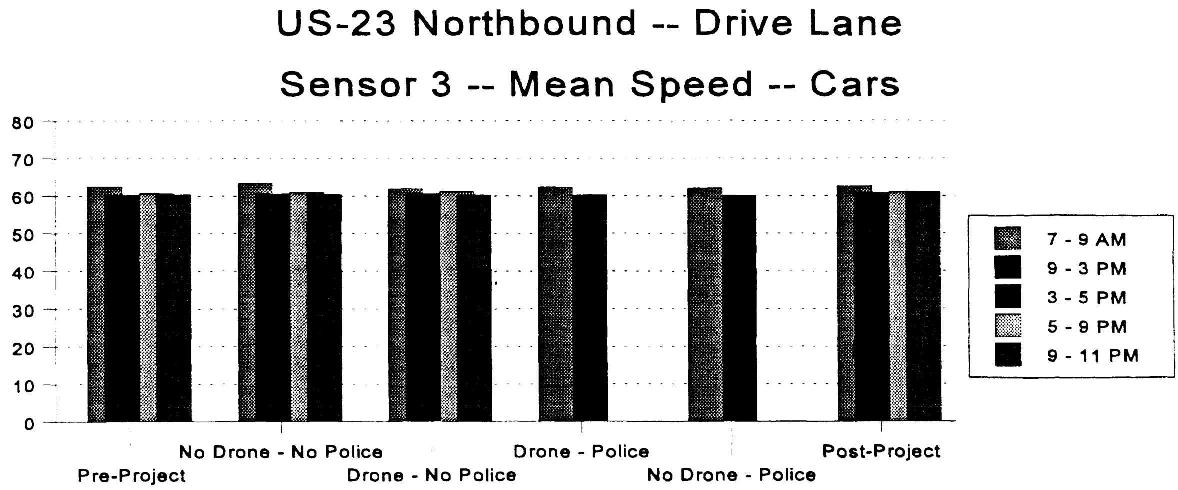
Figures 57 - 62 show the mean speed, 85th percentile speed, and the percentage of cars exceeding the speed limit by 10 mph at sensor 3 (i.e., about 3,400 ft past the drone zone, for cars in the drive lane and in the pass lane).

The mean speed of cars downstream of the drone zone ranged from 59.7 mph to 63.3 mph in the drive lane and 66.0 mph to 69.6 mph in the pass lane across the various conditions of the study. The speeds measured in conditions when the drone radar was on and/or police patrols were present upstream do not appear very different from the mean speeds of the other conditions.

The 85th percentile speeds of cars at sensor 3 ranged from 65.1 mph to 68.4 mph in the drive lane and 70.1 mph to 74 mph in the pass lane. Again, there was no obvious difference in this speed measure among the various conditions of the study.

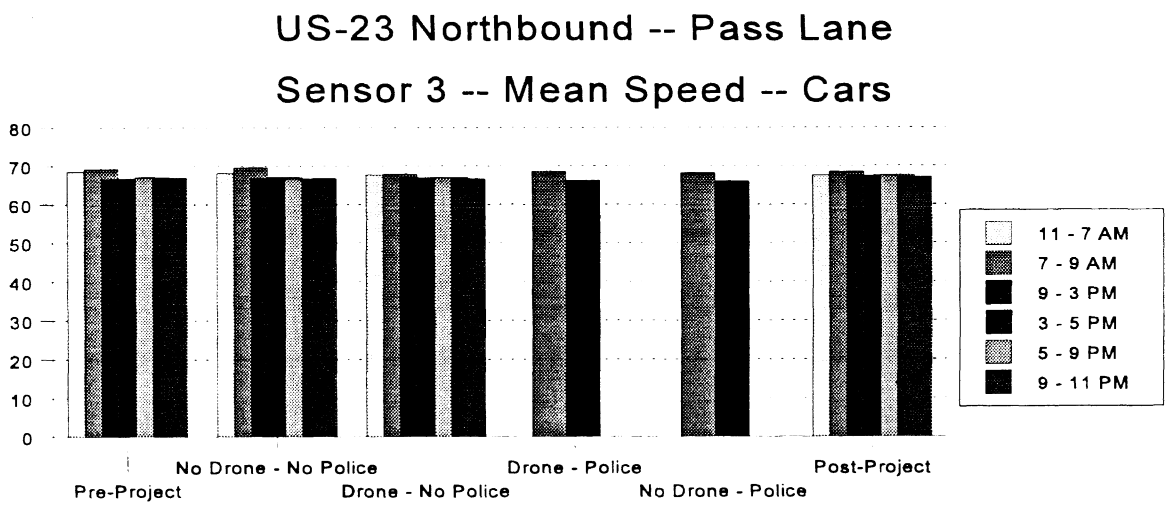
The portion of cars at sensor 3 exceeding 75 mph ranged from 0.3 percent and 1.3 percent in the drive lane and 2 percent to 8.1 percent in the pass lane. Some of the lowest values of this measure were observed for conditions when drone radar and/or police were present. However, this effect was not consistent and at other times the portion of cars exceeding the speed limit by 10 mph was not distinguishable from conditions without drone radar or police.

There was a general decrease in speeds of cars on the segment of northbound US-23 observed in this study. The decrease was consistent for all the conditions of the experiment and cannot be attributed to the drone radar or police presence. There was also a noticeable, but inconsistent, decrease in the portion of cars exceeding the speed limit by 10 mph or more, which was more pronounced in conditions with the drone radar and/or police present.



7 - 9 AM	62.5	63.35	62	62.38	62.05	62.49
9 - 3 PM	60.26	60.54	60.61			60.79
3 - 5 PM	59.7	60.59	60	60.29	60.11	60.81
5 - 9 PM	60.79	60.95	61.15			61.01
9 - 11 PM	60.49	60.48	60.28			61.1

Figure 57. US-23 Northbound, Drive Lane, Sensor 3, Mean Speed, Cars

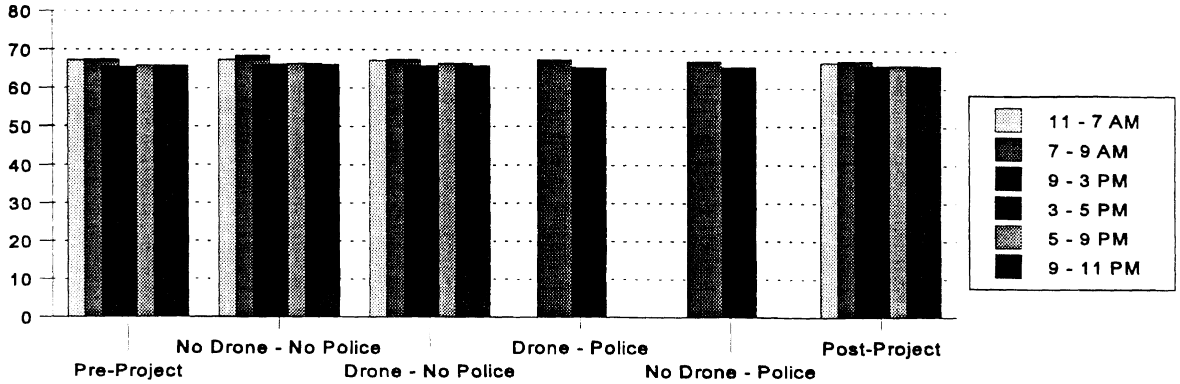


11 - 7 AM	68.45	68.07	67.75			67.55
7 - 9 AM	69.27	69.58	67.91	68.6	68.1	68.48
9 - 3 PM	66.49	66.75	66.89			67.36
3 - 5 PM	66.76	67.13	66.26	66.29	66.03	67.47
5 - 9 PM	67.08	66.74	67.03			67.61
9 - 11 PM	66.92	66.79	66.66			67.12

Figure 58. US-23 Northbound, Pass Lane, Sensor 3, Mean Speed, Cars

US-23 Northbound -- Drive Lane

Sensor 3 -- 85th Percentile Speed -- Cars

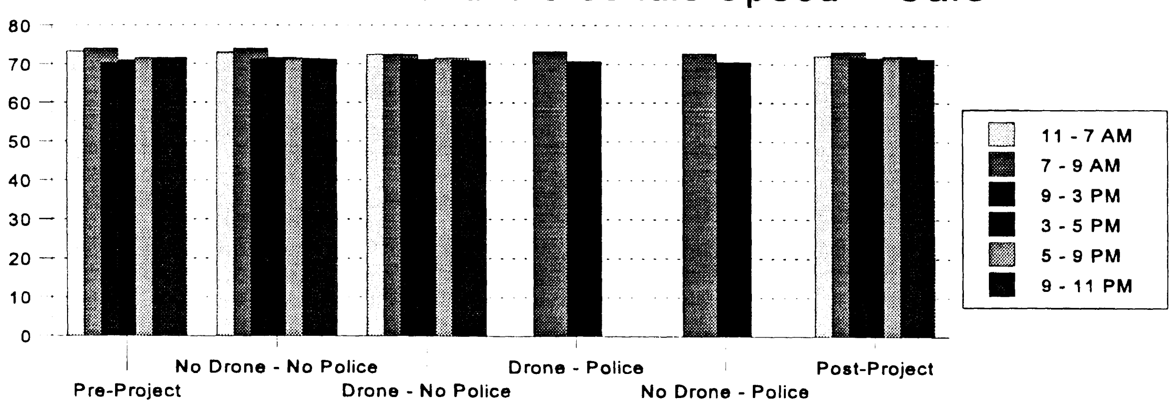


11 - 7 AM	67.26	67.41	67.2			66.94
7 - 9 AM	67.45	68.45	67.39	67.48	67.12	67.25
9 - 3 PM	65.44	65.94	65.88			65.84
3 - 5 PM	65.12	66.22	65.56	65.49	65.67	65.99
5 - 9 PM	65.86	66.36	66.49			66.1
9 - 11 PM	65.78	66.06	65.89			66.1

Figure 59. US-23 Northbound, Drive Lane, Sensor 3, 85th Percentile Speed, Cars

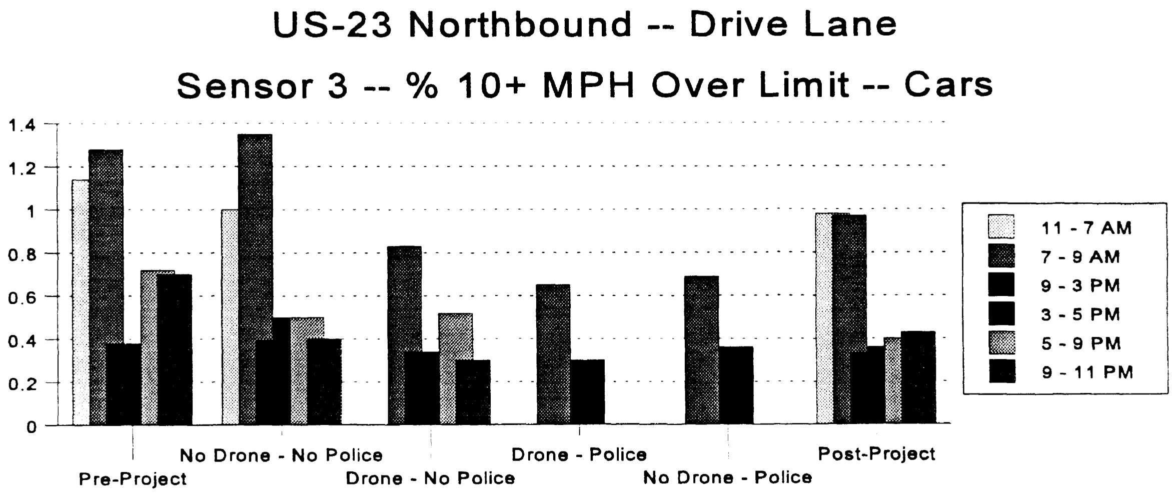
US-23 Northbound -- Pass Lane

Sensor 3 -- 85th Percentile Speed -- Cars



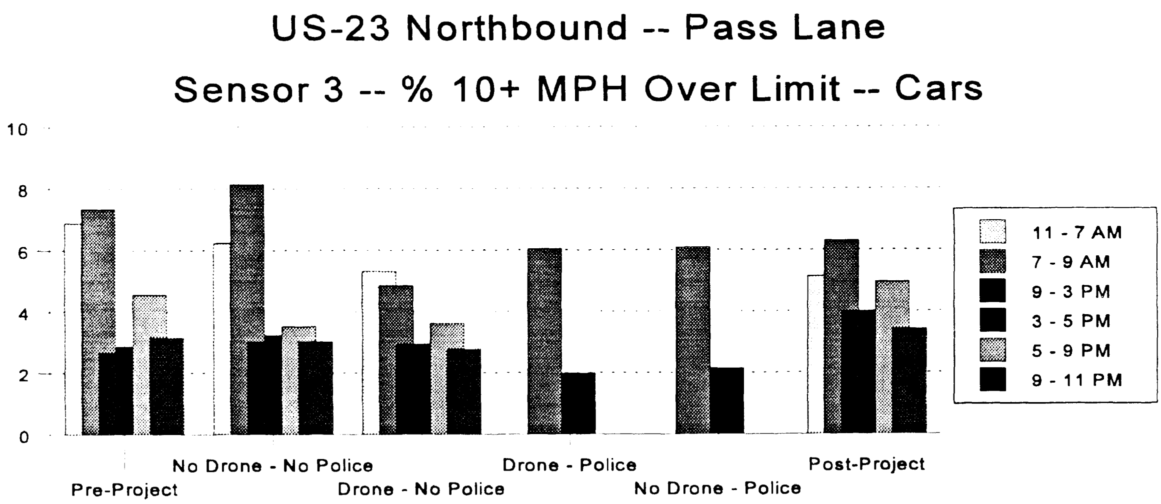
11 - 7 AM	73.3	72.9	72.47			72.18
7 - 9 AM	73.93	73.96	72.47	73.22	72.66	73.16
9 - 3 PM	70.16	71.23	71.22			71.61
3 - 5 PM	70.99	71.49	70.87	70.66	70.53	71.58
5 - 9 PM	71.53	71.35	71.57			71.97
9 - 11 PM	71.57	71.16	70.98			71.3

Figure 60. US-23 Northbound, Pass Lane, Sensor 3, 85th Percentile Speed, Cars



11 - 7 AM	1.14	1				0.98
7 - 9 AM	1.28	1.35	0.83	0.65	0.69	0.97
9 - 3 PM	0.38	0.39	0.34			0.33
3 - 5 PM	0.37	0.5	0.31	0.3	0.36	0.36
5 - 9 PM	0.72	0.5	0.52			0.4
9 - 11 PM	0.7	0.4	0.3			0.43

Figure 61. US-23 Northbound, Drive Lane, Sensor 3, % 10+ MPH Over Limit, Cars



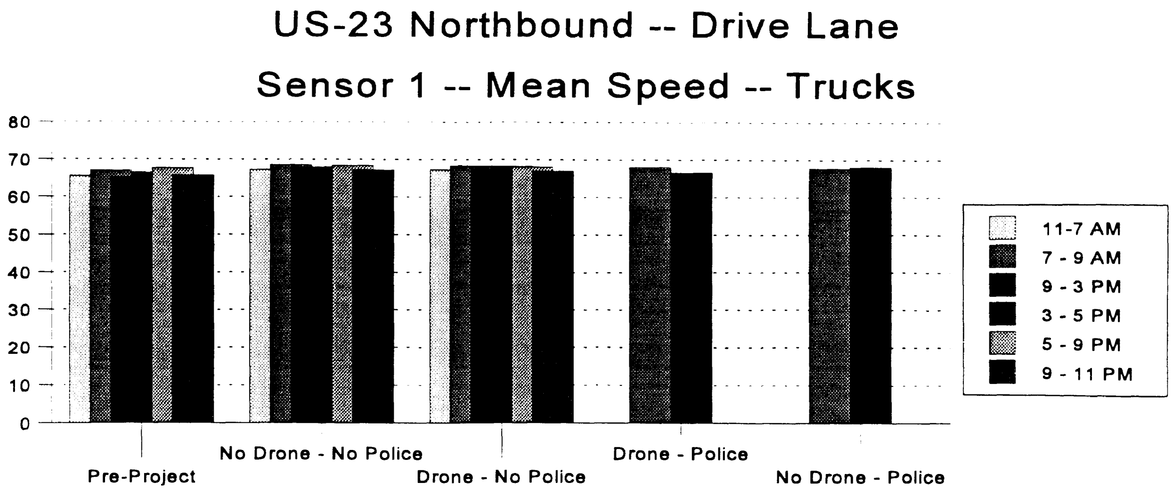
11 - 7 AM	6.88	6.23	5.32			5.14
7 - 9 AM	7.35	8.13	4.85	6.04	6.08	6.29
9 - 3 PM	2.66	3.02	2.95			3.99
3 - 5 PM	2.87	3.24	2.78	1.98	2.15	4
5 - 9 PM	4.56	3.53	3.62			4.95
9 - 11 PM	3.16	3.03	2.78			3.42

Figure 62. US-23 Northbound, Pass Lane, Sensor 3, % 10+ MPH Over Limit, Cars

Trucks

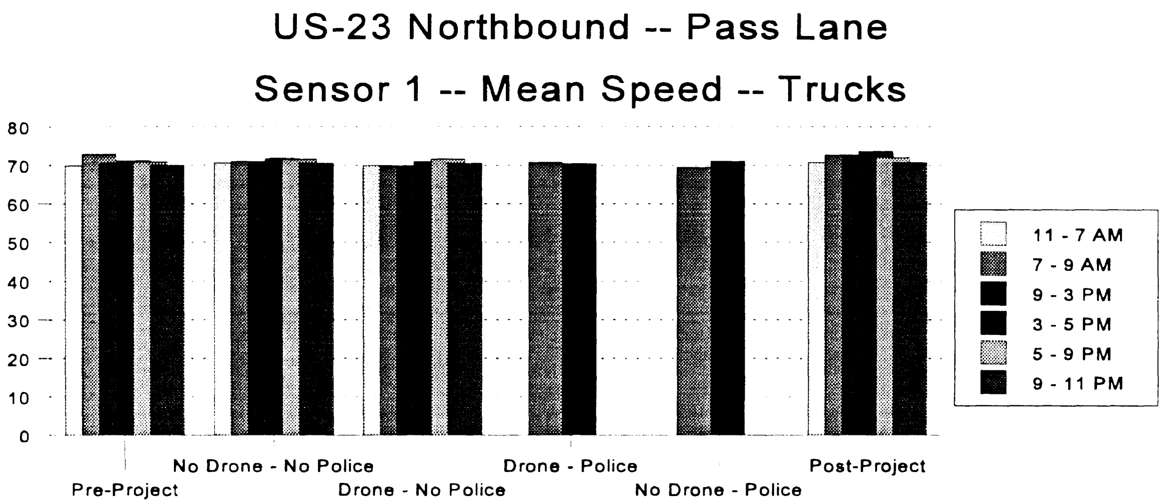
The next set of figures is concerned with trucks on the northbound US-23 site. Figures 63 - 68 show the mean speed, 85th percentile speed, and the percentage of trucks exceeding the speed limit by 10 mph at sensor 1 (i.e., upstream of the drone zone, in the drive lane and in the pass lane).

The mean speed of trucks at sensor 1 ranged from 65.2 mph to 68.5 mph in the drive lane and from 69.4 mph to 73.6 mph in the pass lane. The 85th percentile speed ranges from 71 mph to 74.9 mph in the drive lane and from 70.8 mph to 78.8 mph in the pass lane. The percentage of trucks traveling at speeds exceeding 65 mph ranged from 54.9 percent to 71.7 percent in the drive lane and 71.3 percent and 96.5 percent in the pass lane. No effects of the drone radar or police presence were obvious at sensor 1. As before, this was expected because the drivers should not have known of the radar signal or police patrol downstream.



11-7 AM	65.52	67.3	67.25		
7 - 9 AM	67.02	68.49	68.31	67.98	67.7
9 - 3 PM	65.21	67.98	67.51		
3 - 5 PM	66.5	67.78	68.18	66.53	68.09
5 - 9 PM	67.7	68.33	68.07		
9 - 11 PM	65.72	67.19	66.95		

Figure 63. US-23 Northbound, Drive Lane, Sensor 1, Mean Speed, Trucks

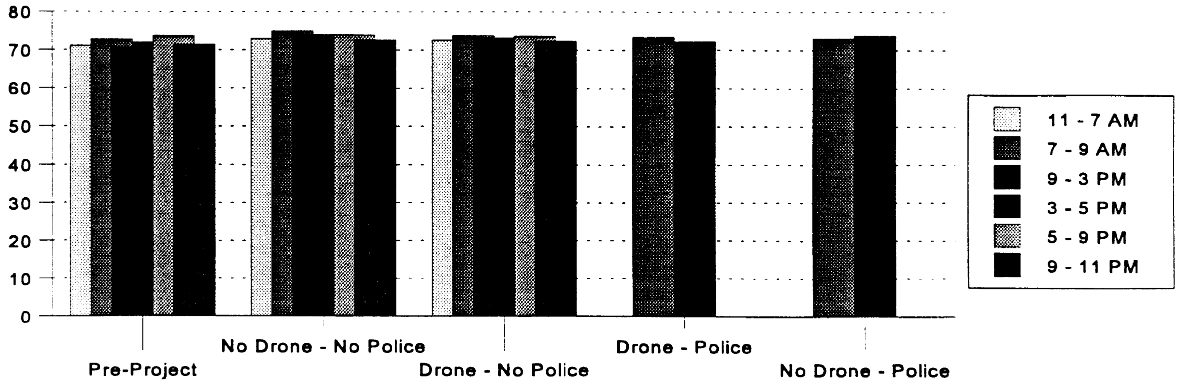


11 - 7 AM	69.85	70.63	70.03			70.8
7 - 9 AM	72.91	71.05	69.82	70.74	69.43	72.75
9 - 3 PM	70.52	70.98	69.87			72.41
3 - 5 PM	71.15	71.84	71.05	70.39	71.11	73.62
5 - 9 PM	70.92	71.61	71.68			72.07
9 - 11 PM	69.93	70.53	70.5			70.75

Figure 64. US-23 Northbound, Pass Lane, Sensor 1, Mean Speed, Trucks

US-23 Northbound -- Drive Lane

Sensor 1 -- 85th Percentile Speed -- Trucks

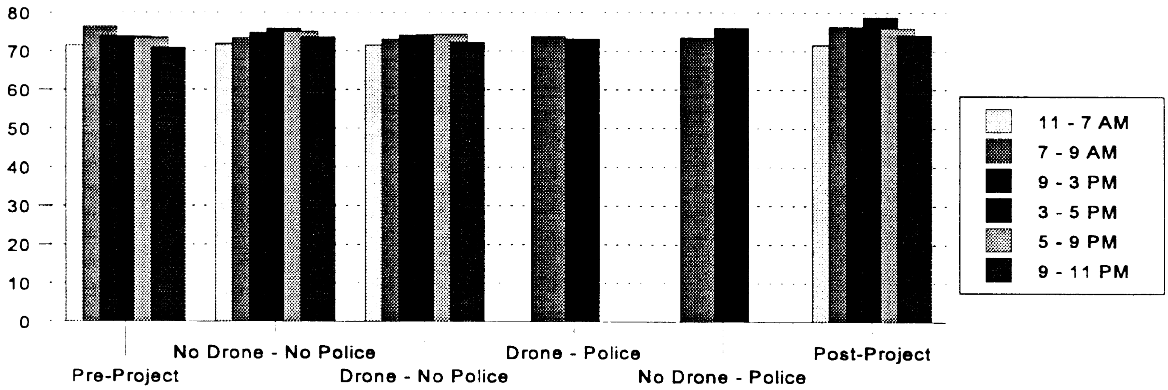


11 - 7 AM	71.06	72.91	72.59		
7 - 9 AM	72.77	74.94	73.74	73.37	72.99
9 - 3 PM	70.43	73.86	73.21		
3 - 5 PM	71.89	73.92	72.24	72.14	73.75
5 - 9 PM	73.63	73.82	73.53		
9 - 11 PM	71.42	72.6	72.32		

Figure 65. US-23 Northbound, Drive Lane, Sensor 1, 85th Percentile Speed, Trucks

US-23 Northbound -- Pass Lane

Sensor 1 -- 85th Percentile Speed -- Trucks

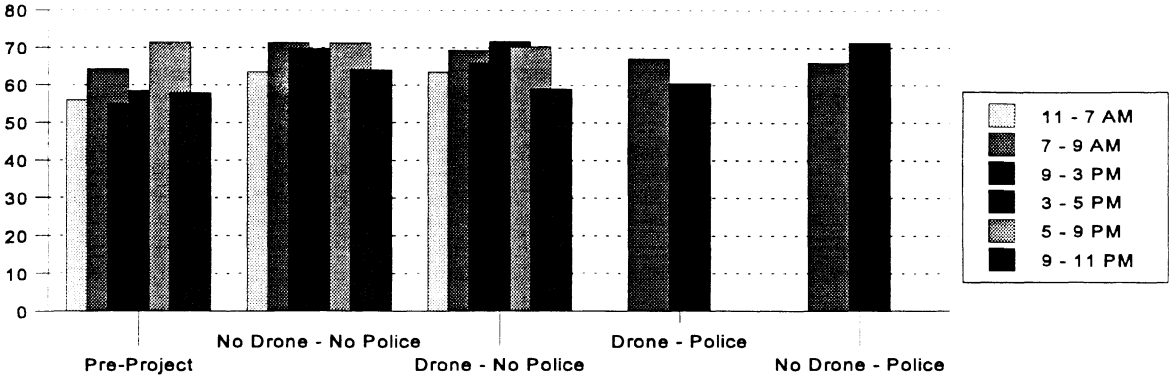


11 - 7 AM	71.57	71.87	71.57			71.63
7 - 9 AM	76.45	73.4	73.15	73.82	73.45	76.39
9 - 3 PM	73.9	74.76	74.12			76.23
3 - 5 PM	73.81	75.9	74.33	73.17	76.05	78.83
5 - 9 PM	73.54	75.08	74.43			76
9 - 11 PM	70.85	73.68	72.22			74.19

Figure 66. US-23 Northbound, Pass Lane, Sensor 1, 85th Percentile Speed, Trucks

US-23 Northbound -- Drive Lane

Sensor 1 -- % 10+ MPH Over Limit -- Trucks

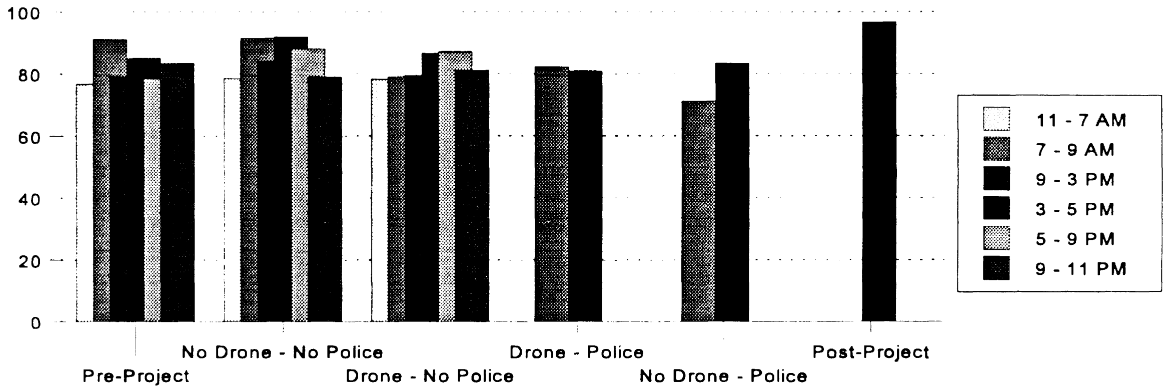


11 - 7 AM	55.97	63.46	63.46		
7 - 9 AM	64.3	71.36	69.26	67.04	66.13
9 - 3 PM	54.89	69.73	65.78		
3 - 5 PM	58.47	68.26	71.75	60.41	71.41
5 - 9 PM	71.43	71.27	70.31		
9 - 11 PM	57.94	64.1	58.97		

Figure 67. US-23 Northbound, Drive Lane, Sensor 1, % 10+ MPH Over Limit, Trucks

US-23 Northbound -- Pass Lane

Sensor 1 -- % 10+ MPH Over Limit -- Trucks



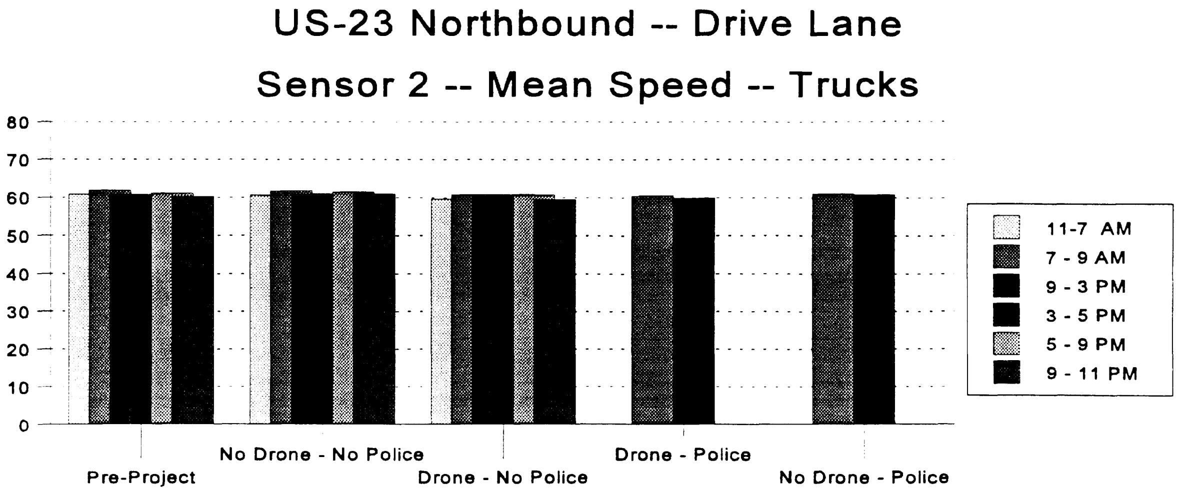
11 - 7 AM	76.77	78.48	78.3			
7 - 9 AM	91.04	91.38	79.09	82.26	71.28	
9 - 3 PM	79.09	83.99	79.36			
3 - 5 PM	84.95	91.82	86.75	80.9	83.33	96.55
5 - 9 PM	78.32	88.05	87.2			
9 - 11 PM	83.34	78.95	81.11			

Figure 68. US-23 Northbound, Pass Lane, Sensor 1, % 10+ MPH Over Limit, Trucks

Figures 69 - 74 show the mean speed, 85th percentile speed, and the percentage oftrucks exceeding the speed limit by 10 mph at sensor 2 (i.e., the drone zone).

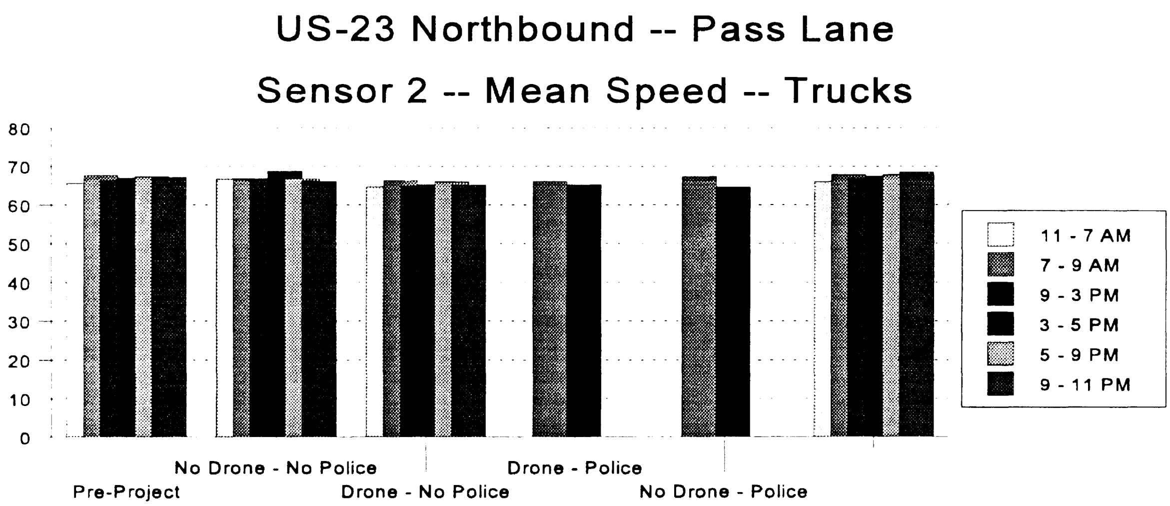
The mean speed of trucks at this location ranged from 59.4 mph to 61.8 mph in the drive lane and 64.7 mph to 68.5 mph in the pass zone. The 85th percentile speed ranged from 64.2 mph to 66.7 mph in the drive lane and 66.1 mph to 72.3 mph in the pass lane. The portion of trucks exceeding 65 mph ranged from 10.9 percent to 24.7 percent in the drive lane and from 37.7 percent to 76.8 percent in the pass lane.

There was a decrease in the mean and 85th percentile speeds and in the percentage oftrucks exceeding 65 mph in both lanes between sensor 1 and sensor 2. This decrease was noticeable for all conditions, regardless of the presence of the drone radar and/or police presence. However, the portion of trucks traveling 10 mph over the speed limit in the drive lane was lower when the drone radar was on and police were present. In the pass lane the lower values of this measure were observed for some cases when the drone radar was on or police were present. However, this effect was not consistent in that it was observed in only one of the two time periods when police were present.



11-7 AM	60.81	60.62	59.61		
7 - 9 AM	61.84	61.78	60.79	60.49	61.09
9 - 3 PM	60.74	60.81	60.2		
3 - 5 PM	60.26	60.96	60.79	59.89	60.78
5 - 9 PM	61.14	61.44	60.69		
9 - 11 PM	60.27	60.97	59.39		

Figure 69. US-23 Northbound, Drive Lane, Sensor 2, Mean Speed, Trucks

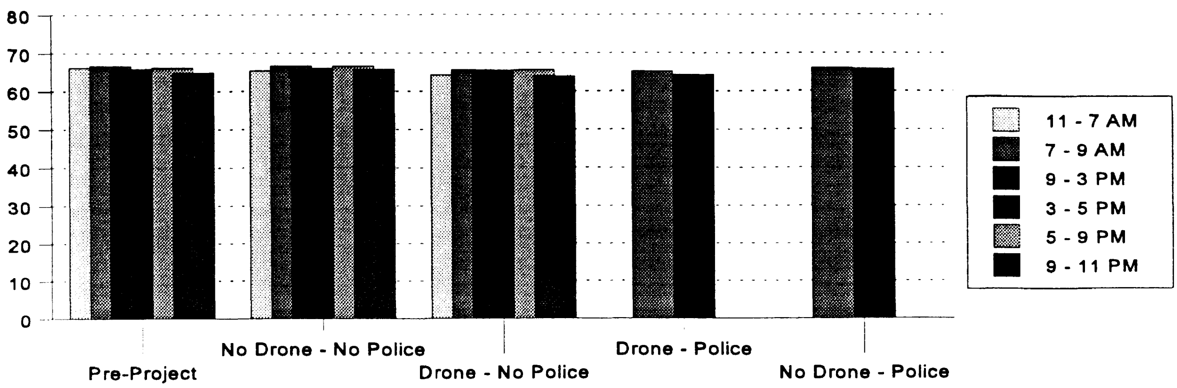


11 - 7 AM	65.65	66.72	64.7			66.11
7 - 9 AM	67.74	66.73	66.24	66	67.39	67.76
9 - 3 PM	66.24	66.61	64.74			66.79
3 - 5 PM	66.95	68.71	65.13	65.17	64.7	67.44
5 - 9 PM	67.37	66.7	66			67.8
9 - 11 PM	67.11	66.09	65.09			68.48

Figure 70. US-23 Northbound, Pass Lane, Sensor 2, Mean Speed, Trucks

US-23 Northbound -- Drive Lane

Sensor 2 -- 85th Percentile Speed -- Trucks

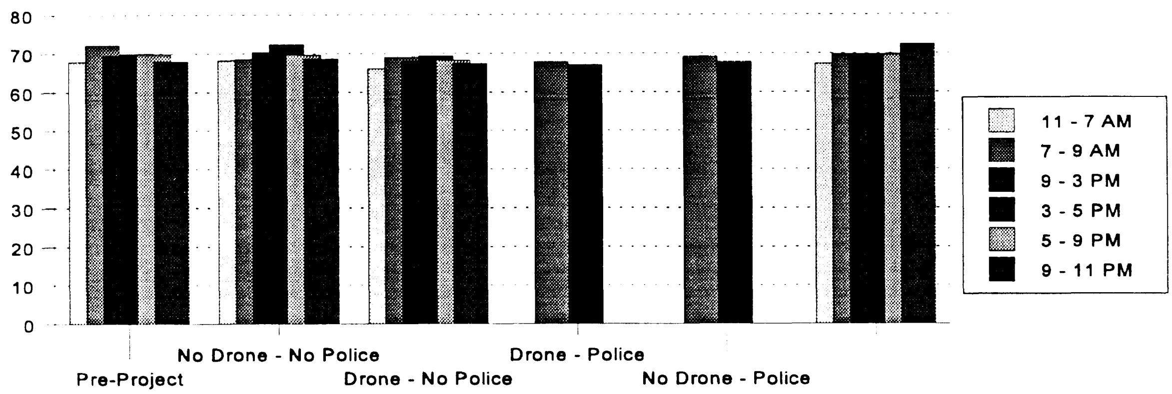


11 - 7 AM	66.16	65.36	64.2		
7 - 9 AM	66.69	66.71	65.56	65.14	66
9 - 3 PM	65.88	65.74	65.08		
3 - 5 PM	65.54	66.01	65.44	64.29	65.77
5 - 9 PM	66.21	66.58	65.57		
9 - 11 PM	64.9	65.72	63.94		

Figure 71. US-23 Northbound, Drive Lane, Sensor 2, 85th Percentile Speed, Trucks

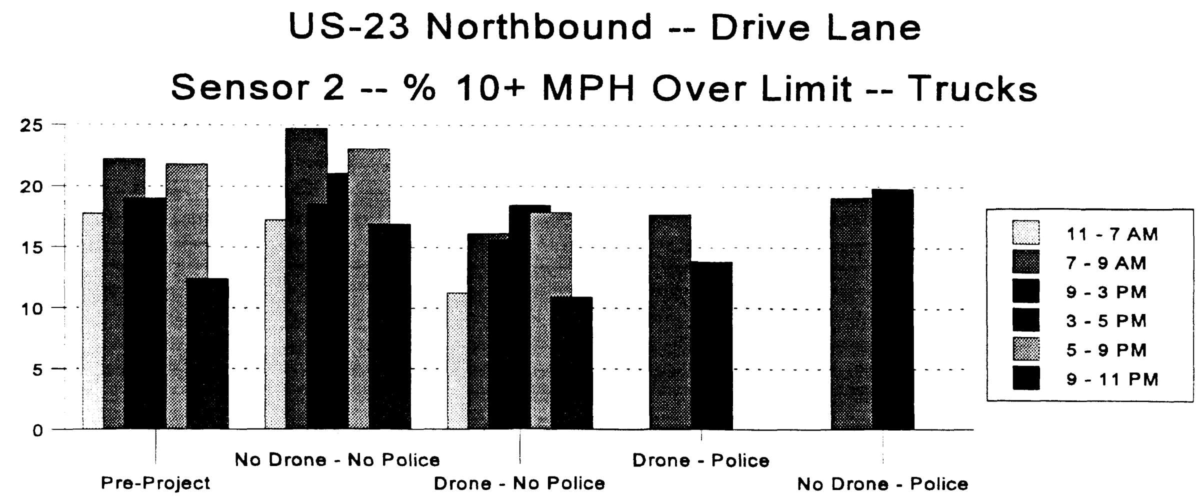
US-23 Northbound -- Pass Lane

Sensor 2-- 85th Percentile Speed -- Trucks



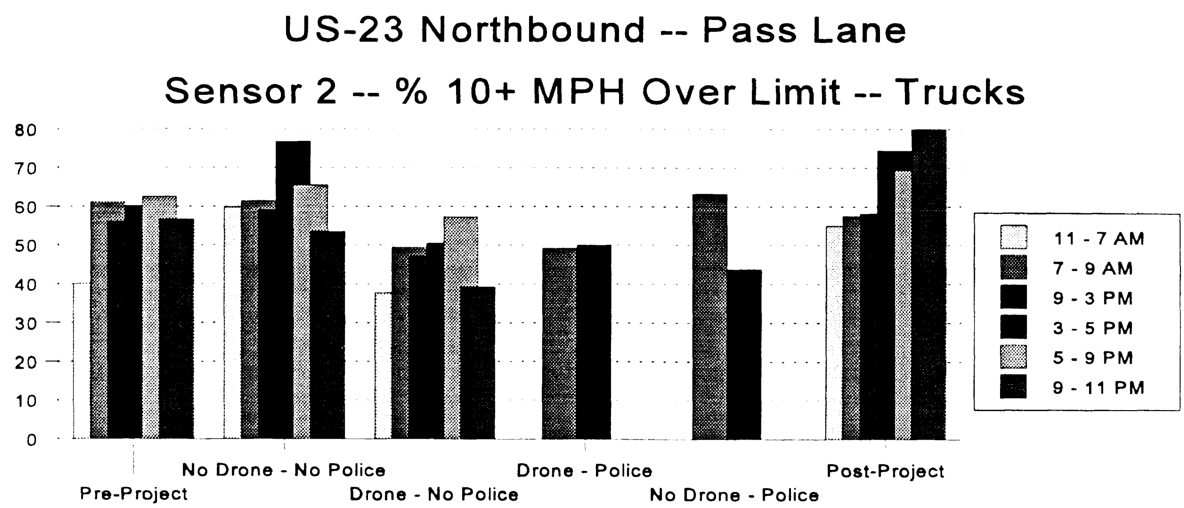
11 - 7 AM	67.93	68.2	66.06			67.28
7 - 9 AM	72.11	68.47	68.99	67.71	69.16	69.7
9 - 3 PM	69.48	70.28	68.01			69.34
3 - 5 PM	69.94	72.33	69.29	66.98	67.75	69.67
5 - 9 PM	69.82	69.64	68.21			69.47
9 - 11 PM	67.94	68.61	67.39			72.28

Figure 72. US-23 Northbound, Pass Lane, Sensor 2, 85th Percentile Speed, Trucks



11 - 7 AM	17.76	17.25	11.28		
7 - 9 AM	22.25	24.71	16.17	17.75	19.11
9 - 3 PM	18.98	18.5	15.66		
3 - 5 PM	17.45	21.07	18.45	13.85	19.81
5 - 9 PM	21.81	23.05	17.89		
9 - 11 PM	12.4	16.9	10.91		

Figure 73. US-23 Northbound, Drive Lane, Sensor 2, % 10+ MPH Over Limit, Trucks



11 - 7 AM	40.12	59.84	37.75			55
7 - 9 AM	61.17	61.43	49.41	49.09	63.26	57.58
9 - 3 PM	56.02	59.09	47.17			58.23
3 - 5 PM	60.19	76.79	50.54	50	43.75	74.42
5 - 9 PM	62.58	65.51	57.33			69.39
9 - 11 PM	56.6	53.54	39.25			80

Figure 74. US-23 Northbound, Pass Lane, Sensor 2, % 10+ MPH Over Limit, Trucks

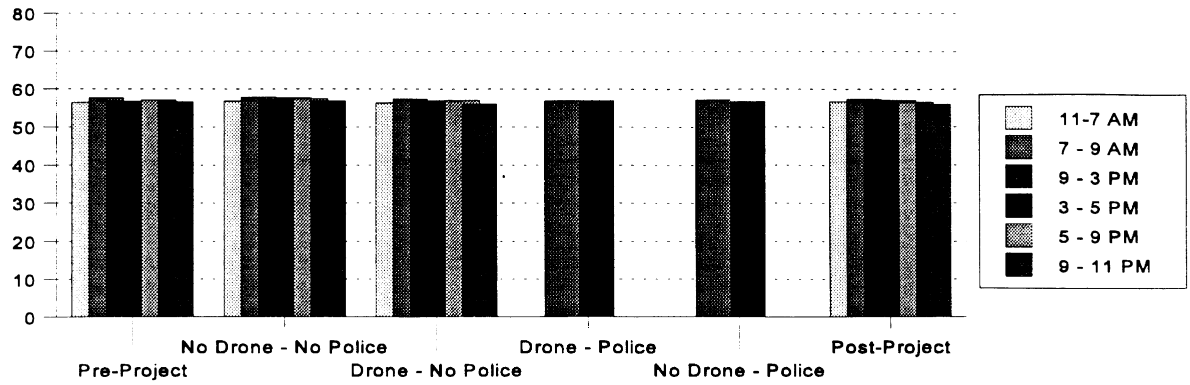
Figures 75 - 80 show the mean speed, 85th percentile speed, and the percentage oftrucks exceeding the speed limit by 10 mph at sensor 3 (approximately 3,400 ft. past the drone zone).

The mean speed of trucks ranged from 56.3 mph to 57.8 mph in the drive lane and from 60.3 mph to 63.3 mph in the pass lane. The 85th percentile speed ranged from 59.7mph to 62.1 mph in the drive lane and 61.3 mph and 67.1 mph in the pass lane. The percentage oftrucks exceeding 65 mph ranged from 1.3 percent to 24.7 percent in the drive lane and from 12.5 percent to 80 percent in the pass lane. No effect of the drone and police presence was obvious from these tables.

Overall, there was a decrease in vehicle speeds between sensor 1 and sensor 3 at this site for both cars and trucks. This decrease in speed was present for all conditions including those with no drone radar or police presence. Therefore, this speed pattern appears to be a characteristic of the traffic flow along that particular segment of road and the decreases in speed cannot be attributed to the drone radar or police presence. There is some evidence of an effect of drone radar and police presence on the reduction of the portion of cars and trucks exceeding the speed limit by at least 10 mph. However, this decrease was not observed consistently.

US-23 Northbound -- Drive Lane

Sensor 3 -- Mean Speed -- Trucks

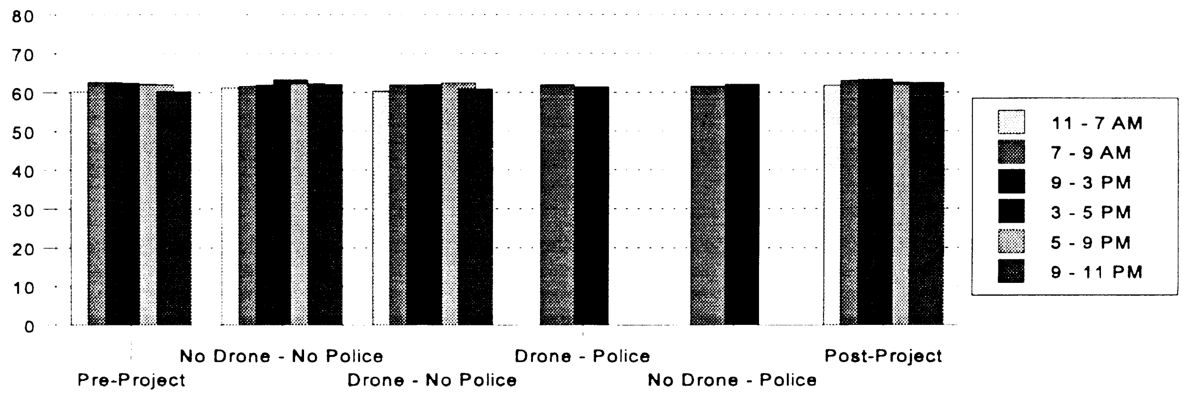


11-7 AM	56.39	56.82	56.32			56.66
7 - 9 AM	57.6	57.85	57.36	56.87	57.21	57.4
9 - 3 PM	56.59	57.04	56.82			56.77
3 - 5 PM	56.69	57.61	56.94	56.93	56.66	57.12
5 - 9 PM	57.08	57.42	56.95			56.56
9 - 11 PM	56.55	56.8	56			56.04

Figure 75. US-23 Northbound, Drive Lane, Sensor 3, Mean Speed, Trucks

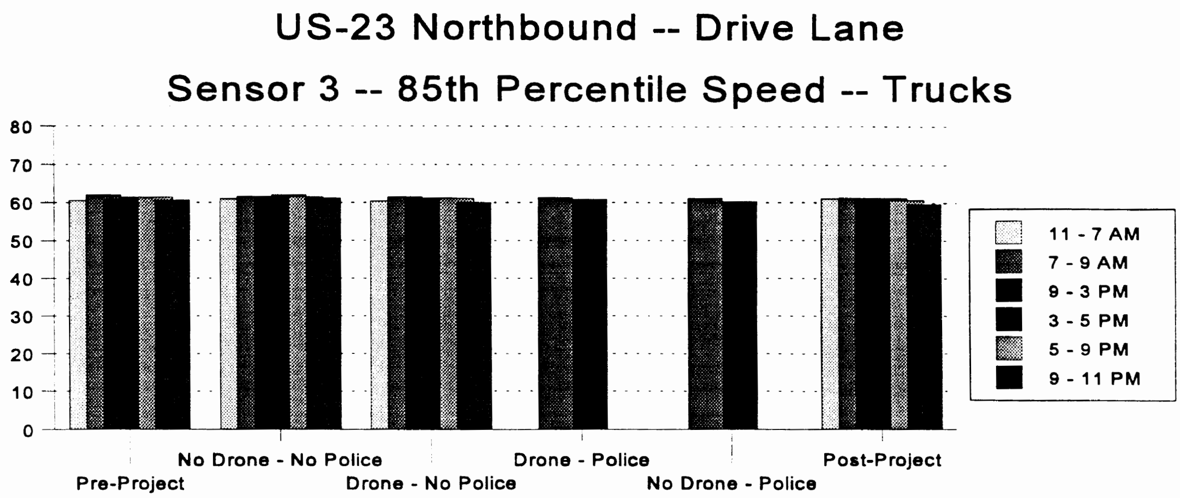
US-23 Northbound -- Pass Lane

Sensor 3 -- Mean Speed -- Trucks



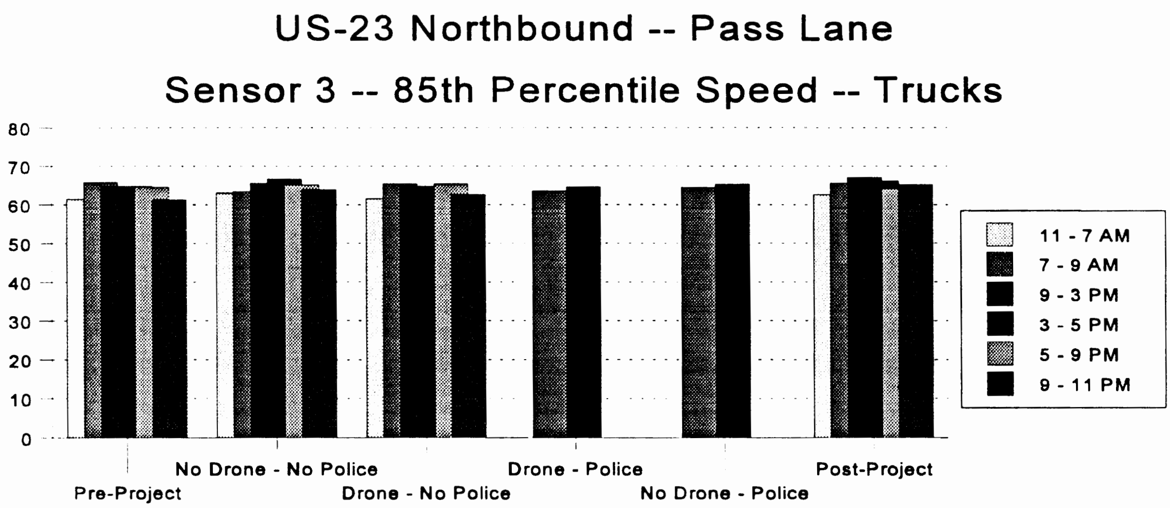
11 - 7 AM	60.33	61.28	60.4			61.85
7 - 9 AM	62.79	61.66	62.06	62	61.6	63.06
9 - 3 PM	62.5	62.05	61.88			63.33
3 - 5 PM	62.27	63.33	62.18	61.44	62.1	62.58
5 - 9 PM	62.08	62.33	62.46			62.05
9 - 11 PM	60.3	62.12	60.91			62.53

Figure 76. US-23 Northbound, Pass Lane, Sensor 3, Mean Speed, Trucks



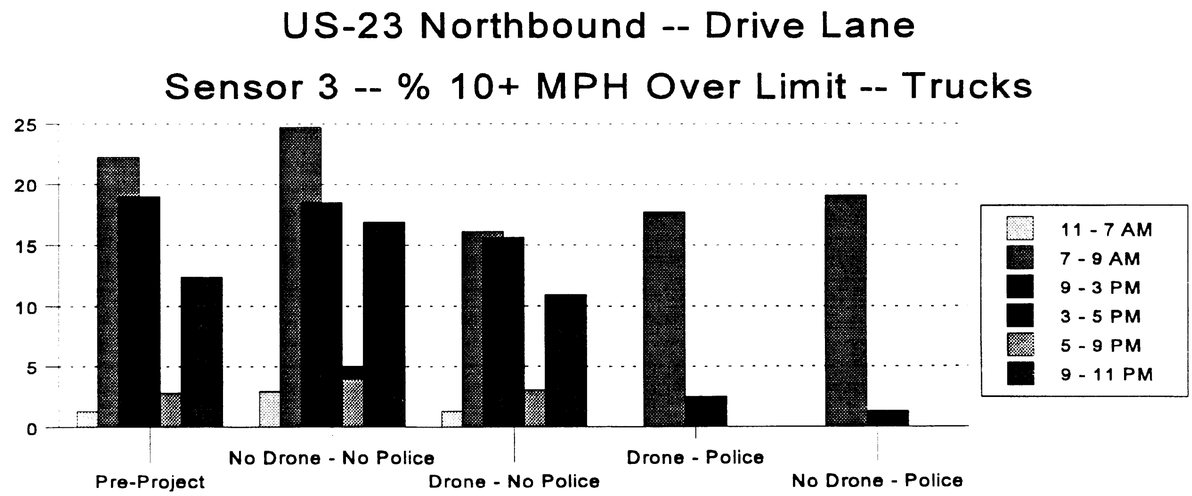
11 - 7 AM	60.45	60.97	60.39			61.08
7 - 9 AM	61.95	61.62	61.41	61.25	61.17	61.27
9 - 3 PM	60.66	61.28	61			60.84
3 - 5 PM	61.44	62.07	61.19	60.85	60.33	61.28
5 - 9 PM	61.44	61.57	61.12			60.69
9 - 11 PM	60.55	61.14	60			59.72

Figure 77. US-23 Northbound, Drive Lane, Sensor 3, 85th Percentile Speed, Trucks



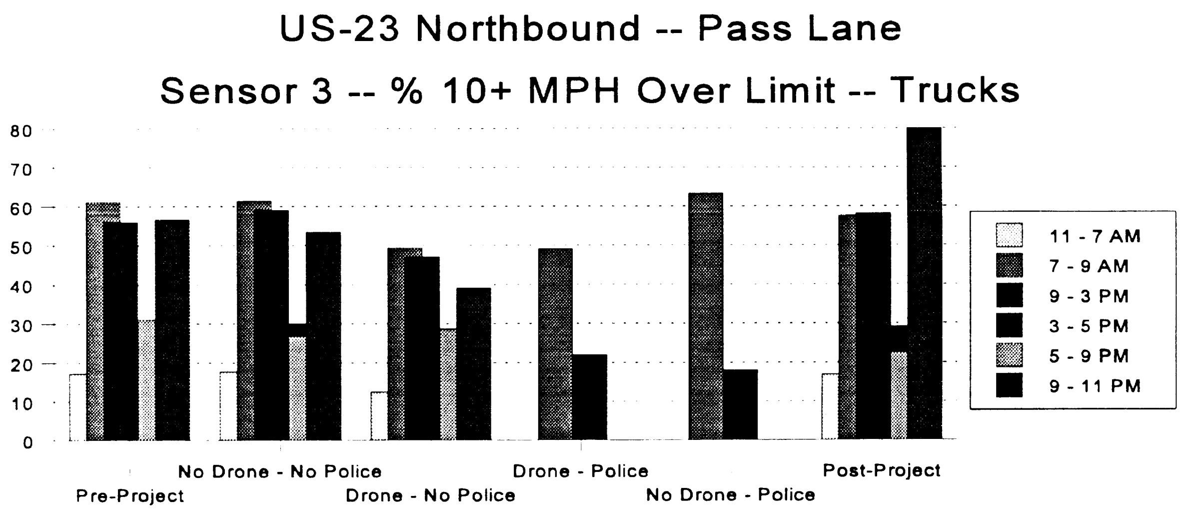
11 - 7 AM	61.47	63.03	61.6			62.65
7 - 9 AM	65.92	63.48	65.48	63.57	64.51	65.62
9 - 3 PM	64.75	65.64	64.68			67.11
3 - 5 PM	64.89	66.62	64.83	64.66	65.36	66.26
5 - 9 PM	64.61	65.14	65.5			64.18
9 - 11 PM	61.33	64.01	62.65			65.13

Figure 78. US-23 Northbound, Pass Lane, Sensor 3, 85th Percentile Speed, Trucks



11 - 7 AM	1.29	2.91	1.32		
7 - 9 AM	22.25	24.71	16.17	17.75	19.11
9 - 3 PM	18.98	18.5	15.66		
3 - 5 PM	2.81	5.04	3.01	2.48	1.32
5 - 9 PM	2.76	3.93	3.03		
9 - 11 PM	12.4	16.9	10.91		

Figure 79. US-23 Northbound, Drive Lane, Sensor 3, % 10+ MPH Over Limit, Trucks



11 - 7 AM	17.21	17.78	12.55			16.9
7 - 9 AM	61.17	61.43	49.41	49.09	63.26	57.58
9 - 3 PM	56.02	59.09	47.17			58.23
3 - 5 PM	18.67	30.08	25.86	21.95	17.97	29.16
5 - 9 PM	31.11	26.73	28.73			22.5
9 - 11 PM	56.6	53.54	39.25			80

Figure 80. US-23 Northbound, Pass Lane, Sensor 3, % 10+ MPH Over Limit, Trucks

Site 3, I-96 Eastbound

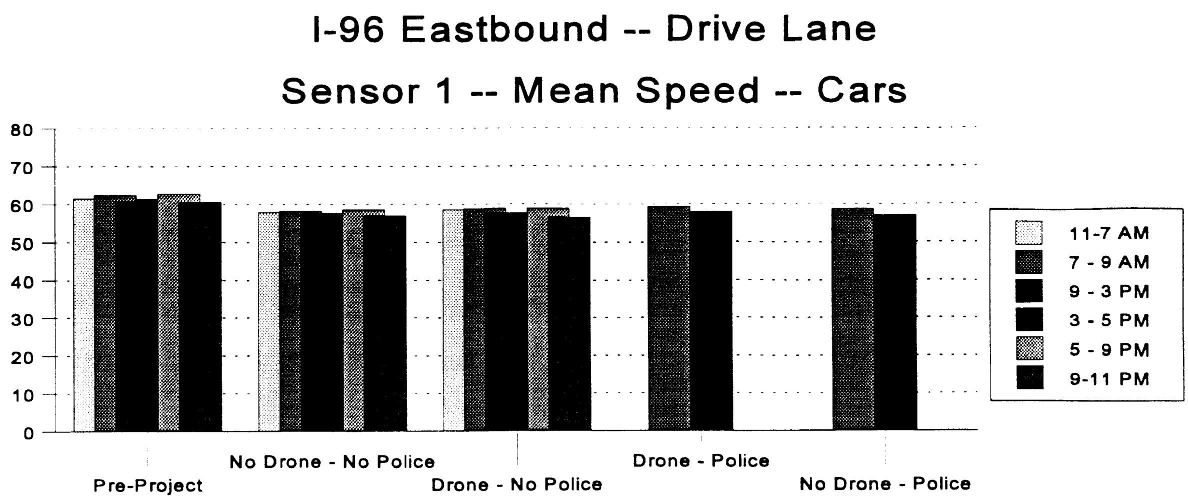
The following section is concerned with the third study site on eastbound I-96. This site was located in a long construction zone and the speed limit for both cars and trucks was 55 mph. The 24-hour volume at this site as measured on August 8th was 22,321 vehicles, of which 976 or 4.4 percent were trucks. The distribution of traffic by lane was 44 percent in the drive lane and 56 percent in the pass lane. The portion of trucks in the drive lane was 9 percent and in the pass lane this portion was 0.7 percent. Observations confirmed that the trucks stayed mostly in the right lane when traveling through this segment of road and, consequently, the percentage of trucks in the pass lane is much smaller than in the other samples.

The speeds in the drive lane during the preproject period were higher than those observed during the project period at all three sensors. This is most likely a result of the various construction activities that were occurring at the site. Sensor damage was sustained in the post-project period at sensor 1 and sensor 3 in the drive lane. Therefore, reliable data were not available from these sensors for the post-project period.

Cars

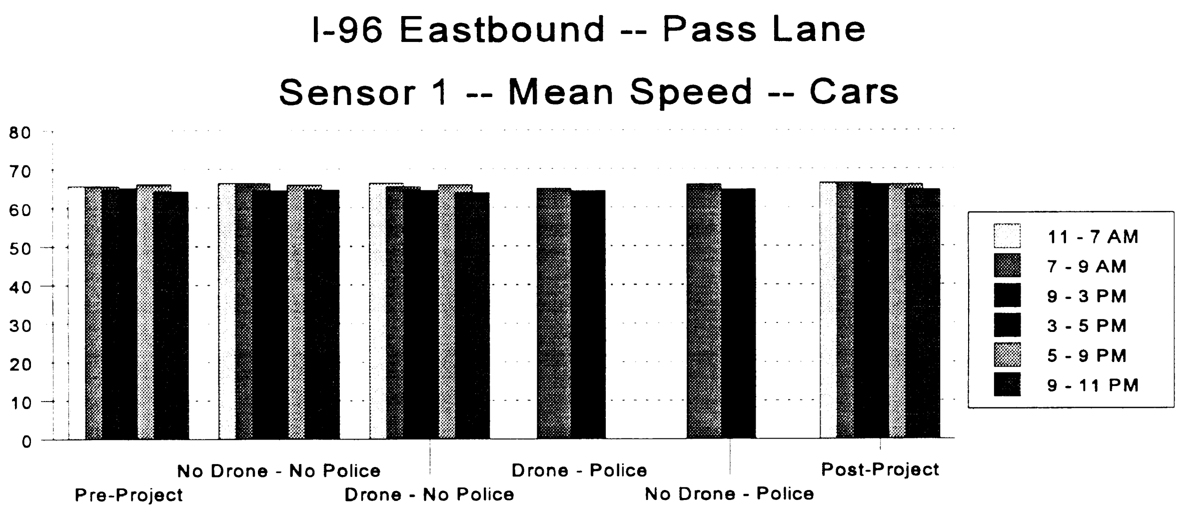
Figures 81 - 86 show the mean speed, 85th percentile speed, and the percentage ofcars exceeding the speed limit by 10 mph at sensor 1 (i.e., upstream of the drone radar zone).

The mean speed of cars in the drive lane ranged from 56.5 mph to 62.8 mph. Mean speeds observed in the pass lane ranged from 63.8 mph to 66.4 mph. The 85th percentile speeds ranged from 61 mph to 68.4 mph in the drive lane and from 68.9 mph to 71.3 mph in the pass lane. The percentage of cars exceeding the speed limit by more than 10 mph, that is, traveling in excess of 65 mph, ranged from 5 percent to 31.1 percent in the drive lane and from 37.5 percent to 61.3 percent in the pass lane. No reduction of speed effect of the drone or police patrols was evident at sensor 1.



11-7 AM	61.45	57.83	58.57		
7 - 9 AM	62.35	58.19	58.83	59.3	58.75
9 - 3 PM	60.77	57.41	57.55		
3 - 5 PM	61.42	57.56	56.56	57.93	57
5 - 9 PM	62.76	58.53	58.82		
9-11 PM	60.51	56.91	56.46		

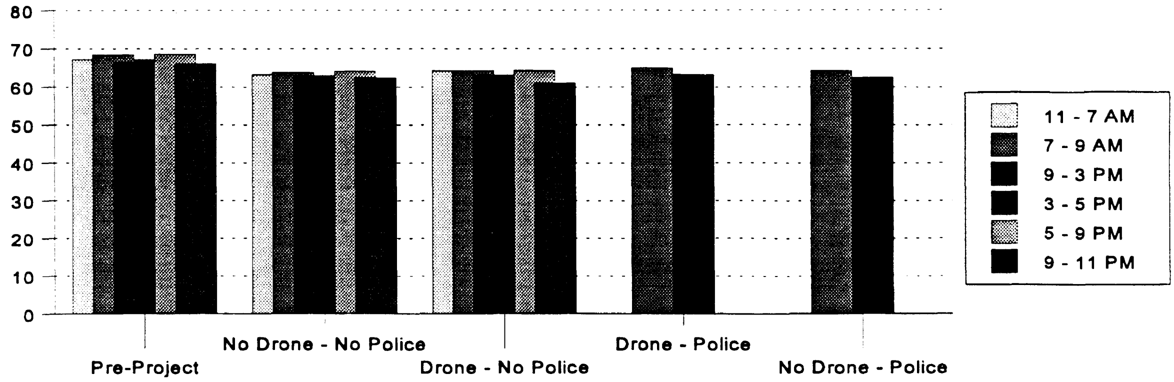
Figure 81. I-96 Eastbound, Drive Lane, Sensor 1, Mean Speed, Cars



11 - 7 AM	65.63	66.37	66.31			66.34
7 - 9 AM	65.55	66.4	65.42	64.98	65.97	66.31
9 - 3 PM	64.78	64.44	64.4			65.92
3 - 5 PM	65.11	63.74	63.96	64.21	64.67	65.4
5 - 9 PM	66.04	65.92	65.95			65.96
9 - 11 PM	64.19	64.61	63.83			64.63

Figure 82. I-96 Eastbound, Pass Lane, Sensor 1, Mean Speed, Cars

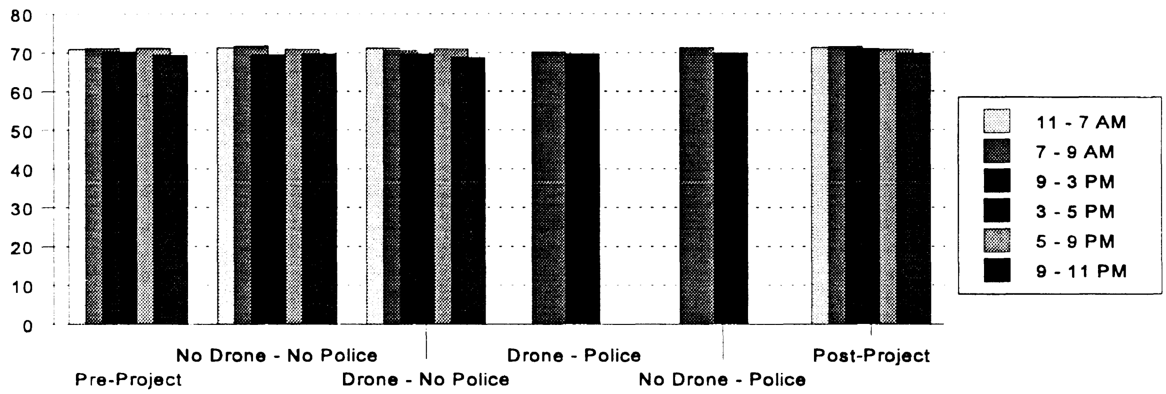
I-96 Eastbound -- Drive Lane
Sensor 1 -- 85th Percentile Speed -- Cars



11 - 7 AM	67.16	63.28	64.2		
7 - 9 AM	68.39	63.82	64.22	64.96	64.36
9 - 3 PM	66.49	63	63.04		
3 - 5 PM	67.12	63.03	61.97	63.37	62.52
5 - 9 PM	68.6	64.04	64.3		
9 - 11 PM	66.07	62.38	61.07		

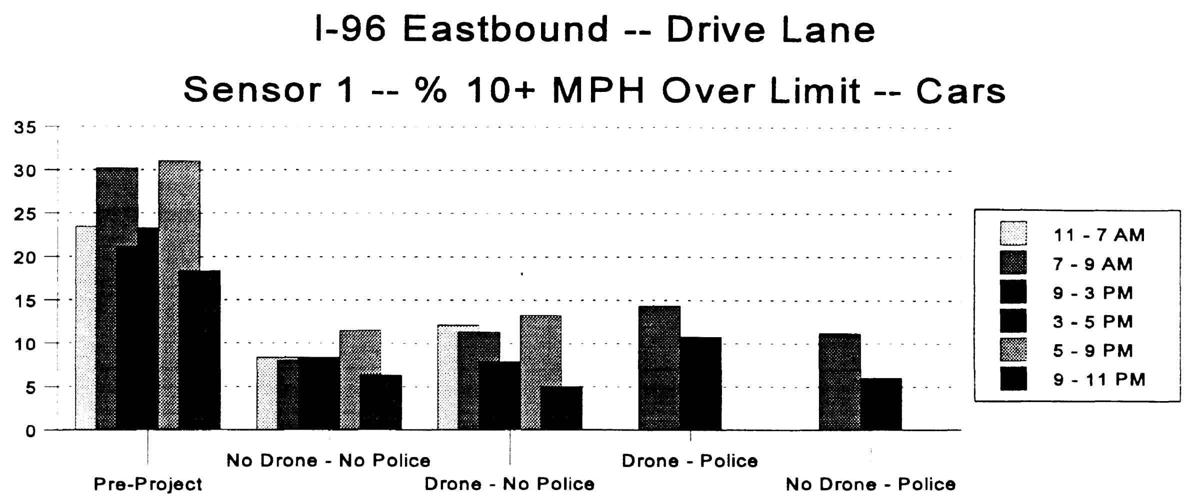
Figure 83. I-96 Eastbound, Drive Lane, Sensor 1, 85th Percentile Speed, Cars

I-96 Eastbound -- Pass Lane
Sensor 1 -- 85th Percentile Speed -- Cars



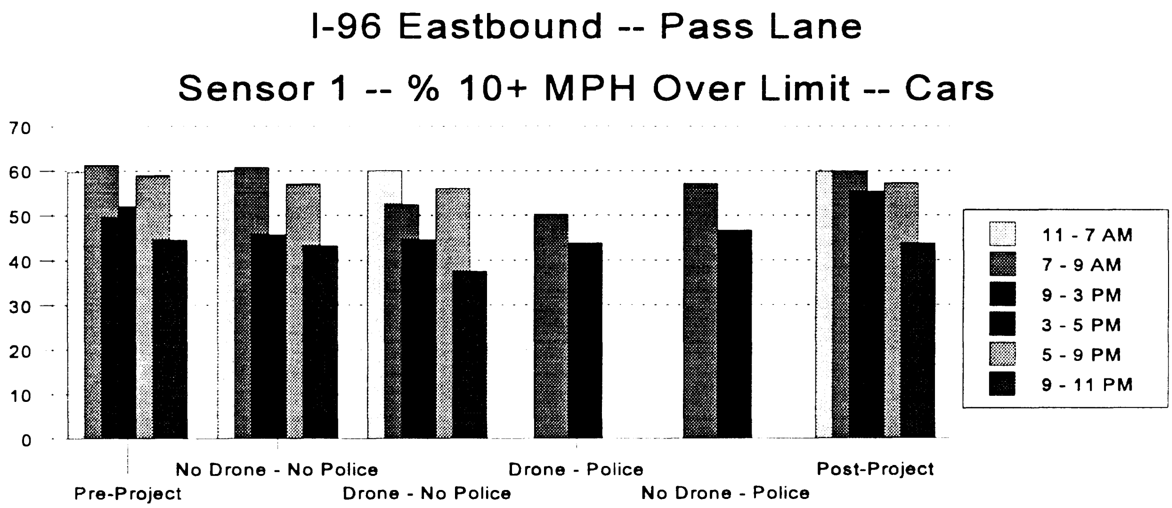
11 - 7 AM	70.88	71.29	71.16			71.28
7 - 9 AM	71.2	71.71	70.52	70.14	71.27	71.6
9 - 3 PM	70.15	69.5	69.65			70.93
3 - 5 PM	70.2	68.88	69.08	69.6	69.85	70.23
5 - 9 PM	71.15	70.86	70.93			70.79
9 - 11 PM	69.37	69.76	68.78			69.78

Figure 84. I-96 Eastbound, Pass Lane, Sensor 1, 85th Percentile Speed, Cars



11 - 7 AM	23.45	8.34	12.13		
7 - 9 AM	30.21	7.98	11.31	14.36	11.21
9 - 3 PM	21.12	8.38	7.91		
3 - 5 PM	23.28	8.1	4.99	10.78	6.02
5 - 9 PM	31.07	11.5	13.22		
9 - 11 PM	18.34	6.31	5.01		

Figure 85. I-96 Eastbound, Drive Lane, Sensor 1, % 10+ MPH Over Limit, Cars



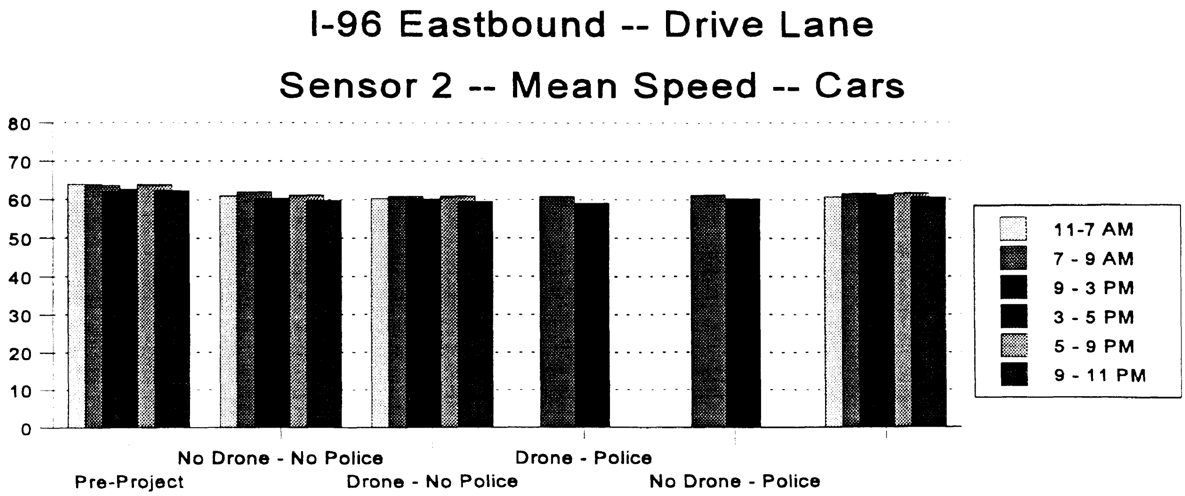
11 - 7 AM	59.72	59.99	60.05			59.85
7 - 9 AM	61.29	60.68	52.46	50.19	57.15	59.93
9 - 3 PM	49.57	45.74	44.62			55.32
3 - 5 PM	52.11	38.75	39.92	43.82	46.68	52.69
5 - 9 PM	58.93	56.99	56.07			57.23
9 - 11 PM	44.65	43.31	37.49			43.74

Figure 86. I-96 Eastbound, Pass Lane, Sensor 1, % 10+ MPH Over Limit, Cars

Figures 87 - 92 show the mean speed, 85th percentile speed, and the percentage ofcars exceeding the speed limit by 10 mph at sensor 2 (i.e., the drone radar zone).

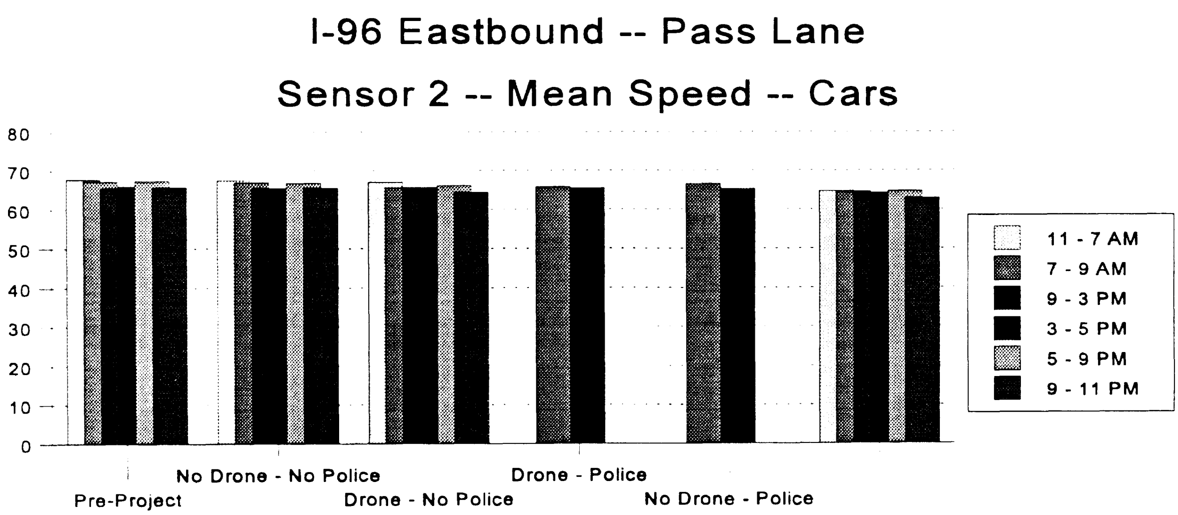
The mean speed of cars at sensor 2 ranged from 59 mph to 63.9 mph in the drive lane and from 62.9 mph to 67.8 mph in the pass lane. The 85th percentile speeds ranged from 64.7 mph to 70.1 mph in the drive lane and 68.1 mph to 73.3 mph in the pass lane. The highest and lowest speeds were measured in the pass lane during the pre- and post-project periods. If these are excluded, the range of the 85th percentile speed in the pass lane is 69.9 mph to 72.9 mph. The portion of cars exceeding 65 mph ranged from 11.9 percent to 42.5 percent in the drive lane and from 30.8 percent to 74.1 percent in the pass lane during the project periods.

The mean and 85th percentile speeds, as well as the portion of cars exceeding 65 mph across the various conditions at sensor 2, did not show obvious effects of the drone radar or of the police patrol. Furthermore, these speed measures at sensor 2 were higher than those at sensor 1 indicating a general increase in speed across all conditions.



11-7 AM	63.91	60.91	60.28			60.79
7 - 9 AM	63.62	61.92	60.77	60.8	61.11	61.59
9 - 3 PM	61.91	60.03	60.14			61.14
3 - 5 PM	62.64	60.19	59.56	59.08	60.12	61.13
5 - 9 PM	63.85	61.1	60.86			61.54
9 - 11 PM	62.26	59.72	59.46			60.54

Figure 87. I-96 Eastbound, Drive Lane, Sensor 2, Mean Speed, Cars

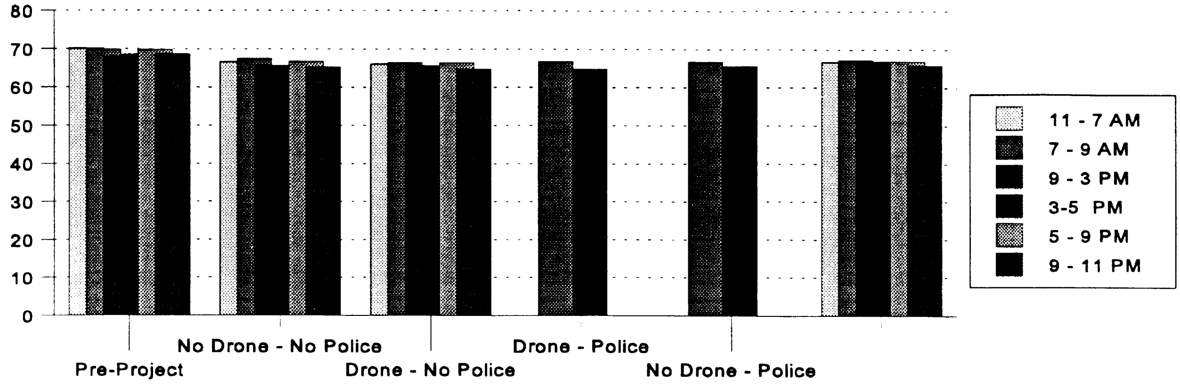


11 - 7 AM	67.8	67.63	67.03			64.73
7 - 9 AM	67.34	66.94	65.62	65.82	66.64	64.51
9 - 3 PM	65.61	65.46	65.62			64.2
3 - 5 PM	66.15	65.25	64.09	65.43	65.29	63.86
5 - 9 PM	67.5	66.8	66.2			64.7
9 - 11 PM	65.84	65.6	64.41			62.91

Figure 88. I-96 Eastbound, Pass Lane, Sensor 2, Mean Speed, Cars

I-96 Eastbound -- Drive Lane

Sensor 2 -- 85th Percentile Speed -- Cars

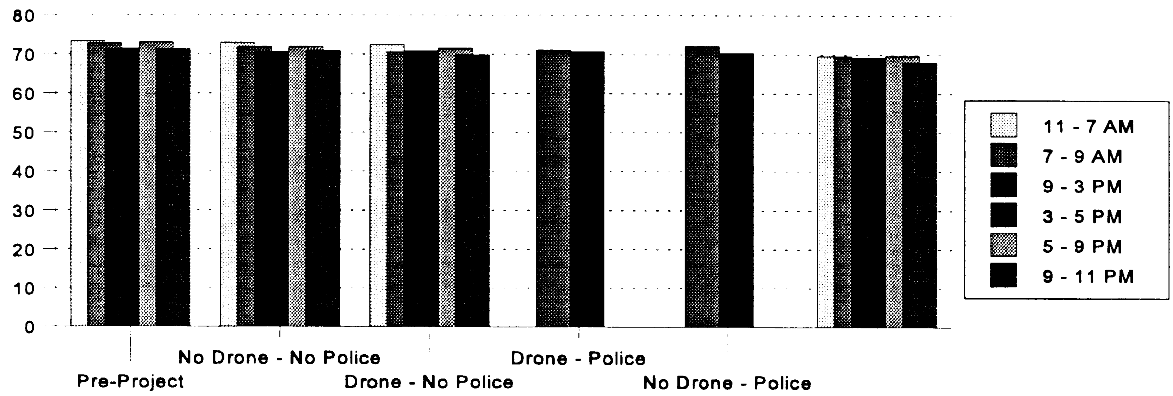


11 - 7 AM	70.14	66.57	66.05			66.66
7 - 9 AM	69.9	67.44	66.31	66.67	66.67	67.25
9 - 3 PM	67.98	65.59	65.65			66.75
3-5 PM	68.53	65.45	64.91	64.68	65.58	66.52
5 - 9 PM	69.79	66.71	66.35			66.77
9 - 11 PM	68.62	65.24	64.66			65.83

Figure 89. I-96 Eastbound, Drive Lane, Sensor 2, 85th Percentile Speed, Cars

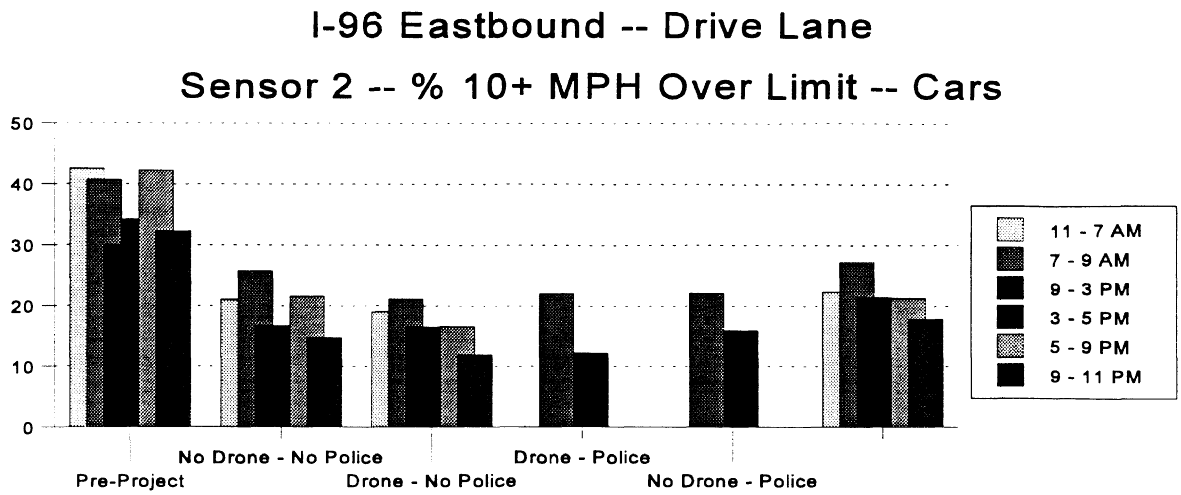
I-96 Eastbound -- Pass Lane

Sensor 2-- 85th Percentile Speed -- Cars



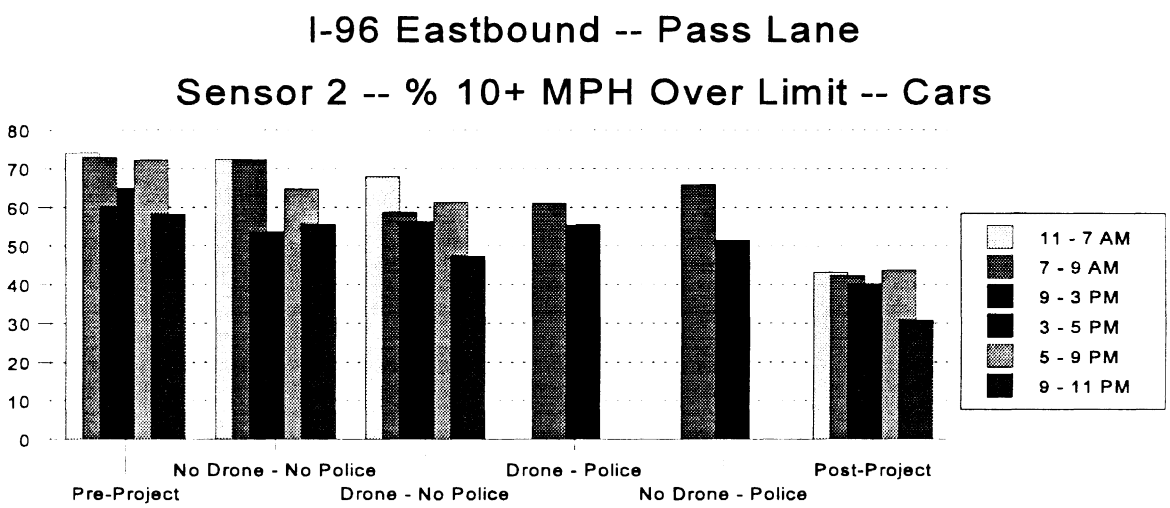
11 - 7 AM	73.33	72.92	72.55			69.62
7 - 9 AM	72.78	71.89	70.49	71.08	72.12	69.26
9 - 3 PM	71.13	70.57	70.87			69.29
3 - 5 PM	71.4	70.17	69.26	70.68	70.32	69.14
5 - 9 PM	73.02	71.94	71.49			69.72
9 - 11 PM	71.24	70.9	69.91			68.06

Figure 90. I-96 Eastbound, Pass Lane, Sensor 2, 85th Percentile Speed, Cars



11 - 7 AM	42.54	21.01	19.01			22.37
7 - 9 AM	40.72	25.74	21.09	22.02	22.1	27.25
9 - 3 PM	30.01	16.68	16.48			21.41
3 - 5 PM	34.22	15.5	13.69	12.19	15.93	20.03
5 - 9 PM	42.31	21.63	16.59			21.31
9 - 11 PM	32.28	14.7	11.92			17.83

Figure 91. I-96 Eastbound, Drive Lane, Sensor 2, % 10+ MPH Over Limit, Cars



11 - 7 AM	74.08	72.44	67.96			43.21
7 - 9 AM	72.92	72.33	58.73	61.08	65.9	42.27
9 - 3 PM	60.15	53.64	56.28			40.17
3 - 5 PM	64.9	49.42	42.16	55.55	51.5	38.48
5 - 9 PM	72.24	64.74	61.34			43.78
9 - 11 PM	58.27	55.57	47.39			30.78

Figure 92. I-96 Eastbound, Pass Lane, Sensor 2, % 10+ MPH Over Limit, Cars

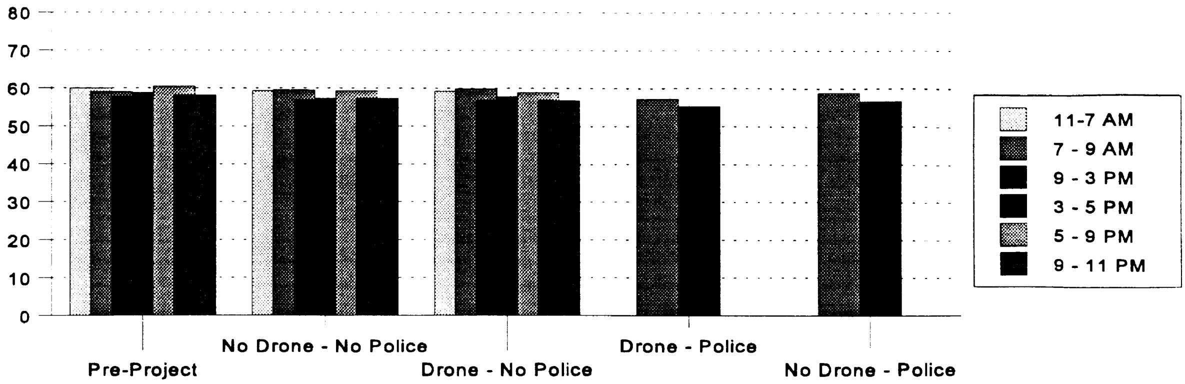
Figures 93 - 98 show the mean speed, 85th percentile speed, and the percentage ofcars exceeding the speed limit by 10 mph at sensor 3 (i.e., about 3,400 ft past the drone zone).

The mean speeds of cars downstream of the drone zone ranged from 55.3 mph to 60.5 mph in the drive lane and from 62 mph to 65.9 mph in the pass lane during the project period. The 85th percentile speed ranged from 60.9 mph to 66 mph in the drive lane and 67.1 mph to 71 mph in the drive lane. The percentage ofcars exceeding 65 mph in the drive lane ranged from 4.6 percent to 18.1 percent and from 27.9 percent to 60.9 percent in the pass lane.

The percentage ofcars exceeding the speed limit by more than 10 mph in the drive lane was the lowest for conditions when police patrols were present upstream. However, this was not the case for the pass lane. In general the speeds at sensor 3 were a little slower than at sensor 2.

The observations of speeds of cars at this construction zone show no practical effect of the drone radar on speed reduction. In general, the speeds increased between sensor 1 and sensor 2 in the drone radar zone and then decreased slightly by sensor 3. This pattern was present across all of the conditions of the experiment.

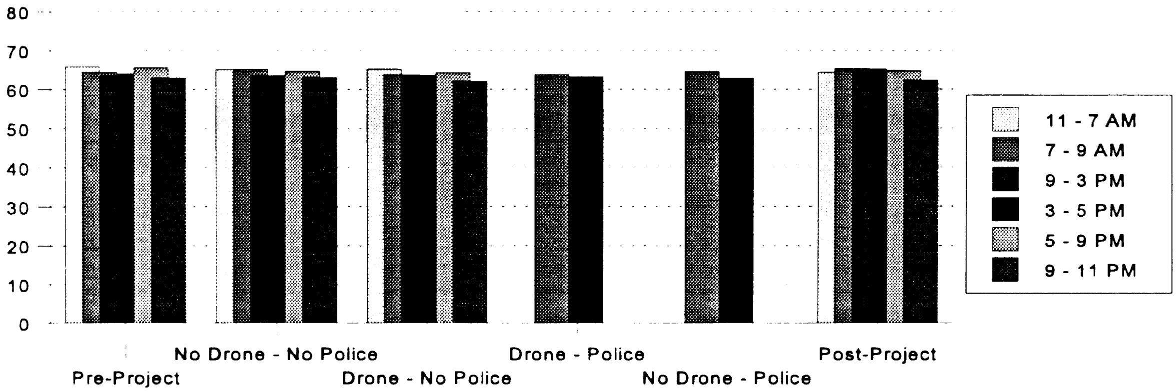
I-96 Eastbound -- Drive Lane
Sensor 3 -- Mean Speed -- Cars



11-7 AM	59.96	59.33	59.23		
7 - 9 AM	59.03	59.53	59.82	57.19	58.86
9 - 3 PM	57.76	56.88	56.89		
3 - 5 PM	58.75	57.22	57.83	55.28	56.67
5 - 9 PM	60.49	59.27	58.92		
9 - 11 PM	58.05	57.26	56.81		

Figure 93. I-96 Eastbound, Drive Lane, Sensor 3, Mean Speed, Cars

I-96 Eastbound -- Pass Lane
Sensor 3 -- Mean Speed -- Cars

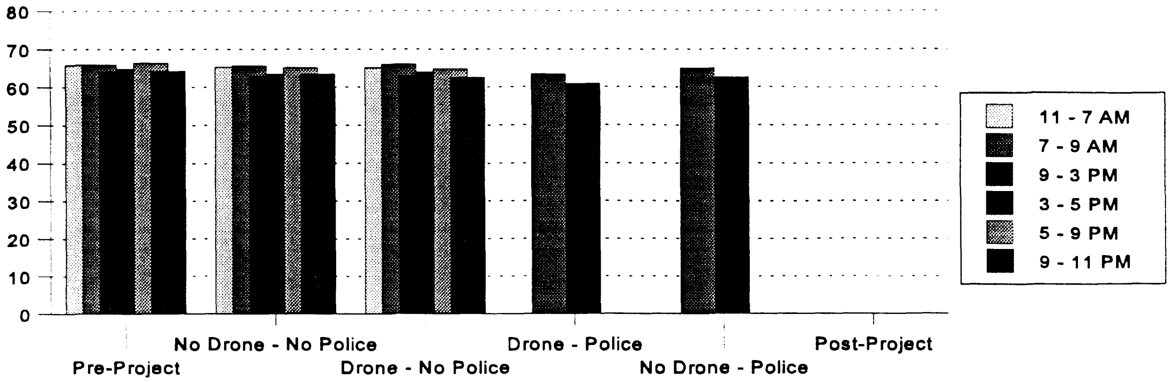


11 - 7 AM	65.92	65.1	65.13			64.41
7 - 9 AM	64.48	65.16	63.75	63.8	64.53	65.38
9 - 3 PM	63.53	63.5	63.63			65.15
3 - 5 PM	64.07	63.32	62.99	63.19	62.92	64.86
5 - 9 PM	65.62	64.65	64.3			64.72
9 - 11 PM	62.97	63.05	62.04			62.31

Figure 94. I-96 Eastbound, Pass Lane, Sensor 3, Mean Speed, Cars

I-96 Eastbound -- Drive Lane

Sensor 3 -- 85th Percentile Speed -- Cars

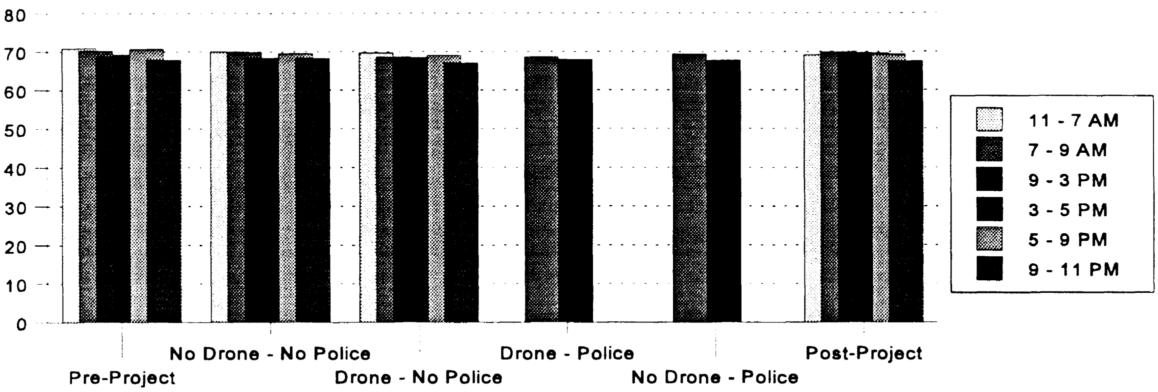


11 - 7 AM	65.79	65.32	65.13			
7 - 9 AM	65.81	65.69	66.03	63.45	64.94	
9 - 3 PM	64.02	62.98	62.85			
3 - 5 PM	64.76	63.42	63.97	60.86	62.51	
5 - 9 PM	66.34	65.16	64.76			
9 - 11 PM	64.26	63.39	62.67			

Figure 95. I-96 Eastbound, Drive Lane, Sensor 3, 85th Percentile Speed, Cars

I-96 Eastbound -- Pass Lane

Sensor 3 -- 85th Percentile Speed -- Cars

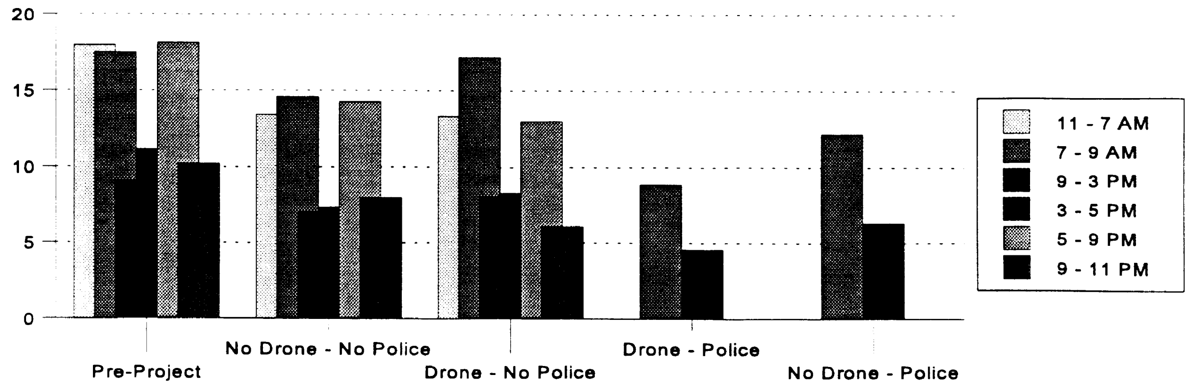


11 - 7 AM	70.99	69.95	69.76			69.14
7 - 9 AM	70.23	69.84	68.6	68.6	69.4	69.91
9 - 3 PM	68.69	68.3	68.38			69.7
3 - 5 PM	69.27	68.02	67.75	67.98	67.71	69.64
5 - 9 PM	70.74	69.52	69.01			69.33
9 - 11 PM	67.9	68.21	67.06			67.56

Figure 96. I-96 Eastbound, Pass Lane, Sensor 3, 85th Percentile Speed, Cars

I-96 Eastbound -- Drive Lane

Sensor 3 -- % 10+ MPH Over Limit -- Cars

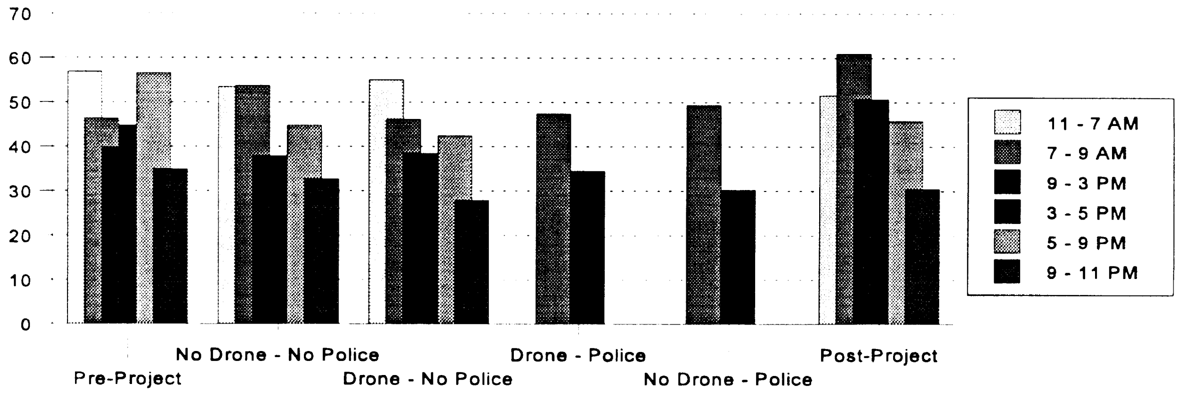


11 - 7 AM	17.96	13.42	13.33		
7 - 9 AM	17.48	14.56	17.16	8.84	12.2
9 - 3 PM	9.04	7.03	8.02		
3 - 5 PM	11.15	7.35	8.26	4.56	6.3
5 - 9 PM	18.13	14.26	13		
9 - 11 PM	10.21	7.97	6.06		

Figure 97. I-96 Eastbound, Drive Lane, Sensor 3, % 10+ MPH Over Limit, Cars

I-96 Eastbound -- Pass Lane

Sensor 3 -- % 10+ MPH Over Limit -- Cars



11 - 7 AM	56.85	53.46	55.02			51.57
7 - 9 AM	46.33	53.73	46.09	47.41	49.29	60.94
9 - 3 PM	39.75	37.87	38.41			50.61
3 - 5 PM	44.77	31.12	29.52	34.54	30.24	44.5
5 - 9 PM	56.5	44.77	42.42			45.78
9 - 11 PM	34.92	32.74	27.86			30.48

Figure 98. I-96 Eastbound, Pass Lane, Sensor 3, % 10+ MPH Over Limit, Cars

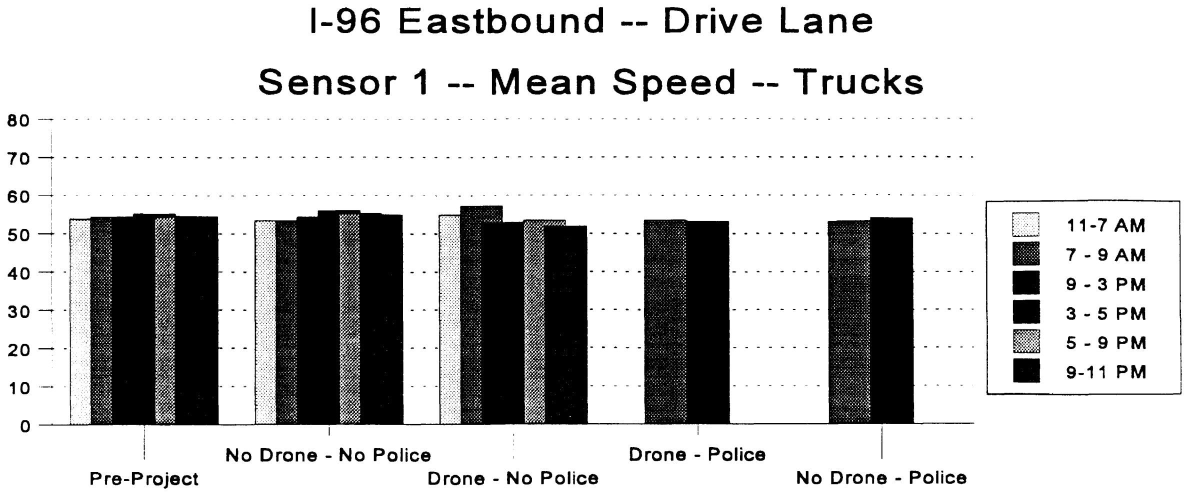
Trucks

Figures 99 - 104 show the mean speed, 85th percentile speed, and the percentage of trucks exceeding the speed limit by 10 mph at sensor 1 (i.e., upstream of the drone zone, in the drive and pass lanes).

The mean speed of trucks ranged from 51.9 mph to 57.4 mph in the drive lane and from 57.6 mph to 62.1 mph in the pass lane. The 85th percentile speeds ranged from 56.2 mph to 61.5 mph in the drive lane and from 57.8 mph to 62.7 mph in the pass lane. The percentage oftrucks exceeding 65 mph ranged from 0 percent to 11.7 percent in the drive lane and from 0 percent to 25.7 percent in the pass lane. There are no obvious differences in speed across the various conditions attributable to the presence of the drone radar signal or police patrols downstream at the drone zone.

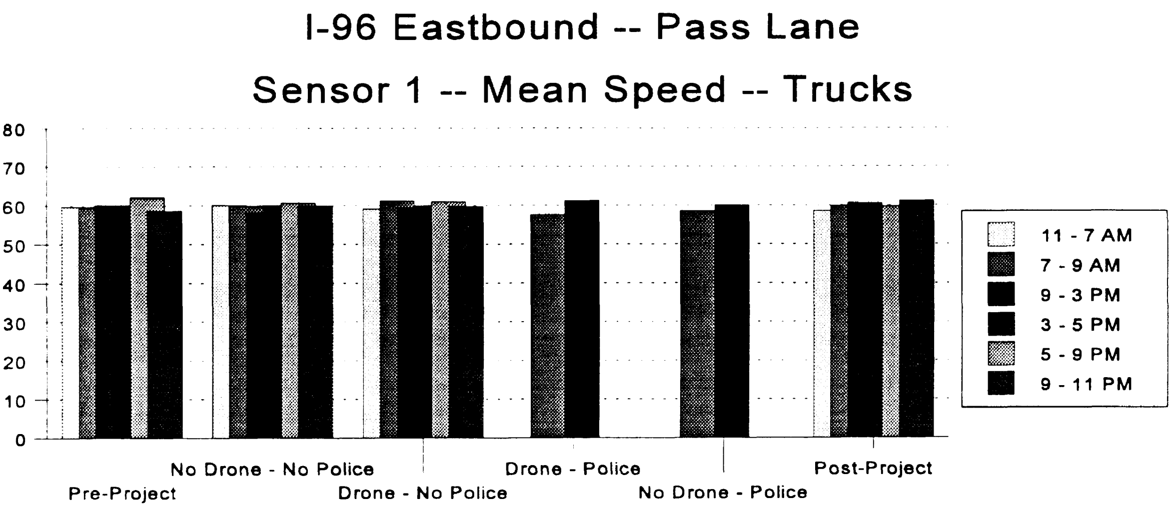
Figures 105 - 110 show the mean speed, 85th percentile speed, and the percentage of trucks exceeding the speed limit by 10 mph at sensor 2 (i.e., the drone zone).

The mean speeds of trucks at sensor 2 ranged from 55.3 mph to 64.4 mph in the drive lane. The speeds of trucks at this location in the preproject period were much higher than those observed during the project. If the preproject speeds are not considered, then the range of mean truck speeds in the drive lane is from 55.3 mph to 57.1 mph. In the pass lane the mean truck speeds ranged from 64.4 mph to 68.1 mph during the project period. The 85th percentile speeds range from 58.6 mph to 61.2 mph in the drive lane and from 67.4 mph to 70.5 mph in the pass lane during the project period. The percentage oftrucks exceeding 65 mph ranges from 0.8 percent to 2.3 percent in the drive lane and from 40 percent to 73.4 percent in the pass lane during the project period. There appears to be no consistent effect of drone radar or police presence on speed across the various conditions of the study and no speed reduction effect between sensor 1 and sensor 2. In the case of trucks the speeds at sensor 2 are slightly higher than at sensor 1.



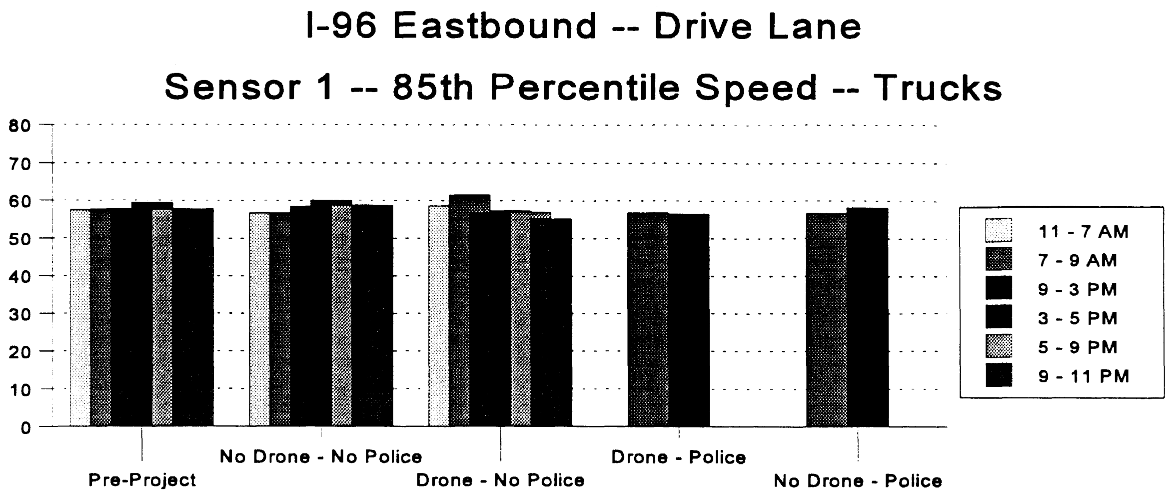
11-7 AM	53.84	53.44	55		
7 - 9 AM	54.42	53.18	57.35	53.45	53.14
9 - 3 PM	54.01	54.34	52.89		
3 - 5 PM	55.18	56.07	52.69	53.13	54.05
5 - 9 PM	54.3	55.34	53.48		
9-11 PM	54.55	54.98	51.95		

Figure 99. I-96 Eastbound, Drive Lane, Sensor 1, Mean Speed, Trucks



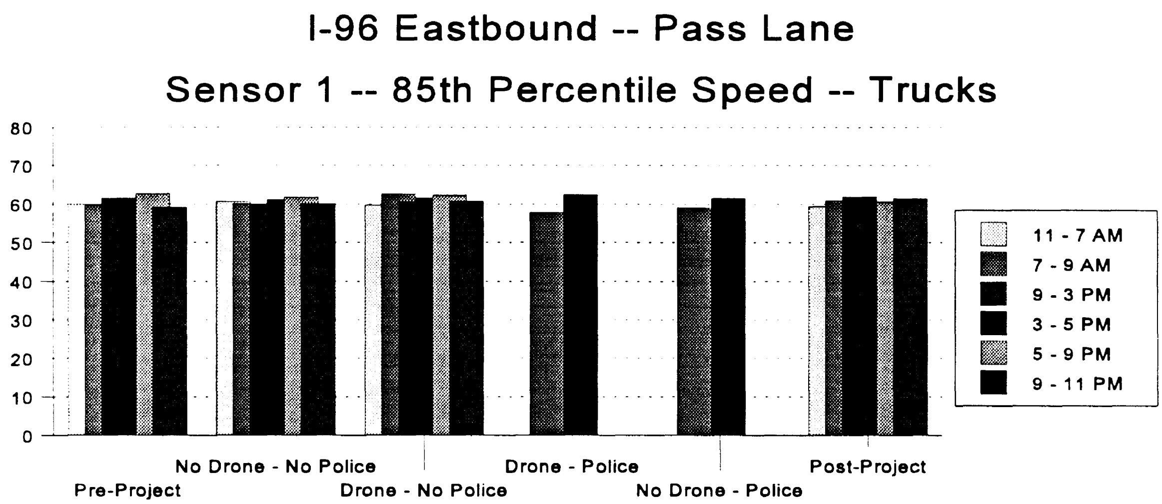
11 - 7 AM	59.68	60.16	59.16			58.64
7 - 9 AM	59.5	60.04	61.27	57.64	58.59	59.93
9 - 3 PM	60.16	58.24	59.27			60.64
3 - 5 PM	59.63	60.06	60	61.23	60.13	
5 - 9 PM	62.14	60.7	60.93			59.71
9 - 11 PM	58.69	60	59.76			61.1

Figure 100. I-96 Eastbound, Pass Lane, Sensor 1, Mean Speed, Trucks



11 - 7 AM	57.55	56.69	58.55		
7 - 9 AM	57.72	56.23	61.46	56.73	56.65
9 - 3 PM	57.53	58.38	56.56		
3 - 5 PM	59.41	59.97	57.25	56.5	58.19
5 - 9 PM	57.6	58.74	56.96		
9 - 11 PM	57.84	58.61	55.19		

Figure 101. I-96 Eastbound, Drive Lane, Sensor 1, 85th Percentile Speed, Trucks

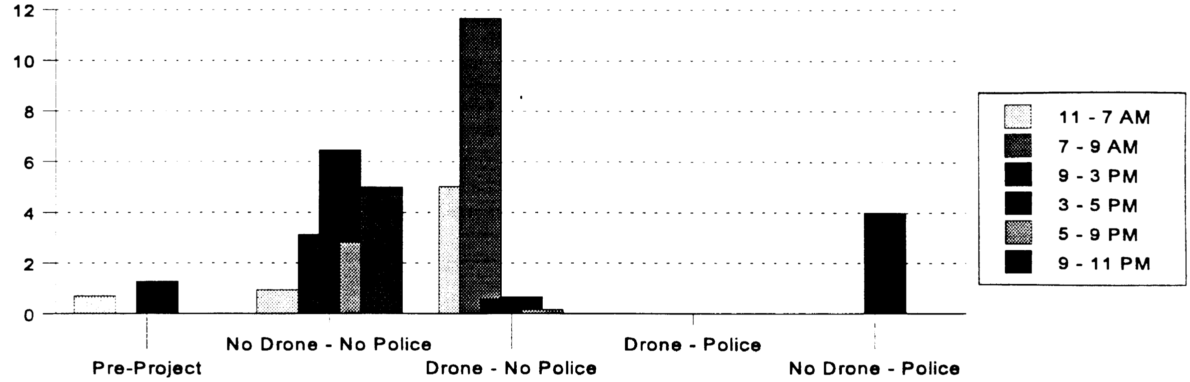


11 - 7 AM	60.05	60.62	59.76			59.36
7 - 9 AM	59.79	60.13	62.6	57.79	59.06	60.87
9 - 3 PM	61.55	59.86	60.43			61.91
3 - 5 PM	61.11	61.15	61.52	62.42	61.6	
5 - 9 PM	62.71	61.88	62.35			60.62
9 - 11 PM	59.15	60.07	60.67			61.5

Figure 102. I-96 Eastbound, Pass Lane, Sensor 1, 85th Percentile Speed, Trucks

I-96 Eastbound -- Drive Lane

Sensor 1 -- % 10+ MPH Over Limit -- Trucks

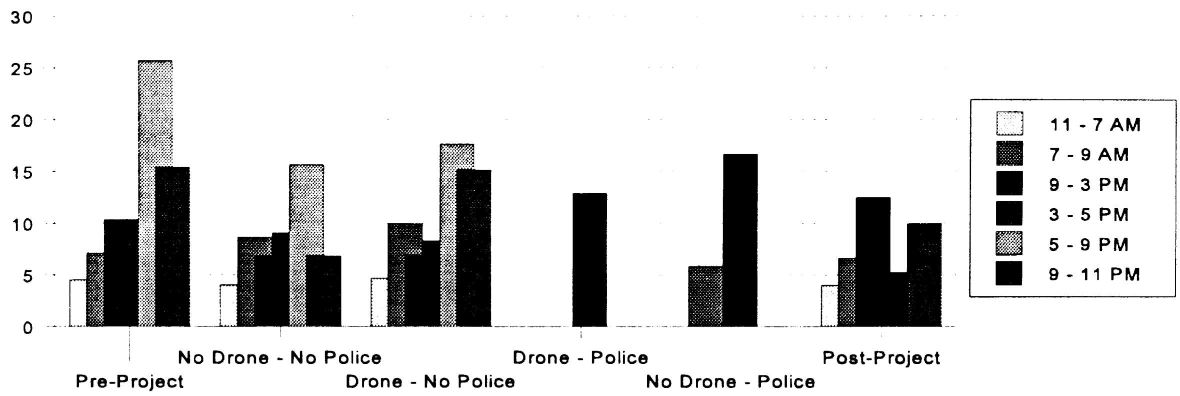


11 - 7 AM	0.69	0.94	5.03		
7 - 9 AM	0	0	11.67	0	0
9 - 3 PM	0	3.13	0.56		
3 - 5 PM	1.27	6.46	0.66	0	4
5 - 9 PM	0	2.81	0.16		
9 - 11 PM	0	5	0		

Figure 103. I-96 Eastbound, Drive Lane, Sensor 1, % 10+ MPH Over Limit, Trucks

I-96 Eastbound -- Pass Lane

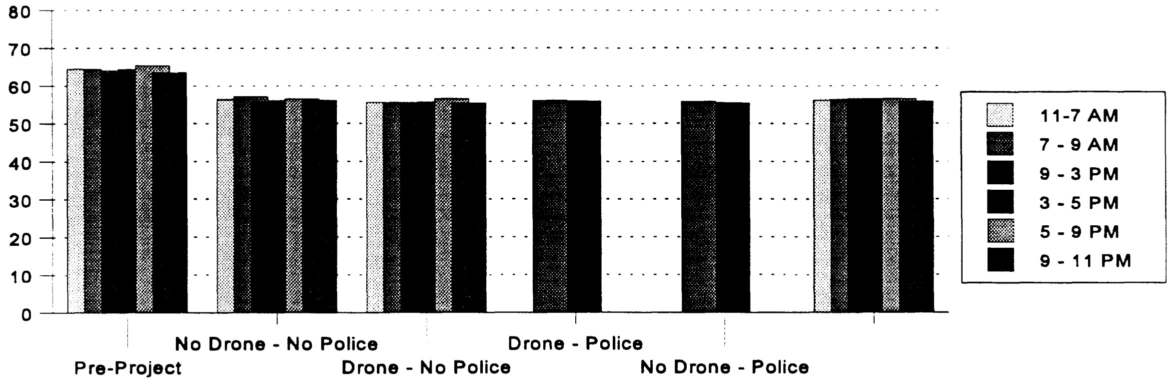
Sensor 1 -- % 10+ MPH Over Limit -- Trucks



11 - 7 AM	4.55	4.05	4.71			4
7 - 9 AM	7.14	8.7	10	0	5.88	6.67
9 - 3 PM	10.39	6.78	6.93			12.5
3 - 5 PM	5.26	9.09	8.33	12.9	16.67	5.26
5 - 9 PM	25.71	15.66	17.65			0
9 - 11 PM	15.38	6.9	15.15			10

Figure 104. I-96 Eastbound, Pass Lane, Sensor 1, % 10+ MPH Over Limit, Trucks

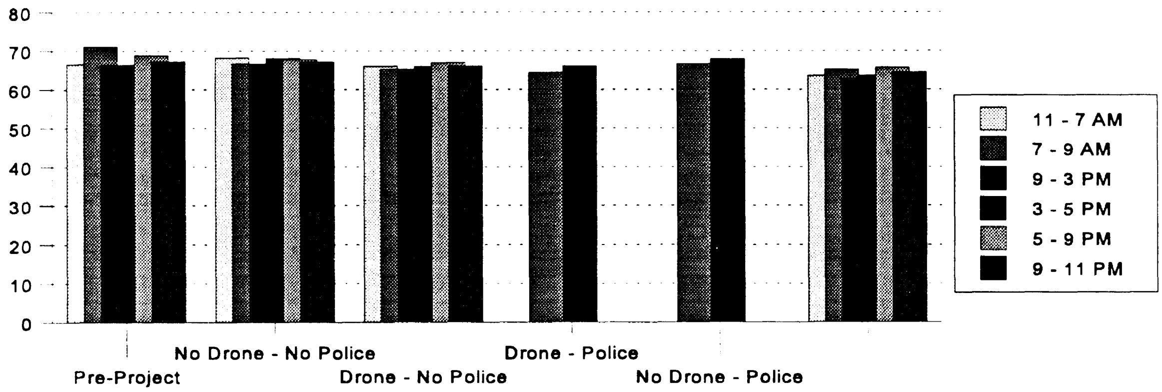
I-96 Eastbound -- Drive Lane
Sensor 2 -- Mean Speed -- Trucks



11-7 AM	64.44	56.41	55.62			56.26
7 - 9 AM	64.09	57.12	55.35	56.11	55.78	56.36
9 - 3 PM	63.53	55.83	55.5			56.5
3 - 5 PM	64.34	56.13	55.71	55.97	55.42	56.45
5 - 9 PM	65.4	56.46	56.57			56.62
9 - 11 PM	63.54	56.22	55.43			55.85

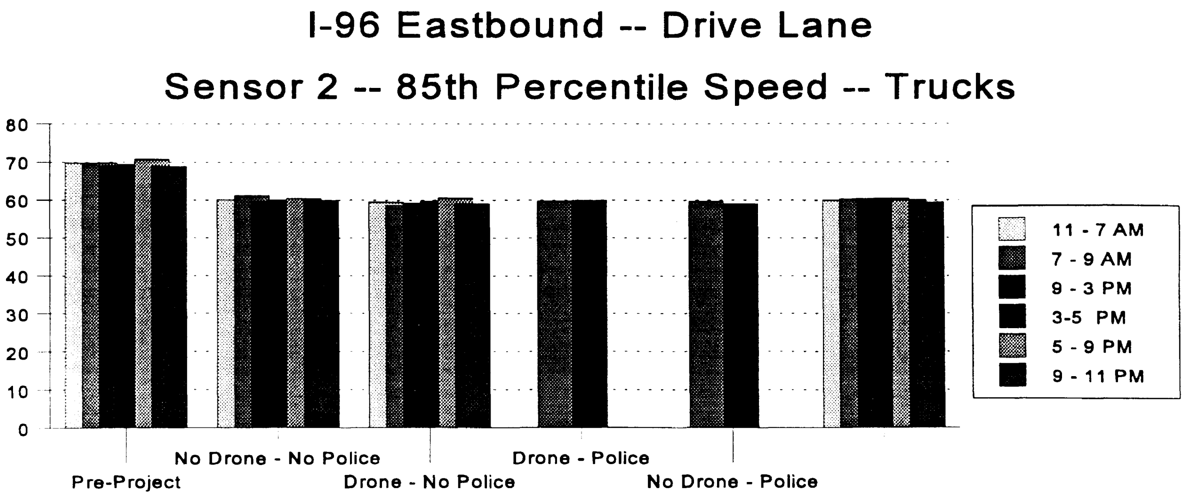
Figure 105. I-96 Eastbound, Drive Lane, Sensor 2, Mean Speed, Trucks

I-96 Eastbound -- Pass Lane
Sensor 2 -- Mean Speed -- Trucks



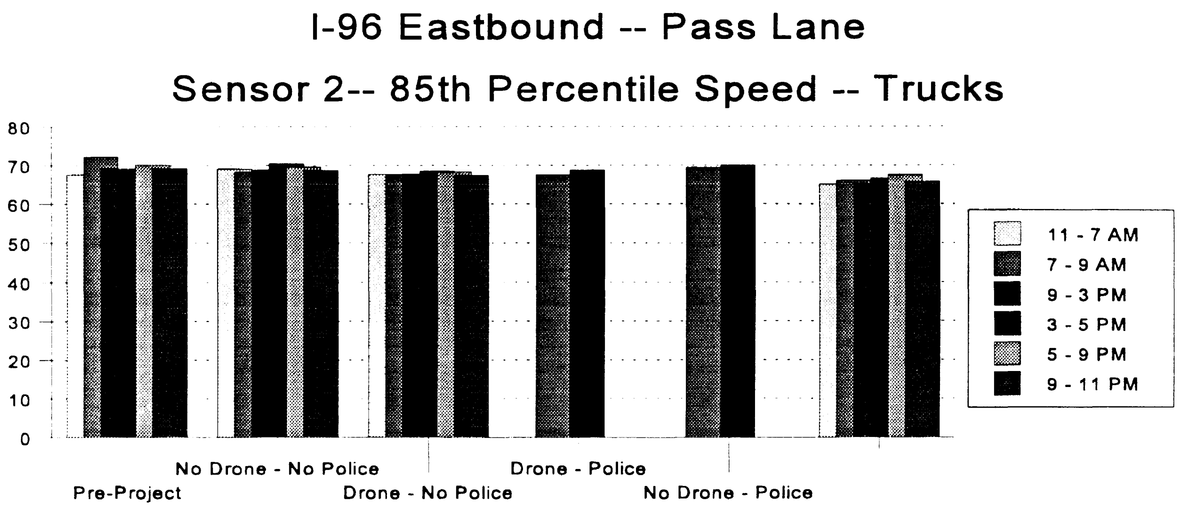
11 - 7 AM	66.55	68.18	66.02			63.64
7 - 9 AM	71.14	66.72	65.28	64.4	66.62	65.25
9 - 3 PM	66.43	66.19	65.1			62.89
3 - 5 PM	66.13	68.03	65.95	66.04	67.9	63.71
5 - 9 PM	68.89	67.74	66.97			65.69
9 - 11 PM	67.28	67.15	66			64.44

Figure 106. I-96 Eastbound, Pass Lane,Sensor 2, Mean Speed, Trucks



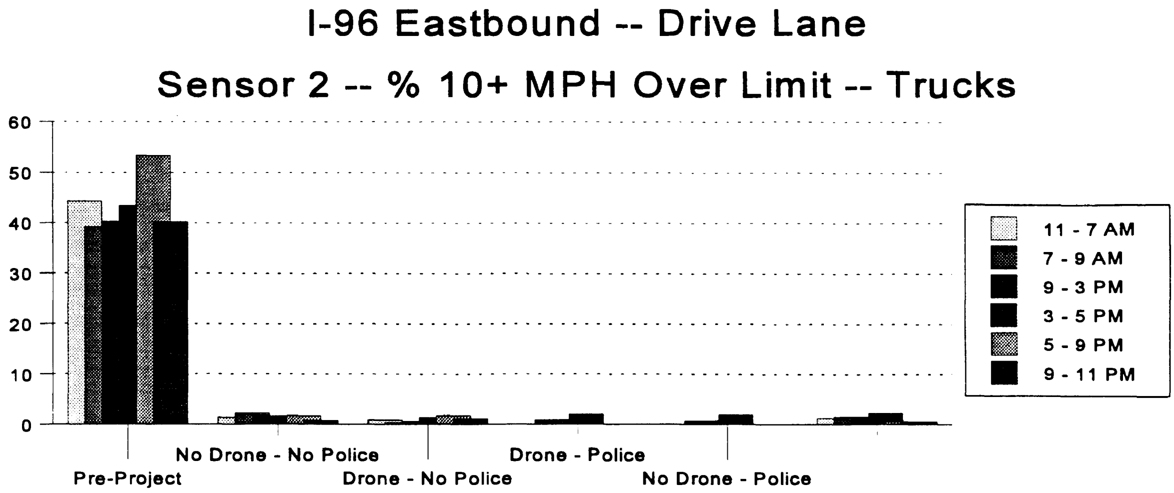
11 - 7 AM	69.8	60.13	59.47			60.04
7 - 9 AM	69.83	61.24	58.64	59.8	59.65	60.36
9 - 3 PM	68.79	59.68	59.32			60.32
3-5 PM	69.35	60	59.76	59.95	59.03	60.49
5 - 9 PM	70.73	60.44	60.63			60.09
9 - 11 PM	68.88	59.89	59.19			59.53

Figure 107. I-96 Eastbound, Drive Lane, Sensor 2, 85th Percentile Speed, Trucks



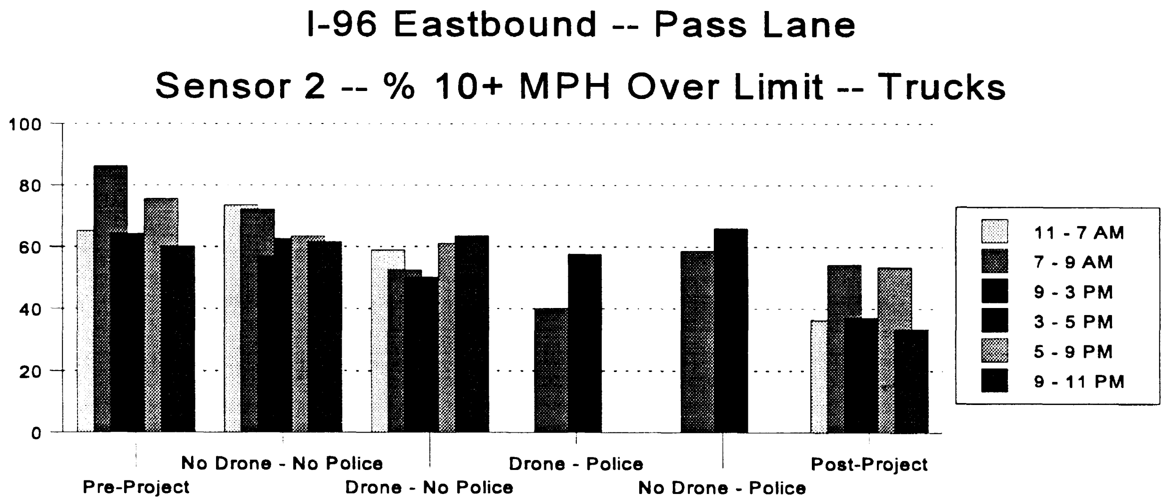
11 - 7 AM	67.66	69.12	67.75			65.18
7 - 9 AM	72.14	68.28	67.55	67.5	69.45	66.04
9 - 3 PM	69.11	68.85	67.77			65.11
3 - 5 PM	68.69	70.51	68.45	68.73	70.05	66.67
5 - 9 PM	70.17	69.6	68.36			67.6
9 - 11 PM	69.2	68.77	67.44			65.67

Figure 108. I-96 Eastbound, Pass Lane, Sensor 2, 85th Percentile Speed, Trucks



11 - 7 AM	44.32	1.41	0.85			1.23
7 - 9 AM	39.13	2.26	0.37	0.88	0.77	1.53
9 - 3 PM	40.27	1.68	0.61			1.39
3 - 5 PM	43.41	1.35	1.4	2.02	1.96	2.32
5 - 9 PM	53.37	1.75	1.79			0.59
9 - 11 PM	40.17	0.78	1.18			0.59

Figure 109. I-96 Eastbound, Drive Lane, Sensor 2, % 10+ MPH Over Limit, Trucks



11 - 7 AM	65.14	73.45	58.91			36.37
7 - 9 AM	86.21	72	52.5	40	58.62	54.17
9 - 3 PM	64.12	56.84	50.18			37.03
3 - 5 PM	62.22	62.5	49.99	57.69	65.85	30.95
5 - 9 PM	75.47	63.41	61.16			53.33
9 - 11 PM	60	61.54	63.46			33.33

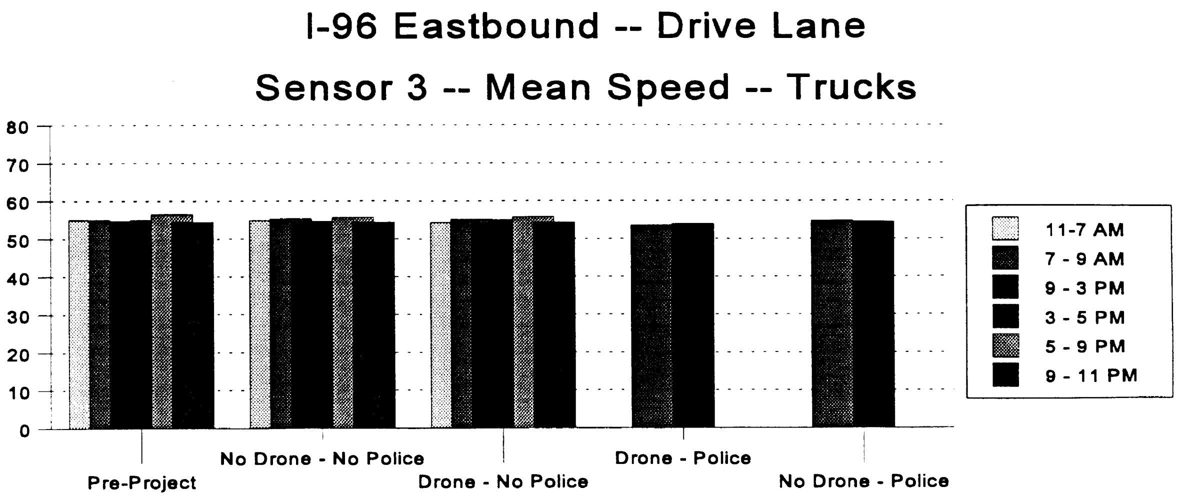
Figure 110. I-96 Eastbound, Pass Lane, Sensor 2, % 10+ MPH Over Limit, Trucks

Figures 111 - 116 show the mean speed, 85th percentile speed, and the percentage of trucks exceeding the speed limit by 10 mph at sensor 3 (approximately 3,400 ft. past the drone zone).

The mean speed of trucks at sensor 3 ranged from 53.8 mph to 56.5 mph in the drive lane and from 58.9 mph to 63.6 mph in the pass lane. The 85th percentile speeds ranged from 57.6 mph to 60.7mph in the drive lane and from 61.1 mph to 66.7 mph in the pass lane. The percentage oftrucks exceeding 65 mph ranged from 0.2 percent to 2.6 percent in the drive lane and from 4.2 percent to 34.8 percent in the pass zone.

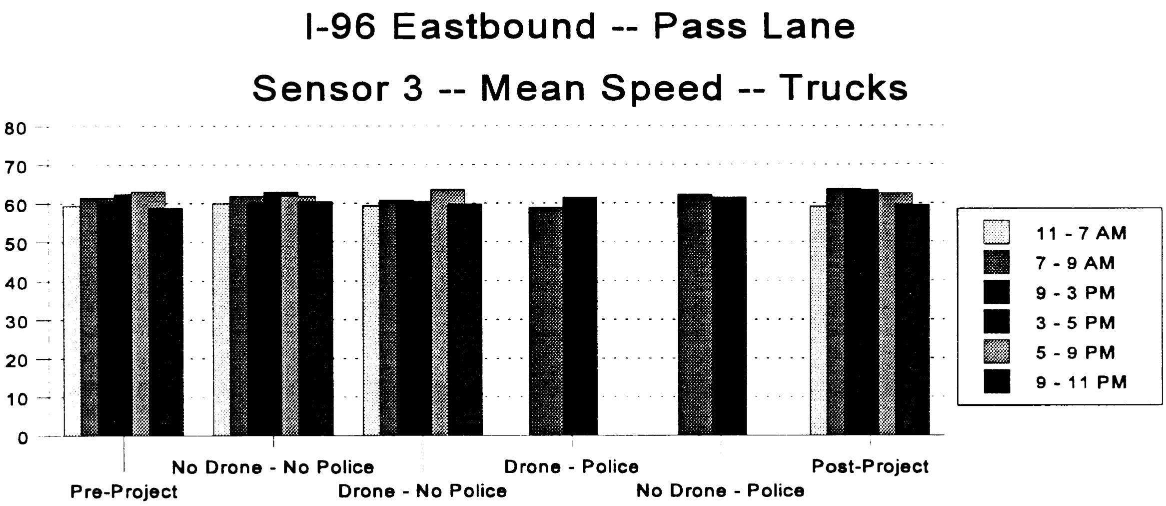
The speeds of trucks at sensor 3 were lower than upstream at sensor 2 for all conditions. The lowest speeds and percentages of trucks exceeding the speed limit were measured at times when drone radar signals and/or police were present. However, this was not consistent for all the times that drone radar and/or police were present.

The observations of speeds at the construction site on eastbound I-96 show a general speed increase between sensor 1, upstream of the drone radar zone and sensor 2 at the radar zone, followed by a small decrease in speed at sensor 3. This pattern was present for cars and trucks across all the conditions of the experiment. No consistent effect of drone radar and/or police on speed reductions could be seen.



11-7 AM	55.02	54.86	54.35		
7 - 9 AM	54.7	55.34	55.2	53.56	54.72
9 - 3 PM	54.47	53.91	54.13		
3 - 5 PM	55.07	54.55	55.01	53.83	54.4
5 - 9 PM	56.54	55.67	55.77		
9 - 11 PM	54.44	54.31	54.27		

Figure 111. I-96 Eastbound, Drive Lane, Sensor 3, Mean Speed, Trucks

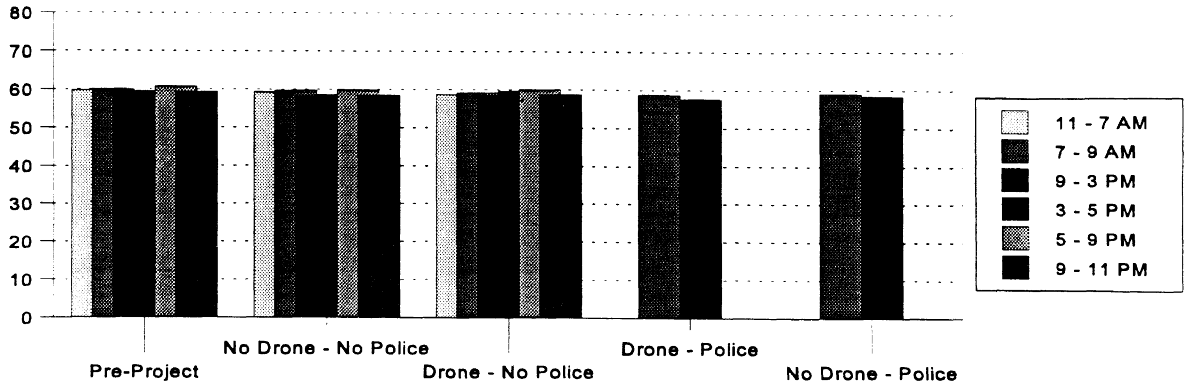


11 - 7 AM	59.45	59.98	59.31			59.07
7 - 9 AM	61.56	61.92	60.85	58.94	62.24	63.61
9 - 3 PM	60.37	60.14	60.49			63.3
3 - 5 PM	62.41	62.93	59.87	61.52	61.58	61.58
5 - 9 PM	63.09	61.87	63.49			62.5
9 - 11 PM	58.85	60.44	59.79			59.53

Figure 112. I-96 Eastbound, Pass Lane, Sensor 3, Mean Speed, Trucks

I-96 Eastbound -- Drive Lane

Sensor 3 -- 85th Percentile Speed -- Trucks

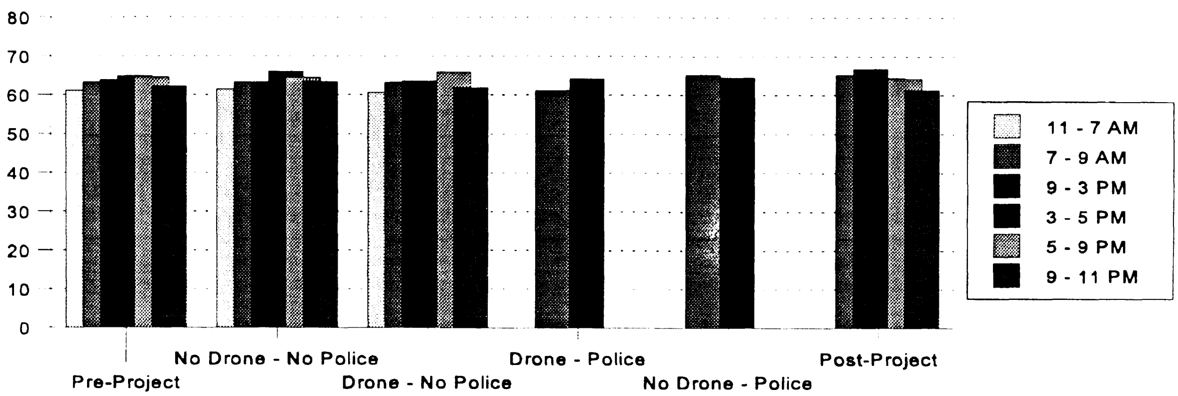


11 - 7 AM	59.72	59.26	58.68		
7 - 9 AM	59.93	59.74	59.18	58.75	59.1
9 - 3 PM	59.07	58.14	58.24		
3 - 5 PM	59.42	58.58	59.6	57.62	58.34
5 - 9 PM	60.74	59.87	59.93		
9 - 11 PM	59.28	58.47	58.61		

Figure 113. I-96 Eastbound, Drive Lane, Sensor 3, 85th Percentile Speed, Trucks

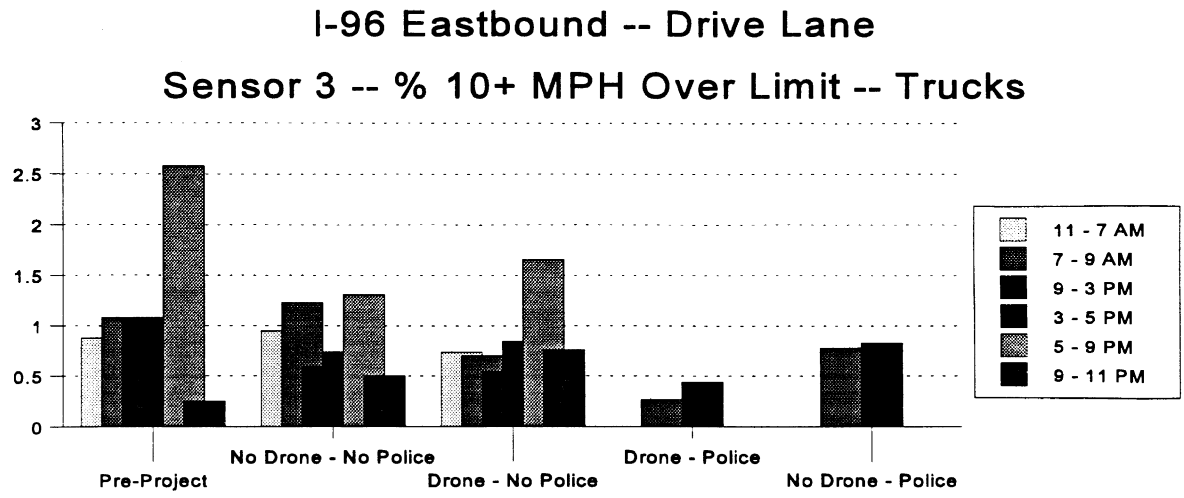
I-96 Eastbound -- Pass Lane

Sensor 3 -- 85th Percentile Speed -- Trucks



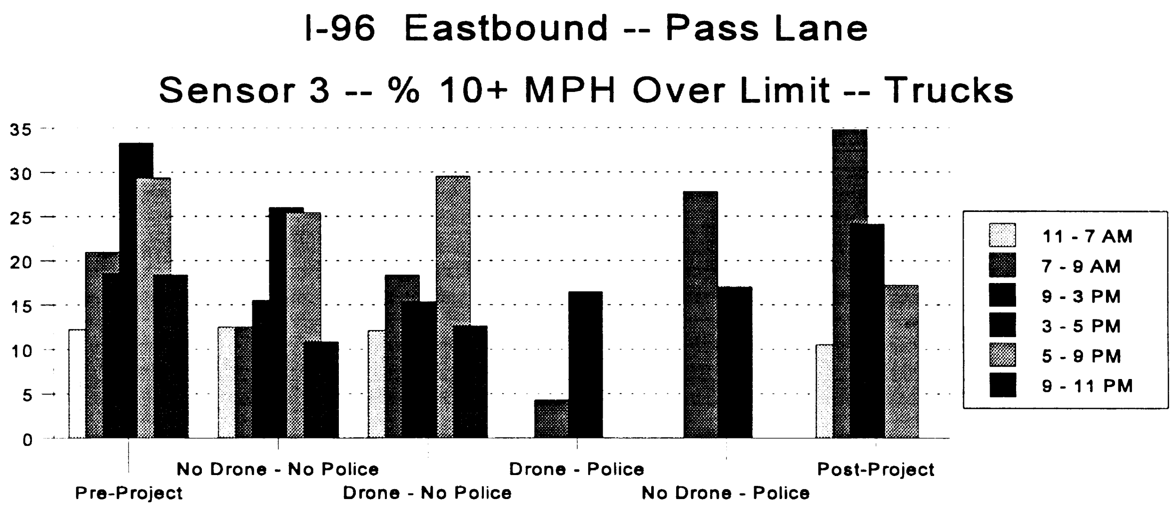
11 - 7 AM	61.16	61.46	60.68			
7 - 9 AM	63.26	63.31	63.22	61.13	65.13	65.17
9 - 3 PM	63.85	63.3	63.58			66.76
3 - 5 PM	64.83	66.02	62.75	64.19	64.53	64.44
5 - 9 PM	64.63	64.49	65.89			64.28
9 - 11 PM	62.08	63.47	61.86			61.29

Figure 114. I-96 Eastbound, Pass Lane, Sensor 3, 85th Percentile Speed, Trucks



11 - 7 AM	0.88	0.95	0.74		
7 - 9 AM	1.08	1.23	0.7	0.27	0.78
9 - 3 PM	1.08	0.59	0.54		
3 - 5 PM	1	0.74	0.85	0.44	0.83
5 - 9 PM	2.58	1.31	1.66		
9 - 11 PM	0.25	0.5	0.76		

Figure 115. I-96 Eastbound, Drive Lane, Sensor 3, % 10+ MPH Over Limit, Trucks



11 - 7 AM	12.23	12.5	12.14			10.53
7 - 9 AM	20.93	12.5	18.33	4.25	27.78	34.78
9 - 3 PM	18.54	15.52	15.32			24.1
3 - 5 PM	33.33	26	10.67	16.46	17.05	14.52
5 - 9 PM	29.35	25.44	29.54			17.24
9 - 11 PM	18.31	10.85	12.62			0

Figure 116. I-96 Eastbound, Pass Lane, Sensor 3, % 10+ MPH Over Limit, Trucks

Summary Of Observations

Overall, the speed differences observed at the three different study sites over the four conditions of drone radar and police presence do not show any evidence that either the drone radar, police presence, or the combination of drone radar and police presence contribute to the practical reduction of speeds of cars on a high speed freeway or in a construction zone. Speed reductions, when present, were usually less than 1.5 mph and frequently less than 1 mph. There is some indication that the highest speed vehicles respond to the drone radar signal both with and without police presence.

The observations show that the drone radar and police presence do have a practical speed reduction effect on high speed trucks. It was obvious from the speed observations that trucks in general do not obey the 55 mph truck speed limit on expressways, and travel at speeds approaching that of cars. Comparison of the percentages of trucks in the pass lane exceeding the speed limit by 10 mph between sensor 1 located upstream of the drone radar zone and sensor 2 at the drone radar zone showed reductions for some of the conditions.

On northbound US-23 the percentage oftrucks in the pass lane traveling over 65 mph (i.e., exceeding the speed limit by over 10 mph) decreased consistently from sensor 1 to sensor 2 to sensor 3 for all conditions, indicating a pattern of speed decrease not attributable to the drone radar or police. However, in each case, comparing across the various conditions, the lowest portions of trucks exceeding 65 mph were observed for conditions where the drone radar signals and/or police patrols were present.

Decreases in the portion of trucks in the pass lane exceeding 65 mph were also observed at the southbound US-23 site. Upstream of the drone zone, no effect of drone radar or police presence on the reduction of this measure was apparent. An effect of the drone radar and police presence was clearly seen on the portion of trucks in the pass lane exceeding 65 mph at the drone radar zone and also downstream of the zone.

No clear evidence of decreases in the percentage of trucks in the pass lane exceeding 65 mph attributable to drone radar and/or police presence were observed on eastbound I-96 in the construction zone.

STATISTICAL ANALYSIS

The statistic of choice for this study was analysis of variance (ANOVA). ANOVA permits researchers to determine if the difference between two means is "real" or the result of chance variation. For example, ANOVA can determine if an observed difference in mean speed between days in which the drone radar was operating versus those days when it was not operating is "statistically significant," that is, not due to chance or random variation. The analysis design of the experimental data covered three factors with the following levels:

Factor	Levels
Drone	On, Off
Police	Present, Not present
Location	Upstream, at Drone Radar Zone, Downstream

The analyses of variance are intended to identify main effects of the factors, as well as the interactions of the factors on the speeds of vehicles. Three measures of speed, the mean speed, the 85th percentile speed, and the portion of vehicles exceeding the speed limit by at least 10 mph, served as the independent variables in the analyses. Each independent variable was analyzed separately. Separate analyses were run for cars and trucks for the drive and pass lane. The following analyses of variance were conducted:

Three-way analysis of variance for each of the three independent variables: mean speed, 85th percentile speed, and portion of vehicles exceeding speed limit by 10 mph for cars in each of the two lanes (drive and pass) and for trucks in each of the two lanes. Thus, for each of the three sites, 12 three-way analyses of variance were conducted.

Two-way analyses (drone and police) were run for each of the three independent variables (mean speed, 85th percentile speed, portion of vehicles exceeding speed limit by 10 mph) for cars in each lane and for trucks in each lane for each of the three sensors. Thus, 36 two-way analyses of variance were run for each of the three sites.

The observations consisted of 5-minute averages of the appropriate independent variables. In the analyses these were weighed by the vehicle count in that time interval. In all, 144 analyses of variance were carried out.

Table 5 shows an example of a summary table for a three-way analysis of variance on mean speed of cars in the pass lane of US-23 northbound.

TABLE 5
SUMMARY TABLE FOR 3-WAY ANOVA
FOR MEAN SPEED OF CARS IN PASS LANE
ON NORTHBOUND US-23

Source	DF	Type III SS (N)	Mean Square	F Value (N)	PR>F (N)
Drone	1	5301.52160681	5301.52160681	24.50	0.0001
Police	1	1955.77831330	1955.77831330	9.04	0.0027
Drone*Police	1	10453.10531441	10453.10531441	48.30	0.0001
Sensor	2	40819.26064283	20409.63032141	94.31	0.0001
Drone*Sensor	2	684.26817837	342.13408919	1.58	0.2063
Police*Sensor	2	358.72780622	179.36390311	0.83	0.4369
Drone*Police*Sensor	2	1171.29163275	585.64581637	2.71	0.0673

The results of this particular analysis indicate that the null hypothesis of no difference between the means of the speeds should be rejected. In other words, the differences in the average speeds with the drone radar on and off, between the sensors, and for conditions with and without police presence are significant and not due to random variation.

The mean speed with no drone radar signals was 69.74 mph and it was 69.20 mph with the drone on. The analysis found this difference of .54 mph significant because of the large number of observations.

Similarly, the small differences in the speed with and without police presence were also found to be significant. The differences in the speeds at the three sensors were also significant. However, it should be noted that the average speed at the sensors at this point decreased from 70.40 mph at sensor 1 to 69.46 mph at sensor 2 to 68.55 mph at sensor 3. This indicates an overall decrease in the speed of traffic over this portion of the roadway.

Table 6 shows an example of a summary table for a two-way analysis of variance. In this case, it is on the mean speed of cars in the pass lane at sensor 2 on northbound US-23.

TABLE 6
SUMMARY TABLE FOR 2-WAY ANOVA
FOR MEAN SPEED OF CARS IN PASS LANE
AT SENSOR 2 ON NORTHBOUND US-23

Source	DF	Type III SS (N)	Mean Square	F Value (N)	PR>F (N)
Drone	1	3562.42792680	3562.42792680	19.30	0.0001
Police	1	113.82212999	113.82212999	0.62	0.4329
Drone*Police	1	3217.14533411	3217.14533411	17.43	0.0001

The results show that the main effect of the drone is significant, that the main effect of police presence is not significant, and that the interaction of drone and police is significant. Although the drone effect is found to be significant, the difference in the means with the drone on and the drone off is actually quite small (i.e., 69.83 mph vs. 69.08 mph). Again, owing to the large number of observations, differences in speed measures of less than 1 mph are found to be statistically significant.

The pattern of results from the two-way analyses of variance is quite similar across the various conditions. Overall, all the analyses of variance conducted in this study indicate that there are real differences between the mean speeds, 85th percentile speeds, and the portion of vehicles exceeding the speed limit by 10 mph or more, for all the experimental conditions. The magnitudes in the speed measures are small, usually less than 1 mph. However, because of the statistical power of the experiment (i.e., the large number of observations) these differences are statistically significant.

Appendix B contains additional analysis of variance tables.

SUMMARY AND CONCLUSIONS

The intent of this study was to determine the effectiveness of drone radar in combination with police patrols on the reduction of speeds at a high speed freeway location and at a freeway construction zone in Michigan.

The high speed freeway site selected for study was located on US-23 just south of its interchange with I-96. Both the southbound and northbound directions were studied. The total traffic volume at that site was 51,800 vehicles per day, 4.7 percent of which were trucks. Approximately 5 percent of the cars were equipped with radar detectors. Radar detector use by trucks varied by time of day and was 19 percent during the day and 28 percent at night.

The construction zone studied was on eastbound I-96 just west of its interchange with US-23. The traffic volume was 22,300 vehicles per day, 4.4 percent of which were trucks. The percentage of cars and trucks using radar detectors was approximately 5 percent and 16.5 percent, respectively. The usage of radar detectors among the trucks did not vary over the time of day.

Mean speeds, 85th percentile speeds, and the portion of vehicles exceeding the speed limit by at least 10 mph were measured in the drive and pass lane separately for cars and for trucks. A full factorial experimental design on the factors of drone radar on and off, police, present and absent, and location relative to the drone radar device was developed and the experiment was carried out in August and September, 1993.

Analyses of variance of the speed data by three-way analysis and two-way analysis at locations upstream, at, and downstream of the drone radar zone found the effects of the drone, police presence, location, and the interactions of these factors to be statistically significant on the speed measures in almost all cases. The number of observations was very large, thus resulting in high statistical power, which, in many cases, will find differences in mean speeds as small as .5 mph to be statistically significant. The actual differences in the speed measures were small, typically less than 1.5 mph and, in many cases, less than 1 mph. Speed differences of that magnitude are not readily noticeable in the traffic stream and reductions of speed of that magnitude make no practical difference.

There is some indication that the highest speed cars reduced their speeds when drone radar signals were present. However, this effect was not observed consistently.

Patterns of speed changes relative to sensor locations were observed at all the sites. There was a decrease of speeds between sensor 1, upstream of the drone zone, to sensor 2, at the drone zone, and then to sensor 3, downstream of the drone zone at the northbound US-23 site. This decrease was evident with and without the drone signal or the presence of police. The southbound section of US-23 displayed the reverse speed pattern, with small but significant increases of speed from sensor 1 to sensor 2 to sensor 3. This increase was found regardless of the presence of the drone signal or police. A pattern of speed increase followed by a decrease was present at the eastbound I-96 site. This indicates that there are underlying speed changes on the roadways that cannot be attributed to the drone radar or police presence, but appear to be a phenomenon of the roadway environment.

The findings of this study are consistent with the results of previous studies of drone radar effects in that speed reductions on general traffic with drone radar present, although sometimes statistically significant, are consistently less than 2 mph. This study design allowed further exploration of these changes and provides indication that these small changes may be systematic speed variations from the roadway itself rather than from the drone radar.

An interesting finding from this study is that the presence of police patrols also did not cause practical reductions in the speed of cars. While it can be argued that the portion of cars equipped with radar detectors may be too small to produce the speed reduction effect, this clearly is not the case for police patrols, which can be seen by all drivers.

This study has found that drone radar, police presence, and the combination of drone radar and police presence have a practical effect on the behavior of high speed trucks. This result is also consistent with previous findings that indicate that drone radar has the greatest effect on commercial vehicles. Commercial vehicles are known to use radar detectors more than other vehicles and therefore are the ones that can sense the radar signal from the drone. Consequently, it is not surprising that an effect of drone radar and police presence is consistently found for high speed commercial vehicles.

In this study, large reductions of the portion of trucks in the pass lane exceeding the speed limit by at least 10 mph were found at two out of the three test sites. Reductions in this measure were observed at both of the zones on US-23. These varied by time of day and, in some circumstances, were quite large with magnitudes between 30 percent and 70 percent. There was no similar reduction in high speed trucks at the construction zone on I-96.

A study specifically designed to explore the effects of drone radar and police presence on the behavior of high speed commercial vehicles with different levels of radar-detector use would have to be carried before specific statements on the actual effects on the behavior of high speed trucks can be made.

However, it is clear that the drone radar and police presence do affect the speed of the fastest moving trucks. These trucks are particularly hazardous in a traffic stream and it is highly beneficial for safety to modify their speeding behavior. Although the findings about the speed reduction of trucks are not consistent, they do indicate that there are real effects of the drone radar and police patrols on high speed trucks. It can be concluded that drone radar with police presence is a good countermeasure at locations where high speed trucks are a problem.

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APPENDIX A

TOOLS AND EQUIPMENT

A-1 DECATUR ELECTRONICS LIFEGUARD DRONE RADAR

OPERATION

Radar detectors in vehicles were triggered by the Decatur Electronics Lifeguard drone radar. The Lifeguard transmits a microwave signal on the X-band used by police speed radar. This is the oldest and perhaps the most common type of police radar used. The Lifeguard is encased in a water and weather proof polycarbonate enclosure and has an internal battery for power and an external solar panel to extend operation before the battery needs recharging. Removing the front panel provides access to drone controls and displays. Twenty-four switches, twelve each for AM and PM hours, allow the user to select the hours that Lifeguard will operate during a twenty-four hour daily cycle. There are also switches to display and set the time of an internal clock. A display consisting of two LEDs indicating AM and PM, twelve LEDs indicating the hour of the day, and a two digit LED display indicating minutes of the hour are used to display the drone clock time. Removing the panel containing these controls and displays allows access to the internal battery and the control for choosing the transmitting cycle. Moving a jumper to one of five pairs of terminals allows selection of one of five different transmitting cycles, which vary from one second on/one second off to continuous operation. Finally, an LED mounted in the bottom of the enclosure indicates when the drone radar transceiver is transmitting and receiving a reflected signal. When the drone is set to operate, this makes it possible to check the drone operation easily by moving ones hand in front of the drone and observing whether or not the LED in illuminated. Keep in mind that this will not happen when the drone is in the "off" portion of the transmition cycle.

FIELD TESTING

To estimate the distance at which a Decatur Electronics Lifeguard drone radar can be "seen" by a radar detector and to get an estimate of the relative signal strength as the distance from the drone varies, field tests were conducted with the Lifeguard mounted on a mast placed 28 feet to the side of a 4-lane, limited-access highway on a straight, clear section of road 1.2 miles long. The drone was set to run in the continuous mode.

Two observers were used to gather test data. Observer #1 used a Laser Technology Industries LTI 20/20 infrared laser speed radar in the distance measuring mode to determine the distance from the drone. A 14 inch X 40 inch piece of white foam-core poster board was mounted on the mast and used as a target for the laser radar. During the first series of signal strength recordings, Observer #1 also marked the distances on the outside edge of the shoulder, at 500 foot intervals, while moving away from the Lifeguard. The method for measuring the distance to the Lifeguard had to be changed in the field. In the absence of any external support for Observer #1 to use, the foam-core poster board proved to be a difficult target to "hit" with the LTI 20/20 beyond 1500 feet. The back of a speed limit sign, 1500 ft from the Lifeguard, was used as an intermediate target for another 2000 ft or 3500 ft from the Lifeguard. At this point it also proved difficult to "hit" and, for the remaining measurements, Observer #2 would continue on the outbound leg and serve as the "target." Observer #1 would signal when Observer #2 was 500 ft away. Observer #2 would then mark the distance on the edge of the shoulder and take the signal strength reading.

A Cincinnati Microwave, Escort radar detector was used to measure relative signal strength. Power for the Escort was provided by a twelve volt lantern battery. The Escort has a meter on its front face that is graduated from 0 - 9+. The Escort was held at eye level for all readings. Observer #2 recorded the strength of the signal received on the Escort at 500-foot intervals. These readings were taken while standing at the outside edge of the shoulder. A second series of signal strength measurements were made from the other side of the two traffic lanes while returning to the Lifeguard.

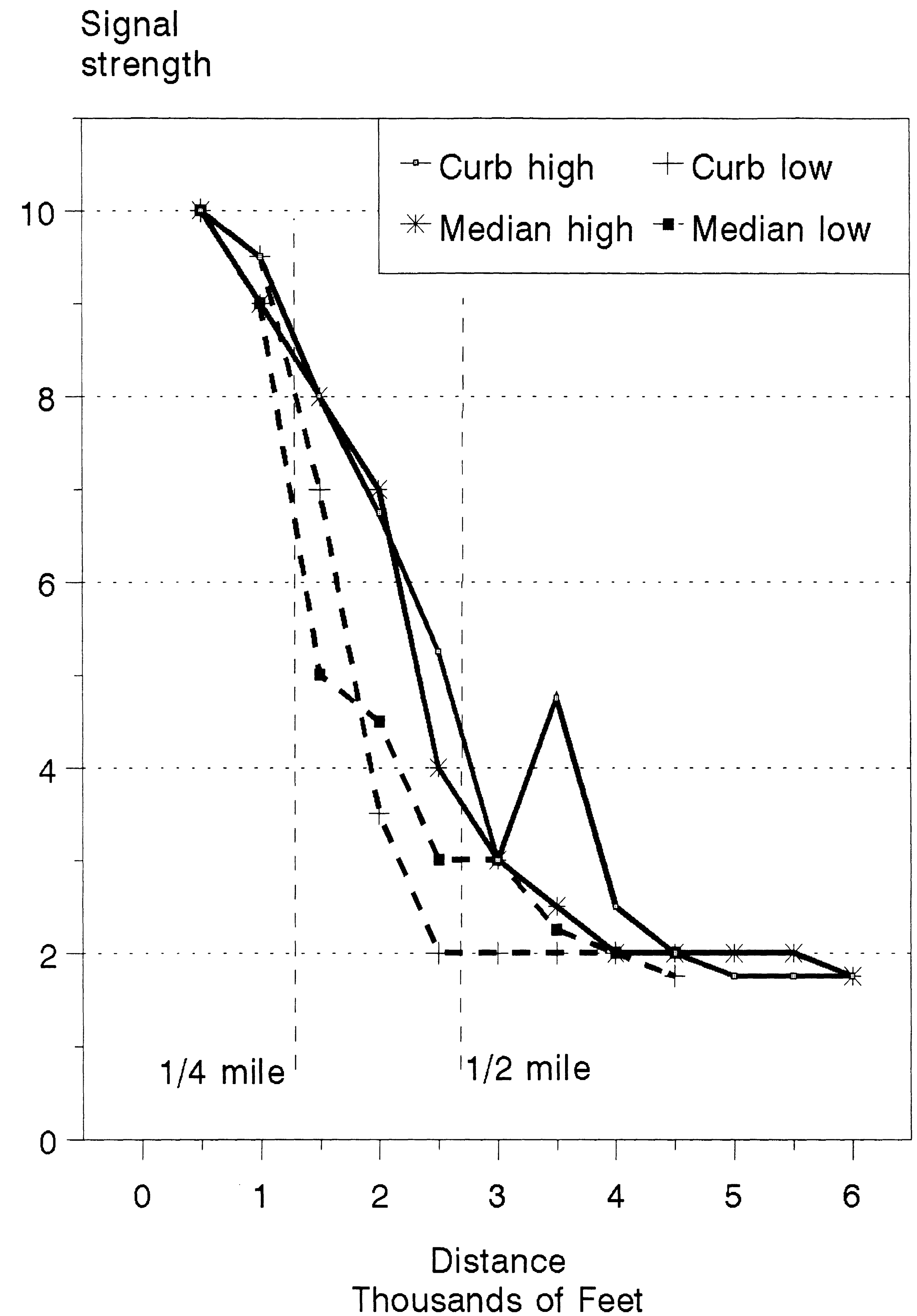
Observer #1 would stand at the distance markings made on the outbound trip while Observer #2 would stand at the edge of the median and record the signal strength. It was noticed that some traffic, especially large trucks, would affect the signal strength when interposed between the Lifeguard and the Escort. Therefore, Observer #2 would wait until traffic had cleared to take the signal strength reading. It was also noticed on the outbound leg that the signal strength measured at 3500 ft seemed quite high compared to the readings at 3000 and 4000 ft. This was rechecked on the inbound leg with the same results. The first round of signal strength readings was made with the Lifeguard approximately 8 feet above the roadway surface.

A second round of signal strength measurements was made with the Lifeguard mounted 3 ft 6 inches above the roadway surface. Since the distances had been previously marked, Observer #2 read the signal strength as before and Observer #1 recorded them for the outbound leg. Signal strength readings on the inbound leg were made as in the first round of measurements.

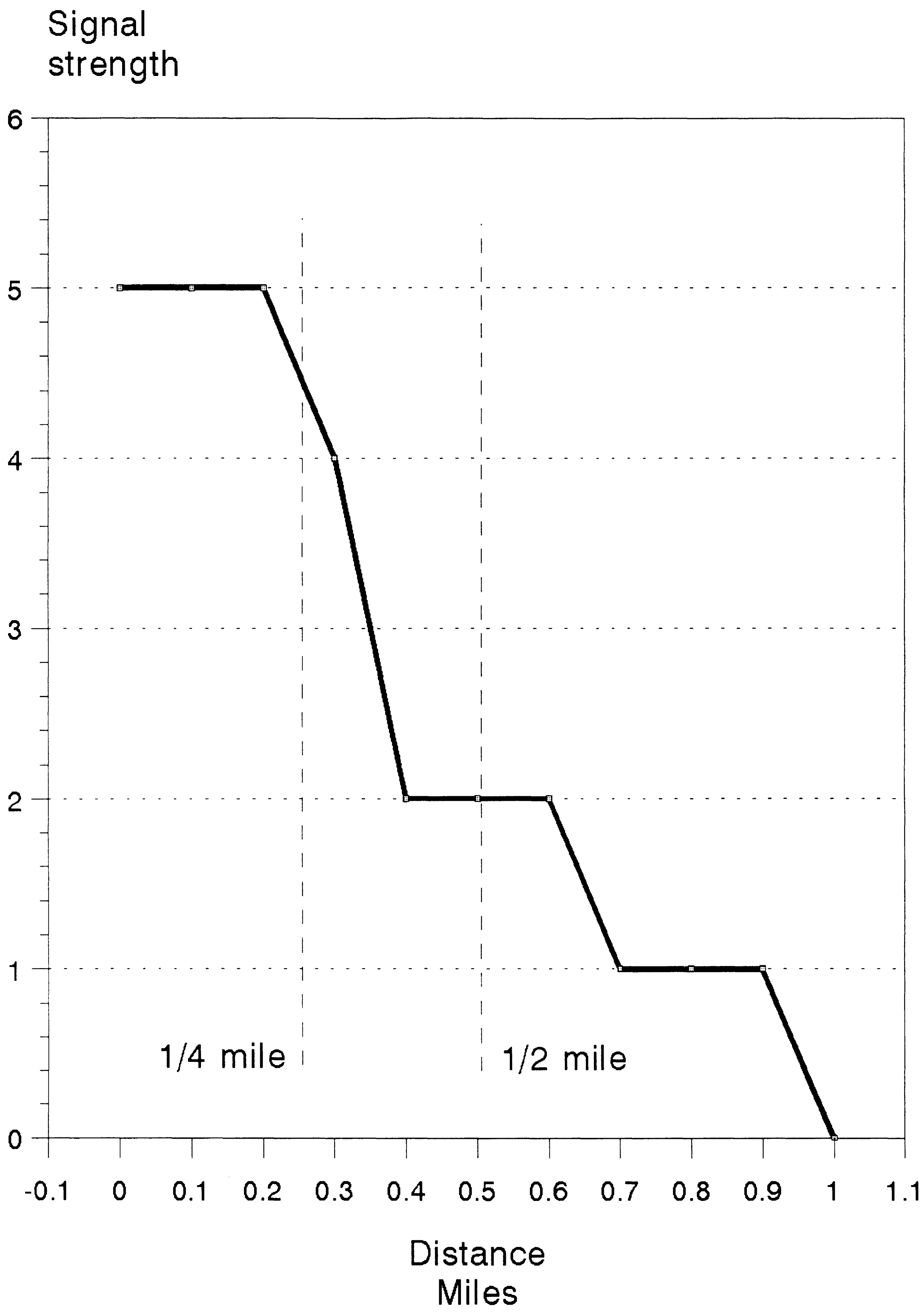
Since it was intended to have two drones at each site on opposite sides of the road, signal strength readings were also taken, at both heights, from the rear of the Lifeguard to determine what effect a drone would have on radar detectors approaching from the opposite direction and receiving the signal from the rear side of the drone. With the Escort pointed at the back of the drone, there was little difference in the signal strength at both heights and the signal dropped off rapidly from 7.0 at 100 feet to 1.75 at 500 feet.

A graph of the Escort radar detector response is shown at the end of this section. As measured by the Escort radar detector, signal strength is very high up to 1/4 mile from the drone and then drops off rapidly and fairly linearly as the distance increases from 1/4 to 1/2 mile. Determining the distance at which a radar detector responds to the Lifeguard was used to select sites on limited-access freeways for placement of the radar drones and to select the on/off cycle of operation.

After these field tests had been completed the Escort became unavailable so a similar, though simpler, test was conducted with a Cobra Trapshooter Micro radar detector. Observer #1 held the drone about four feet above the road in the same position on the same limited-access freeway as the first test. A station wagon drove away from Observer #1 on the shoulder of the road and stopped every tenth of a mile for one mile. Observer #2, located in the rear of the station wagon with the tailgate open, recorded the signal strength indicated on the Cobra's visual display. A graph of the results, shown at the end of this section, are very similar to the Escort with a radar detector response, which is high up to 1/4 mile from the drone and then falls off rapidly.



Cincinnati Microwave Escort radar detector



Cobra Trapshooter Micro radar detector

FIELD PROCEDURES

Sites for the Lifeguard drone radar units were selected to have several characteristics. First, they were placed on a section of limited-access freeway that did not contain an entrance or exit ramp. This was to allow the traffic flow to reach a steady-state condition for gathering speed data. This may not occur where traffic is leaving or merging onto the freeway. Second, the drones were placed on a clear, straight section of road that allowed drivers of vehicles with radar detectors a buffer zone in which they could recognize the presence of speed radar early and not be "surprised" by a strong signal from their detector, brake suddenly, and possibly cause a crash. Field tests of the Lifeguard showed that the strength of the signal received by a radar detector decreased rapidly beyond 1/4 mile from the drone. Third, this approach area was preceded by a hill or curve in the road to shield on-coming traffic from the Lifeguard drone radar. This was to allow for placement of the first TT-2001 traffic counter before drivers could slow down in response to the drone radar signal. Fourth, there was a place close to the roadway where observers could be safely situated and use the VG-2 to gather data on the number of radar detectors in use. With these characteristics in mind, one pair of sites was selected on opposite sides of US-23, north- and southbound. This is a rural section of freeway where the speed limit is 65 mph. The second pair of sites was selected on I-96, east- and westbound, in a highway construction area where the speed limit is 55 mph.

Once the drone radars were installed in the field the distance at which a radar detector would strongly respond to them was checked. The Cincinnati Microwave Escort radar detector was not available so a Cobra Trapshooter Micro was used instead. The drones were set to transmit continuously and then approached by a car with the radar detector on and set to the "highway" position, which is more sensitive than the "city" position. When the radar detector began sounding a continuous alarm, the trip odometer on the car was set to zero and the distance to the drone was measured and recorded. Each drone was checked this way twice. The minimum distance was 0.3 miles and the maximum was 0.6 miles.

This information was used to select the operating cycle of the drone radar units. The Lifeguard has five transmitting options available. They are:

Transmitting Option	Seconds On	Seconds Off
1	1	1
2	2	4
3	6	6
4	12	12
5	Continuous	

None of these approximates a random pattern typical of police operated speed radar. Therefore, the selection was based on an option that might appear random during travel through the buffer zone, and on how far into the buffer zone a speeding vehicle might travel during the "off" portion of the transmitting cycle. The first and fifth options were rejected because they would not appear random. The third and fourth options were rejected because of the length of the "off" cycle. During the six seconds the transmitter would be off during transmitting option three, a vehicle speeding at 90 mph (132 fps) would travel 0.15 miles (792 feet). This represents one-half of the minimum buffer distance available to receive the drone radar signal, assuming a worst case where the "off" cycle began at the start of this buffer zone. With transmitting option four, this same speeding vehicle could possibly travel completely through the buffer zone. Both of these could result in a driver being suddenly surprised by a strong radar detector alert as described above. During the four seconds the transmitter is off in the second option, a vehicle speeding at 90 mph would travel 0.1 miles (528 feet) into the buffer zone or about one-third of the minimum distance available. With a total cycle time of six seconds and buffer zone distances of 0.3 to 0.6 miles, a vehicle traveling at 65 mph (95.33 fps) would be exposed to a range of 2.8 to 5.5 transmition cycles. At a speed of 90 MPH (132 fps) a vehicle would be exposed to 2.0 to 4.0 transmition cycles and travel 0.1 miles (528 feet).

The drones were not in continuous operation during the intervention period but were used along with police patrols using speed radar to create an environment where a driver being alerted by a radar detector could not tell whether the source was the drone or police radar. Field observers were responsible for turning the drones on and off following the schedule discussed in the experimental design.

PROBLEMS

Several problems occurred with the Lifeguard drone radar units. The initial drone was received with the battery in a discharged state. The battery could not be charged and was replaced. The four Lifeguard drone radar units used in the study were installed in the field by the Michigan Department of Transportation. The batteries were checked and all were found in a discharged state. Decatur Electronics was contacted and it was determined that there was a flaw in the design that allowed the drone to draw current from the battery when the drone was not set to operate. After a sufficient amount of time, this would lead to discharging of the battery. When left in a discharged state for an extended period of time, a sulfate formed on the battery plates and the battery could no longer be charged. Since the condition of the batteries regarding the presence of this sulfate could not be determined before the study was to begin, the internal batteries were disconnected and the solar panels were removed. An external battery of sufficient capacity to operate the drone through the entire study was connected to the solar panel input connecter.

To test the operation of the Lifeguard drone with the internal battery and the solar panel, one drone was set up outside in a site receiving full sun light. In setting up and testing the drone for this test, it was noticed that the LED indicating that the radar transceiver is transmitting and receiving a reflected signal was lighting up. The drone was not set to be on at this time and this LED should not have been lit. Further testing revealed that the drone would operate when it was not supposed to. The hours of the day, during which the drone is to operate, are set with twenty-four switches, one for each hour of the day. Some switch combinations caused the drone to operate during hours when the drone was set to not operate. Decatur Electronics was contacted and it was determined that this was due to a design flaw. The schedule for setting the switches on the Lifeguard drones was then changed to accommodate this flaw.

Later in the study, on August 19, the Lifeguard on northbound US-23 was found with its internal clock stopped at 12:40 pm. The internal display would light up indicating sufficient battery charge, but the time could not be changed. This was discovered during a two-day period when the drone was not operating and this drone was replaced with the one being used to test internal battery and solar panel operation. Further operation was not affected; however, it could not be determined when this malfunction occurred.

A-2 DIAMOND TRAFFIC PRODUCTS TT-2001 TRAFFIC COUNTER

Operation

Data on traffic flow were gathered on four sections of limited-access freeway with twelve TT-2001 traffic counters. The Diamond Traffic TT-2001 is a portable, battery-powered traffic counter housed in a weather proof, aluminum enclosure. The roads were a rural section of north- and southbound US-23, where the speed limit is 65 mph, and east- and westbound I-96 in a construction zone, where the speed limit is 55 mph. The installation and field maintenance of the TT-2001 units were performed by the Michigan Department of Transportation.

On each of these sections three TT-2001 traffic counters recorded time of day, lane number, speed in miles per hour, and vehicle length for each vehicle that passed. At each traffic counter, a pair of inductive loop sensors were placed in each lane as recommended by the manufacturer. As the bumper or leading edge of a vehicle passes over the lead sensor, an "on" condition is created and two timers are started. When the bumper or leading edge of the vehicle passes over the lag sensor, a second "on" condition is created that stops one of the timers. Knowing the distance between sensors and this elapsed time, the speed of the vehicle can be calculated (V = d/delta t). The second timer measures the time that elapses from this "on" condition until the rear bumper or trailing edge of the vehicle passes, which creates an "off" condition. Knowing the speed and the elapsed time, the length of the vehicle can be calculated (Distance (length) = speed x delta t). See Fig. A-1 and A-2 drone, traffic counter, and sensor loops configuration.

The traffic counters were placed to gather speed data in three areas -- before, at, and after the radar drones. The first traffic counter was located before the drones and far enough up the straffic stream so that a radar detector could not receive the signal from the drone. This allowed gathering of speed data before drivers of cars with radar detectors would be alerted by the drone signal and possibly slow down. The second traffic counter was located at, or very close to, the radar drones to gather speed data after drivers of vehicles with radar detectors had been exposed to the drone radar signal. The third traffic counter was located at least 3,400 feet after the drones where radar detectors would no longer receive the drone signal and drivers of these vehicles may have accelerated up to their speed at the first traffic counter.

The TT-2001 is equipped with a serial port to allow downloading of data. Data from the counters was downloaded to a Compac Contura 3/25 using High Leah Electronics *TrafMan* Software twice daily to minimize data that would be lost because of the limits of the TT-2001 internal memory. Downloading was performed from approximately 9:00 a.m. - 12:00 p.m. and 6:00 p.m. - 8:00 p.m., after the morning and evening computer rush hours. Each time data were downloaded, information on counter operation, battery condition, and loop sensor functioning was recorded on the form shown in Figures A-3 and A-4. Each weekday morning, this information was summarized and a facsimile itemizing equipment needing maintenance was sent to MDOT. Since the counters were located close to the roadway field personnel were equipped with a hard hat, fluorescent orange safety vest and goggles to provide visibility and some protection from debris thrown up by passing vehicles. In addition their vehicle was equipped with an orange rotating safety light and a cellular phone.

Problems

Data were occasionally lost due to equipment failures. The batteries in the TT-2001 traffic counters occasionally discharged before their scheduled replacement. In one case a TT-2001 was struck by a vehicle and the sensors were torn loose from the counter. The most common problem was failure of the sensors. The sensors would sometimes work intermittently or stop working altogether. The environment in the construction zone on westbound I-96 proved particularly hostile, with the majority of the sensor failures occurring there.

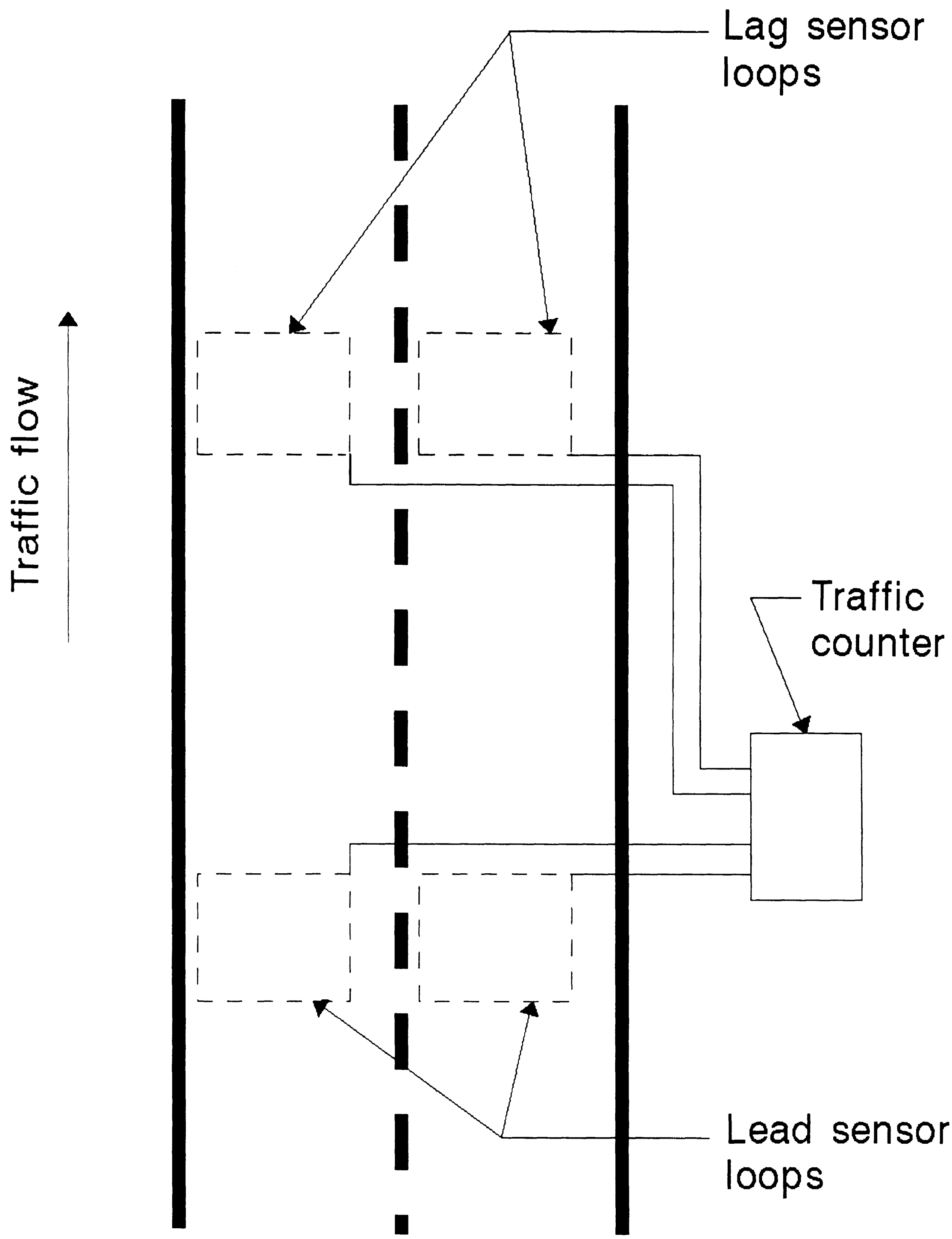


Fig. A-1 Typical traffic counter and speed loops configuration for one counter in one direction of traffic flow.

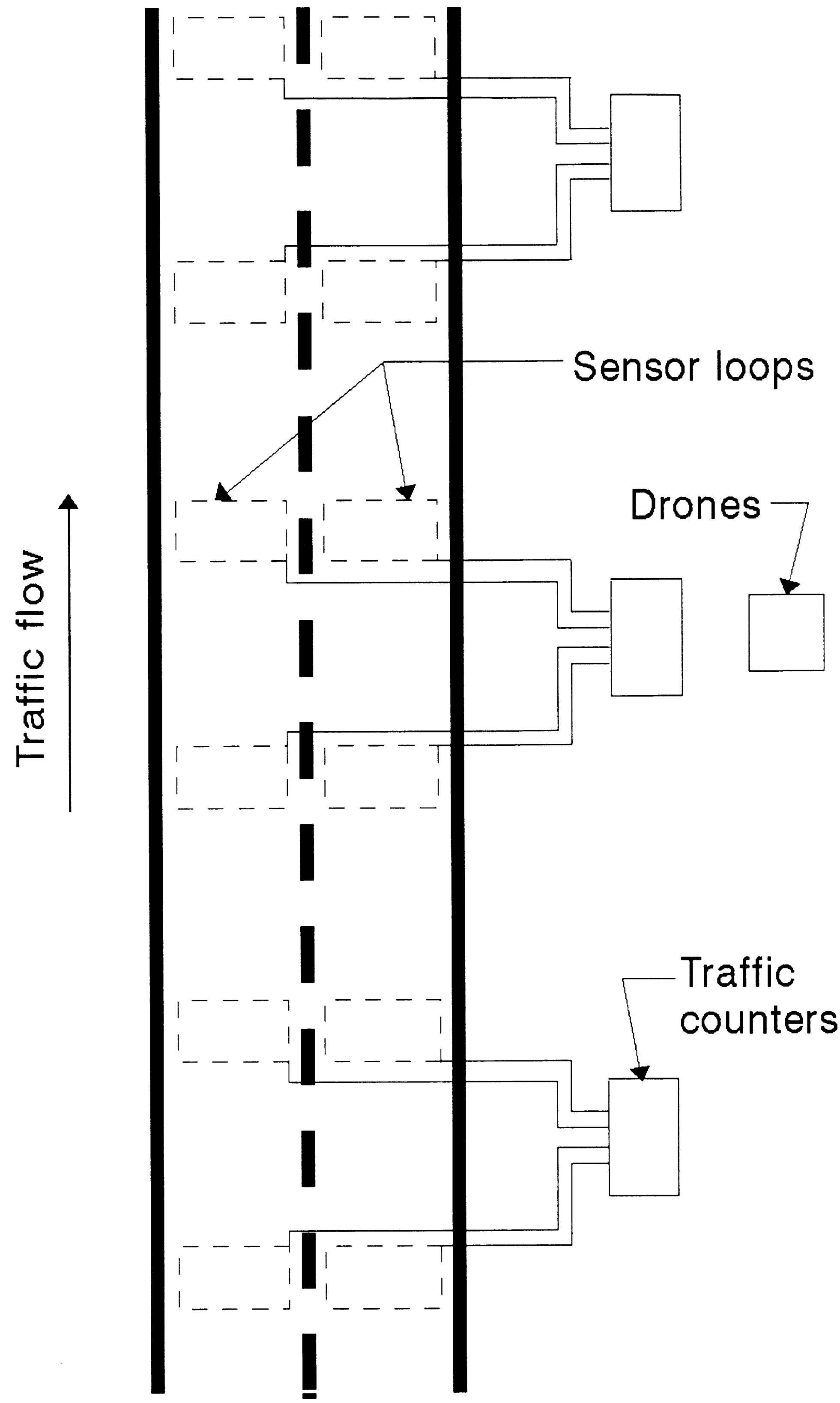


Fig. A-2 Typical drone, traffic counter, and sensor loops configuration for three counters in one direction of traffic flow.

DATE:______________

TIME:_________AM/PM

US-23

OBSERVER:__________

NORTH

NOT TO SCALE.

LEE ROAD

S231D TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)	N233D TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)
S231P TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)	N233P TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)
S232D TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)	N232D TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)
S232P TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)	N232P TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)
S233D TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)	N231D TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)
S233P TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)	N231P TALLEY COUNTER BATTERY LOOP 1 (LEAD) LOOP 2 (LAG)

SILVER LAKE ROAD

Fig. A-3 Data collection form for US-23 sensors and counters.

DATE:______________

TIME:_________AM/PM

OBSERVER:__________

I-96

NORTH

NOT TO SCALE.

W963D	W962D	W961D
TALLEY COUNTER	TALLEY COUNTER	TALLEY COUNTER
BATTERY	BATTERY	BATTERY
LOOP 1 (LEAD)	LOOP 1 (LEAD)	LOOP 1 (LEAD)
LOOP 2 (LAG)	LOOP 2 (LAG)	LOOP 2 (LAG)
W963P	**W962P**	**W961P**
TALLEY COUNTER	TALLEY COUNTER	TALLEY COUNTER
BATTERY	BATTERY	BATTERY
LOOP 1 (LEAD)	LOOP 1 (LEAD)	LOOP 1 (LEAD)
LOOP 2 (LAG)	LOOP 2 (LAG)	LOOP 2 (LAG)

DORR ROAD

GRAND RIVER AVE.

E961D	E962D	E963D
TALLEY COUNTER	TALLEY COUNTER	TALLEY COUNTER
BATTERY	BATTERY	BATTERY
LOOP 1 (LEAD)	LOOP 1 (LEAD)	LOOP 1 (LEAD)
LOOP 2 (LAG)	LOOP 2 (LAG)	LOOP 2 (LAG)
E961P	**E962P**	**E963P**
TALLEY COUNTER	TALLEY COUNTER	TALLEY COUNTER
BATTERY	BATTERY	BATTERY
LOOP 1 (LEAD)	LOOP 1 (LEAD)	LOOP 1 (LEAD)
LOOP 2 (LAG)	LOOP 2 (LAG)	LOOP 2 (LAG)

Fig A-4 Data collection form for I-96 sensors and counters.

A-3 TECHNISONIC INDUSTRIES INTERCEPTOR VG-2 RADAR DETECTOR DETECTOR

Operation

The presence of operating radar detectors was determined using the Technisonic Industries Limited Interceptor VG-2 microwave receiver. When operating, radar detectors emit a radio signal at a frequency of approximately 11.55 GHz. The VG-2 receives this signal, compares it to a threshold level, which is manually adjustable, and turns on both audio and visual alarms to indicate the presence of an operating radar detector. The audio alarm is a continuous beep with the loudness manually set with a volume control. The visual alarm is a series of ten LEDs forming a horizontal bar graph. This alarm indicates the strength of the microwave signal received from a radar detector. The sensitivity is also manually set.

Lund (1990) tested the VG-2 and found a typical response pattern in which the signal increased gradually as the radar detector approached and then rapidly fell to zero as the radar detector passed the VG-2. This response pattern was unaffected by the velocity of the radar detector, location of the radar detector in the target vehicle, and the size and construction of the target vehicle. In addition, this response pattern is much weaker and lasts for a much shorter period of time when vehicles are approaching from the opposite direction and the radar detector signals are received by the "back" of the VG-2. The ability to recognize the response pattern of the VG-2 enabled our observers to discriminate between radar detectors in the traffic lanes being observed and spurious responses.

Lund also found that identifying specific vehicles as having an operating radar detectors is difficult under two conditions. First, when traffic is dense and vehicles are following each other closely or are side-by-side, the response pattern of the VG-2 would not make it possible to determine which specific vehicle or vehicles have a radar detector.

Second, some radar detector emit a stronger signal than others and will effectively mask the presence of another radar detector with a weaker signal. In addition to the conditions mentioned above, this can also occur when a "noisier" radar detector is following a "quieter" one.

Field Testing

Field testing was conducted to confirm the response pattern reported by Lund (1990) and to familiarize field observers with the operation of the VG-2. In the first test the VG-2 and field observers were located on the sidewalk next to a local street. A known target vehicle with a radar detector turned on drove by several times and the VG-2 consistently responded as reported by Lund. The second test took place on a limited-access freeway with a rural road running close and parallel to it. This site was selected because of its similarity to the sites where observations would take place during the study. The VG-2 continued to respond as previously discussed although there was one unexplained response. On this occasion the VG-2 responded in its characteristic fashion; the audio alarm sounded while the visual alarm slowly increased from zero to a maximum reading and then quickly fell to zero. There were no other vehicles present traveling on either direction of the freeway or the rural road where the VG-2 was located. Technisonic Industries was contacted and, while increasing electromagnetic pollution will cause spurious responses, there was no information available on what else might cause the VG-2 to respond as described. Field observers were instructed to ignore this type of response when collecting data.

The data collection technique was also practiced and evaluated during these tests. The observers counted vehicles in five categories:

- Other vehicles - no detector on,
- Semis - no detector on,
- Other vehicles - detector on,
- Semis - detector on,
- Detector on - don't know vehicle type.

Observations were recorded with a hash mark for each vehicle in the first four categories. When a radar detector was on and the vehicle type was unknown, observers made a hash mark *under* "DETECTOR ON - DON'T KNOW VEHICLE TYPE" and the appropriate "NO DETECTOR ON" categories. This proved to be rather cumbersome in the "OTHER VEHICLES - NO DETECTOR ON" category because of the large number of vehicles in this category. Data collection was modified so that observers maintained a count of the vehicles in this category and wrote down and circled the number when there was a break in the traffic flow. A sample of the form used for training and for collecting data is shown on the next page.

OBSERVER ______________ DATE ___/___/93 SITE US-23 I-96

TRAFFIC NB SB EB WB START TIME ___:___ AM/PM END TIME ___:___ AM/PM

OTHER VEHICLES - NO DETECTOR ON	SEMIS - NO DETECTOR ON
OTHER VEHICLES - DETECTOR ON	**SEMIS - DETECTOR ON**

DETECTOR ON - DON'T KNOW VEHICLE TYPE

COMMENTS:

APPENDIX B

ANALYSIS OF VARIANCE

SAMPLE CALCULATIONS

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1
SENSOR	3	1 2 3

Number of observations in data set = 954

General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	59345.21720424	5395.01974584	24.93	0.0001
Error	942	203859.17207065	216.41101069		
Corrected Total	953	263204.38927490			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.225472	21.18171	14.71091468	69.45103131

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	4607.07620552	4607.07620552	21.29	0.0001
POLICE	1	2353.52956283	2353.52956283	10.88	0.0010
DRONE*POLICE	1	9001.65523046	9001.65523046	41.60	0.0001
SENSOR	2	41140.55520167	20570.27760083	95.05	0.0001
DRONE*SENSOR	2	693.82027942	346.91013971	1.60	0.2018
POLICE*SENSOR	2	377.28909159	188.64454580	0.87	0.4186
DRONE*POLICE*SENSOR	2	1171.29163275	585.64581637	2.71	0.0673

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	5301.52160681	5301.52160681	24.50	0.0001
POLICE	1	1955.77831330	1955.77831330	9.04	0.0027
DRONE*POLICE	1	10453.10531441	10453.10531441	48.30	0.0001
SENSOR	2	40819.26064283	20409.63032141	94.31	0.0001
DRONE*SENSOR	2	684.26817837	342.13408919	1.58	0.2063
POLICE*SENSOR	2	358.72780622	179.36390311	0.83	0.4369
DRONE*POLICE*SENSOR	2	1171.29163275	585.64581637	2.71	0.0673

General Linear Models Procedure
Least Squares Means

DRONE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	69.7374013	4.949492 0.0001
1	69.1987986	

POLICE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	69.6316679	3.006216 0.0027
1	69.3045321	

DRONE	POLICE	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	70.2791165	1	.	7.11963 0.0001	8.351575 0.0001	5.562834 0.0001
0	1	69.1956862	2	-7.11963 0.0001	.	1.389949 0.1649	-1.42532 0.1544

1	0	68.9842193	3	-8.35158	-1.38995	.	-2.75818
				0.0001	0.1649		0.0059
1	1	69.4133780	4	-5.56283	1.425319	2.758181	.
				0.0001	0.1544	0.0059	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

SENSOR	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3
1	70.3991527	1	.	7.062395	13.73367
				0.0001	0.0001
2	69.4561466	2	-7.0624	.	6.894827
			0.0001		0.0001
3	68.5490007	3	-13.7337	-6.89483	.
			0.0001	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

DRONE	SENSOR	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4	5	6
0	1	70.5386401	1	.	3.771163	8.995017	1.443817	7.664869	11.84757
					0.0002	0.0001	0.1491	0.0001	0.0001
0	2	69.8301065	2	-3.77116	.	5.399382	-2.28925	4.057265	8.41653
				0.0002		0.0001	0.0223	0.0001	0.0001
0	3	68.8434573	3	-8.99502	-5.39938	.	-7.52429	-1.29093	3.136243
				0.0001	0.0001		0.0001	0.1970	0.0018
1	1	70.2596652	4	-1.44382	2.289253	7.524289	.	6.204476	10.41319
				0.1491	0.0223	0.0001		0.0001	0.0001
1	2	69.0821866	5	-7.66487	-4.05726	1.290931	-6.20448	.	4.371173
				0.0001	0.0001	0.1970	0.0001		0.0001
1	3	68.2545440	6	-11.8476	-8.41653	-3.13624	-10.4132	-4.37117	.
				0.0001	0.0001	0.0018	0.0001	0.0001	

General Linear Models Procedure
Least Squares Means

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

POLICE	SENSOR	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4	5	6
0	1	70.6264025	1	.	5.846041	9.691249	2.352235	6.452891	11.98621
					0.0001	0.0001	0.0189	0.0001	0.0001
0	2	69.5229910	2	-5.84604	.	4.161732	-3.49049	0.725227	6.422455
				0.0001		0.0001	0.0005	0.4685	0.0001
0	3	68.7456101	3	-9.69125	-4.16173	.	-7.45526	-3.39159	2.094077
				0.0001	0.0001		0.0001	0.0007	0.0365
1	1	70.1719028	4	-2.35224	3.490491	7.455261	.	4.142486	9.735363
				0.0189	0.0005	0.0001		0.0001	0.0001
1	2	69.3893021	5	-6.45289	-0.72523	3.391589	-4.14249	.	5.594703
				0.0001	0.4685	0.0007	0.0001		0.0001
1	3	68.3523913	6	-11.9862	-6.42246	-2.09408	-9.73536	-5.5947	.
				0.0001	0.0001	0.0365	0.0001	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

DRONE	POLICE	SENSOR	MEANMPH LSMEAN	LSMEAN Number
0	0	1	71.0003810	1
0	0	2	70.2523265	2
0	0	3	69.5846420	3

0	1	1	70.0768992	4
0	1	2	69.4078866	5
0	1	3	68.1022727	6
1	0	1	70.2524240	7
1	0	2	68.7936556	8
1	0	3	67.9065782	9
1	1	1	70.2669065	10
1	1	2	69.3707176	11
1	1	3	68.6025098	12

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	1	2	3	4	5	6	7	8	9
1	.	2.745387	5.162218	3.375482	5.831943	10.62058	2.699069	8.116501	10.86343
		0.0062	0.0001	0.0008	0.0001	0.0001	0.0071	0.0001	0.0001
2	-2.74539	.	2.579514	0.679591	3.278305	8.353438	-0.00037	5.690595	8.68847
	0.0062		0.0100	0.4969	0.0011	0.0001	0.9997	0.0001	0.0001
3	-5.16222	-2.57951	.	-1.89324	0.681245	5.717649	-2.53215	3.063294	6.174492
	0.0001	0.0100		0.0586	0.4959	0.0001	0.0115	0.0023	0.0001
4	-3.37548	-0.67959	1.893241	.	2.585492	7.637058	-0.66732	4.983317	8.005535
	0.0008	0.4969	0.0586		0.0099	0.0001	0.5047	0.0001	0.0001
5	-5.83194	-3.2783	-0.68124	-2.58549	.	5.060379	-3.21744	2.390429	5.54855
	0.0001	0.0011	0.4959	0.0099		0.0001	0.0013	0.0170	0.0001
6	-10.6206	-8.35344	-5.71765	-7.63706	-5.06038	.	-8.19753	-2.69277	0.723756
	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	0.0072	0.4694
7	-2.69907	0.000372	2.532153	0.66732	3.217438	8.197535	.	5.583656	8.540722
	0.0071	0.9997	0.0115	0.5047	0.0013	0.0001		0.0001	0.0001
8	-8.1165	-5.69059	-3.06329	-4.98332	-2.39043	2.692773	-5.58366	.	3.292997
	0.0001	0.0001	0.0023	0.0001	0.0170	0.0072	0.0001		0.0010

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: MEANMPH

i/j	1	2	3	4	5	6	7	8	9
9	-10.8634	-8.68847	-6.17449	-8.00554	-5.54855	-0.72376	-8.54072	-3.293	.
	0.0001	0.0001	0.0001	0.0001	0.0001	0.4694	0.0001	0.0010	
10	-2.59077	0.05436	2.526785	0.705462	3.19566	8.058417	0.053064	5.505285	8.408344
	0.0097	0.9567	0.0117	0.4807	0.0014	0.0001	0.9577	0.0001	0.0001
11	-5.83083	-3.33453	-0.80358	-2.65952	-0.14026	4.790208	-3.27569	2.187715	5.284535
	0.0001	0.0009	0.4218	0.0080	0.8885	0.0001	0.0011	0.0289	0.0001
12	-8.74554	-6.37563	-3.76822	-5.67213	-3.10492	1.930001	-6.25796	-0.74047	2.561351
	0.0001	0.0001	0.0002	0.0001	0.0020	0.0539	0.0001	0.4592	0.0106

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	10	11	12
1	2.590767	5.830829	8.745543
	0.0097	0.0001	0.0001
2	-0.05436	3.334532	6.375631
	0.9567	0.0009	0.0001
3	-2.52678	0.803578	3.768218
	0.0117	0.4218	0.0002
4	-0.70546	2.659521	5.672126
	0.4807	0.0080	0.0001
5	-3.19566	0.140264	3.104918
	0.0014	0.8885	0.0020
6	-8.05842	-4.79021	-1.93
	0.0001	0.0001	0.0539
7	-0.05306	3.275687	6.257964
	0.9577	0.0011	0.0001
8	-5.50528	-2.18772	0.740467
	0.0001	0.0289	0.4592

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: MEANMPH

i/j	10	11	12
9	-8.40834	-5.28454	-2.56135
	0.0001	0.0001	0.0106
10	.	3.254912	6.165715
		0.0012	0.0001
11	-3.25491	.	2.88643
	0.0012		0.0040
12	-6.16571	-2.88643	.
	0.0001	0.0040	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

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General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1
SENSOR	3	1 2 3

Number of observations in data set = 954

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General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	81913.27378081	7446.66125280	23.93	0.0001
Error	942	293177.88898589	311.22918151		
Corrected Total	953	375091.16276670			

	R-Square	C.V.	Root MSE	MPH85 Mean
	0.218382	23.73891	17.64168874	74.31549893

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	4147.28333735	4147.28333735	13.33	0.0003
POLICE	1	1797.09137618	1797.09137618	5.77	0.0165
DRONE*POLICE	1	7639.61759333	7639.61759333	24.55	0.0001
SENSOR	2	66525.91995657	33262.95997828	106.88	0.0001
DRONE*SENSOR	2	375.52412515	187.76206257	0.60	0.5472
POLICE*SENSOR	2	2.47055927	1.23527964	0.00	0.9960
DRONE*POLICE*SENSOR	2	1425.36683290	712.68341645	2.29	0.1018

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	4894.67431833	4894.67431833	15.73	0.0001
POLICE	1	1335.19397676	1335.19397676	4.29	0.0386
DRONE*POLICE	1	9348.82807099	9348.82807099	30.04	0.0001
SENSOR	2	65795.44558215	32897.72279108	105.70	0.0001
DRONE*SENSOR	2	375.47391301	187.73695651	0.60	0.5473
POLICE*SENSOR	2	0.95094601	0.47547301	0.00	0.9985
DRONE*POLICE*SENSOR	2	1425.36683290	712.68341645	2.29	0.1018

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General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	74.5894589	3.965717
		0.0001
1	74.0719352	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	74.4659453	2.071248
		0.0386
1	74.1955488	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4

0	0	75.0822231	1	.	5.40039	6.62994	4.2212
					0.0001	0.0001	0.0001
0	1	74.0966947	2	-5.40039	.	1.35504	-1.07943
				0.0001		0.1757	0.2807
1	0	73.8494676	3	-6.62994	-1.35504	.	-2.38452
				0.0001	0.1757		0.0173
1	1	74.2944029	4	-4.2212	1.07943	2.384522	.
				0.0001	0.2807	0.0173	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

SENSOR	MPH85 LSMEAN	i/j	1	2	3
1	75.4004236	1	.	5.546027	14.3673
				0.0001	0.0001
2	74.5123582	2	-5.54603	.	9.082529
			0.0001		0.0001
3	73.0793094	3	-14.3673	-9.08253	.
			0.0001	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

DRONE	SENSOR	MPH85 LSMEAN	i/j	1	2	3	4	5	6
0	1	75.5889572	1	.	3.196234	10.08101	1.627292	6.2888	11.85539
					0.0014	0.0001	0.1040	0.0001	0.0001
0	2	74.8688054	2	-3.19623	.	7.110524	-1.52466	3.224801	9.001615
				0.0014		0.0001	0.1277	0.0013	0.0001
0	3	73.3106140	3	-10.081	-7.11052	.	-8.42332	-3.81159	2.05434
				0.0001	0.0001		0.0001	0.0001	0.0402
1	1	75.2118899	4	-1.62729	1.524657	8.423317	.	4.63988	10.23692
				0.1040	0.1277	0.0001		0.0001	0.0001
1	2	74.1559111	5	-6.2888	-3.2248	3.811591	-4.63988	.	5.760117
				0.0001	0.0013	0.0001	0.0001		0.0001
1	3	72.8480047	6	-11.8554	-9.00162	-2.05434	-10.2369	-5.76012	.
				0.0001	0.0001	0.0402	0.0001	0.0001	

General Linear Models Procedure
Least Squares Means

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

POLICE	SENSOR	MPH85 LSMEAN	i/j	1	2	3	4	5	6
0	1	75.5380701	1	.	3.956777	9.973006	1.18807	5.027334	11.4122
					0.0001	0.0001	0.2351	0.0001	0.0001
0	2	74.6424627	2	-3.95678	.	6.363479	-2.78235	1.177064	7.781395
				0.0001		0.0001	0.0055	0.2395	0.0001
0	3	73.2170031	3	-9.97301	-6.36348	.	-8.91685	-5.11969	1.222931
				0.0001	0.0001		0.0001	0.0001	0.2217
1	1	75.2627770	4	-1.18807	2.782352	8.916847	.	3.886522	10.35624
				0.2351	0.0055	0.0001		0.0001	0.0001
1	2	74.3822538	5	-5.02733	-1.17706	5.119693	-3.88652	.	6.481716
				0.0001	0.2395	0.0001	0.0001		0.0001
1	3	72.9416156	6	-11.4122	-7.78139	-1.22293	-10.3562	-6.48172	.
				0.0001	0.0001	0.2217	0.0001	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

DRONE	POLICE	SENSOR	MPH85 LSMEAN	LSMEAN Number

12	-6.24537	-3.73259	.
	0.0001	0.0002	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1
SENSOR	3	1 2 3

Number of observations in data set = 954

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	763769.32339938	69433.48394540	29.79	0.0001
Error	942	2195451.77718282	2330.62821357		
Corrected Total	953	2959220.10058220			

R-Square	C.V.	Root MSE	PERC10 Mean
0.258098	473.5376	48.27658038	10.19487811

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	40882.84168750	40882.84168750	17.54	0.0001
POLICE	1	18601.18139666	18601.18139666	7.98	0.0048
DRONE*POLICE	1	22550.05475590	22550.05475590	9.68	0.0019
SENSOR	2	674244.52778848	337122.26389424	144.65	0.0001
DRONE*SENSOR	2	2603.33516436	1301.66758218	0.56	0.5723
POLICE*SENSOR	2	3072.08507197	1536.04253598	0.66	0.5176
DRONE*POLICE*SENSOR	2	1814.29753452	907.14876726	0.39	0.6777

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	48694.92824034	48694.92824034	20.89	0.0001
POLICE	1	15188.72523040	15188.72523040	6.52	0.0108
DRONE*POLICE	1	33784.11417526	33784.11417526	14.50	0.0001
SENSOR	2	673430.66497730	336715.33248865	144.47	0.0001
DRONE*SENSOR	2	2405.55163842	1202.77581921	0.52	0.5970
POLICE*SENSOR	2	3134.76976158	1567.38488079	0.67	0.5107
DRONE*POLICE*SENSOR	2	1814.29753452	907.14876726	0.39	0.6777

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	11.0627866	4.570938
		0.0001
1	9.4304484	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	10.7024433	2.552843
		0.0108
1	9.7907916	

DRONE	POLICE	PERC10 LSMEAN	i/j	1	2	3	4
0	0	12.1984334	1	.	4.54813	5.880239	4.98113
					0.0001	0.0001	0.0001
0	1	9.9271398	2	-4.54813	.	1.443464	0.544067
				0.0001		0.1492	0.5865
1	0	9.2064533	3	-5.88024	-1.44346	.	-0.87736
				0.0001	0.1492		0.3805
1	1	9.6544435	4	-4.98113	-0.54407	0.877358	.
				0.0001	0.5865	0.3805	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

SENSOR	PERC10 LSMEAN	i/j	1	2	3
1	13.7225848	1	.	6.801195	16.84632
				0.0001	0.0001
2	10.7423908	2	-6.8012	.	10.34702
			0.0001		0.0001
3	6.2748768	3	-16.8463	-10.347	.
			0.0001	0.0001	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

DRONE	SENSOR	PERC10 LSMEAN	i/j	1	2	3	4	5	6
0	1	14.3091113	1	.	4.111787	11.64793	1.849984	7.373995	14.01141
					0.0001	0.0001	0.0646	0.0001	0.0001
0	2	11.7739095	2	-4.11179	.	7.785175	-2.21207	3.410268	10.30314
				0.0001		0.0001	0.0272	0.0007	0.0001
0	3	7.1053389	3	-11.6479	-7.78518	.	-9.76362	-4.29336	2.695326
				0.0001	0.0001		0.0001	0.0001	0.0072
1	1	13.1360584	4	-1.84998	2.212071	9.763618	.	5.499705	12.1721
				0.0646	0.0272	0.0001		0.0001	0.0001
1	2	9.7108721	5	-7.37399	-3.41027	4.293359	-5.49971	.	6.866347
				0.0001	0.0007	0.0001	0.0001		0.0001
1	3	5.4444146	6	-14.0114	-10.3031	-2.69533	-12.1721	-6.86635	.
				0.0001	0.0001	0.0072	0.0001	0.0001	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

General Linear Models Procedure
Least Squares Means

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

POLICE	SENSOR	PERC10 LSMEAN	i/j	1	2	3	4	5	6
0	1	14.4492284	1	.	5.298686	12.49581	2.291933	6.567153	13.47638
					0.0001	0.0001	0.0221	0.0001	0.0001
0	2	11.1672128	2	-5.29869	.	7.628655	-2.99746	1.404489	8.540363
				0.0001		0.0001	0.0028	0.1605	0.0001
0	3	6.4908887	3	-12.4958	-7.62865	.	-10.3612	-6.14399	0.701083
				0.0001	0.0001		0.0001	0.0001	0.4834
1	1	12.9959412	4	-2.29193	2.997459	10.36115	.	4.320112	11.31037
				0.0221	0.0028	0.0001		0.0001	0.0001
1	2	10.3175689	5	-6.56715	-1.40449	6.143989	-4.32011	.	7.001905
				0.0001	0.1605	0.0001	0.0001		0.0001
1	3	6.0588648	6	-13.4764	-8.54036	-0.70108	-11.3104	-7.00191	.
				0.0001	0.0001	0.4834	0.0001	0.0001	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

DRONE	POLICE	SENSOR	PERC10 LSMEAN	LSMEAN Number
0	0	1	15.4911602	1
0	0	2	12.9691838	2
0	0	3	8.1349560	3
0	1	1	13.1270623	4
0	1	2	10.5786352	5
0	1	3	6.0757217	6
1	0	1	13.4072966	7
1	0	2	9.3652417	8
1	0	3	4.8468214	9
1	1	1	12.8648201	10
1	1	2	10.0565025	11
1	1	3	6.0420078	12

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	1	2	3	4	5	6	7	8	9
1	.	2.820425	8.173538	2.633153	5.482054	10.51423	2.291447	6.86586	11.38928
		0.0049	0.0001	0.0086	0.0001	0.0001	0.0222	0.0001	0.0001
2	-2.82042	.	5.691108	-0.18637	2.828013	8.161246	-0.50979	4.284314	9.167427
	0.0049		0.0001	0.8522	0.0048	0.0001	0.6103	0.0001	0.0001
3	-8.17354	-5.69111	.	-5.85061	-2.86997	2.420305	-6.09203	-1.45187	3.686766
	0.0001	0.0001		0.0001	0.0042	0.0157	0.0001	0.1469	0.0002
4	-2.63315	0.18637	5.850605	.	3.001126	8.310287	-0.32465	4.451544	9.307061
	0.0086	0.8522	0.0001		0.0028	0.0001	0.7455	0.0001	0.0001
5	-5.48205	-2.82801	2.869974	-3.00113	.	5.318205	-3.28379	1.438961	6.455128
	0.0001	0.0048	0.0042	0.0028		0.0001	0.0011	0.1505	0.0001
6	-10.5142	-8.16125	-2.4203	-8.31029	-5.31821	.	-8.51755	-3.90406	1.384947
	0.0001	0.0001	0.0157	0.0001	0.0001		0.0001	0.0001	0.1664
7	-2.29145	0.509791	6.092026	0.324653	3.283791	8.51755	.	4.714522	9.497213
	0.0222	0.6103	0.0001	0.7455	0.0011	0.0001		0.0001	0.0001
8	-6.86586	-4.28431	1.451874	-4.45154	-1.43896	3.904063	-4.71452	.	5.111161
	0.0001	0.0001	0.1469	0.0001	0.1505	0.0001	0.0001		0.0001

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: PERC10

i/j	1	2	3	4	5	6	7	8	9
9	-11.3893	-9.16743	-3.68677	-9.30706	-6.45513	-1.38495	-9.49721	-5.11116	.
	0.0001	0.0001	0.0002	0.0001	0.0001	0.1664	0.0001	0.0001	
10	-2.82681	-0.11857	5.337861	-0.29669	2.591624	7.701593	-0.60568	3.984942	8.703766
	0.0048	0.9056	0.0001	0.7668	0.0097	0.0001	0.5449	0.0001	0.0001
11	-5.92526	-3.35703	2.19949	-3.52377	-0.60041	4.580936	-3.79341	0.798571	5.72979
	0.0001	0.0008	0.0281	0.0004	0.5484	0.0001	0.0002	0.4247	0.0001
12	-10.5016	-8.15731	-2.44697	-8.30577	-5.32951	-0.03964	-8.51265	-3.92288	1.340421
	0.0001	0.0001	0.0146	0.0001	0.0001	0.9684	0.0001	0.0001	0.1804

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	10	11	12
1	2.826815	5.925265	10.50164
	0.0049	0.0001	0.0001
2	0.11857	3.357029	8.157309
	0.9056	0.0008	0.0001
3	-5.33786	-2.19949	2.446965
	0.0001	0.0281	0.0146
4	0.296694	3.523771	8.305773
	0.7668	0.0004	0.0001
5	-2.59162	0.600413	5.32951
	0.0097	0.5484	0.0001
6	-7.70159	-4.58094	0.039636
	0.0001	0.0001	0.9684
7	0.605679	3.793406	8.512647
	0.5449	0.0002	0.0001
8	-3.98494	-0.79857	3.922883
	0.0001	0.4247	0.0001

Dependent Variable: PERC10

i/j	10	11	12
9	-8.70377	-5.72979	-1.34042
	0.0001	0.0001	0.1804
10	.	3.108058	7.701817
		0.0019	0.0001
11	-3.10906	.	4.596384
	0.0019		0.0001
12	-7.70182	-4.59638	.
	0.0001	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1
SENSOR	3	1 2 3

Number of observations in data set = 789

General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	126749.13112555	11522.64828414	33.08	0.0001
Error	777	270659.31084325	348.33888139		
Corrected Total	788	397408.44196880			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.318939	28.83144	18.66383887	64.73432581

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	11868.36695065	11868.36695065	34.07	0.0001
POLICE	1	25730.71185271	25730.71185271	73.87	0.0001
DRONE*POLICE	1	372.20193702	372.20193702	1.07	0.3016
SENSOR	2	85698.83365844	42849.41682922	123.01	0.0001
DRONE*SENSOR	2	307.88709342	153.94354671	0.44	0.6430
POLICE*SENSOR	2	430.40348245	215.20174123	0.62	0.5394
DRONE*POLICE*SENSOR	2	2340.72615087	1170.36307543	3.36	0.0352

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	6450.45155567	6450.45155567	18.52	0.0001
POLICE	1	15556.47936736	15556.47936736	44.66	0.0001
DRONE*POLICE	1	45.50079815	45.50079815	0.13	0.7179
SENSOR	2	81267.58774535	40633.79387268	116.65	0.0001
DRONE*SENSOR	2	194.96697526	97.48348763	0.28	0.7560
POLICE*SENSOR	2	1017.17009402	508.58504701	1.46	0.2329
DRONE*POLICE*SENSOR	2	2340.72615087	1170.36307543	3.36	0.0352

General Linear Models Procedure
Least Squares Means

DRONE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	65.1203886	4.303225 0.0001
1	64.4527552	

POLICE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	65.3049763	6.682742 0.0001
1	64.2681675	

DRONE	POLICE	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	65.6668294	1	.	6.163279 0.0001	3.488754 0.0005	7.155526 0.0001
0	1	64.5739478	2	-6.16328	.	-1.8565	2.650172

				0.0001		0.0638	0.0082
1	0	64.9431232	3	-3.48875	1.856497	.	3.851514
				0.0005	0.0638		0.0001
1	1	63.9623872	4	-7.15553	-2.65017	-3.85151	.
				0.0001	0.0082	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

SENSOR	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3
1	65.2460598	1	.	10.56964	-2.90654
				0.0001	0.0038
2	63.2769361	2	-10.5696	.	-14.2402
			0.0001		0.0001
3	65.8367198	3	2.90654	14.24018	.
			0.0038	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

DRONE	SENSOR	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4	5	6
0	1	65.6304779	1	.	8.941502	-2.0664	2.600859	11.40494	0.151756
					0.0001	0.0391	0.0095	0.0001	0.8794
0	2	63.6437867	2	-8.9415	.	-11.7357	-4.25461	3.234759	-6.93906
				0.0001		0.0001	0.0001	0.0013	0.0001
0	3	66.0869012	3	2.066398	11.73566	.	4.295709	14.08564	1.793828
				0.0391	0.0001		0.0001	0.0001	0.0732
1	1	64.8616416	4	-2.60086	4.254609	-4.29571	.	6.524665	-2.12469
				0.0095	0.0001	0.0001		0.0001	0.0339
1	2	62.9100855	5	-11.4049	-3.23476	-14.0856	-6.52467	.	-9.13124
				0.0001	0.0013	0.0001	0.0001		0.0001
1	3	65.5865385	6	-0.15176	6.939058	-1.79383	2.12469	9.131241	.
				0.8794	0.0001	0.0732	0.0339	0.0001	

General Linear Models Procedure
Least Squares Means

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

POLICE	SENSOR	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4	5	6
0	1	65.6114212	1	.	6.496112	-2.77443	2.471927	11.92996	0.983292
					0.0001	0.0057	0.0137	0.0001	0.3258
0	2	63.9554380	2	-6.49611	.	-9.92125	-3.37754	5.98279	-5.09514
				0.0001		0.0001	0.0008	0.0001	0.0001
0	3	66.3480697	3	2.774426	9.921251	.	5.16988	15.71098	3.666435
				0.0057	0.0001		0.0001	0.0001	0.0003
1	1	64.8806984	4	-2.47193	3.377535	-5.16988	.	8.398454	-1.44505
				0.0137	0.0008	0.0001		0.0001	0.1488
1	2	62.5984342	5	-11.93	-5.98279	-15.711	-8.39845	.	-10.2274
				0.0001	0.0001	0.0001	0.0001		0.0001
1	3	65.3253700	6	-0.98329	5.095139	-3.66644	1.44505	10.22737	.
				0.3258	0.0001	0.0003	0.1488	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

DRONE	POLICE	SENSOR	MEANMPH LSMEAN	LSMEAN Number
0	0	1	66.2977401	1
0	0	2	64.1431152	2

0	0	3	66.5596330	3
0	1	1	64.9632158	4
0	1	2	63.1444583	5
0	1	3	65.6141694	6
1	0	1	64.9251022	7
1	0	2	63.7677609	8
1	0	3	66.1365064	9
1	1	1	64.7981810	10
1	1	2	62.0524102	11
1	1	3	65.0365705	12

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	1	2	3	4	5	6	7	8	9
1	.	6.381417	-0.79403	4.030476	9.729542	2.080702	3.490512	7.228784	0.416636
		0.0001	0.4274	0.0001	0.0001	0.0378	0.0005	0.0001	0.6771
2	-6.38142	.	-7.98498	-2.69745	3.369601	-4.88372	-2.10929	1.156768	-5.47501
	0.0001		0.0001	0.0071	0.0008	0.0001	0.0352	0.2477	0.0001
3	0.794028	7.984982	.	5.405584	11.88132	3.233101	4.494988	8.825308	1.185707
	0.4274	0.0001		0.0001	0.0001	0.0013	0.0001	0.0001	0.2361
4	-4.03048	2.697454	-5.40558	.	6.295265	-2.21507	0.104479	3.763044	-3.27699
	0.0001	0.0071	0.0001		0.0001	0.0270	0.9168	0.0002	0.0011
5	-9.72954	-3.3696	-11.8813	-6.29527	.	-8.6369	-4.96775	-2.00829	-8.51071
	0.0001	0.0008	0.0001	0.0001		0.0001	0.0001	0.0450	0.0001
6	-2.0807	4.883715	-3.2331	2.215065	8.636899	.	1.901106	5.861736	-1.46866
	0.0378	0.0001	0.0013	0.0270	0.0001		0.0577	0.0001	0.1423
7	-3.49051	2.10929	-4.49499	-0.10448	4.96775	-1.90111	.	3.029587	-2.91079
	0.0005	0.0352	0.0001	0.9168	0.0001	0.0577		0.0025	0.0037
8	-7.22878	-1.15677	-8.82531	-3.76304	2.00829	-5.86174	-3.02959	.	-6.30712
	0.0001	0.2477	0.0001	0.0002	0.0450	0.0001	0.0025		0.0001

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: MEANMPH

i/j	1	2	3	4	5	6	7	8	9
9	-0.41664	5.475012	-1.18571	3.276985	8.510713	1.46866	2.910786	6.307122	.
	0.6771	0.0001	0.2361	0.0011	0.0001	0.1423	0.0037	0.0001	
10	-3.22309	1.467482	-3.99868	-0.37383	3.790934	-1.85648	-0.25913	2.260696	-2.76063
	0.0013	0.1426	0.0001	0.7086	0.0002	0.0638	0.7956	0.0241	0.0059
11	-11.9287	-6.31927	-13.9599	-8.97906	-3.44485	-11.0771	-7.41473	-4.99466	-10.7173
	0.0001	0.0001	0.0001	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001
12	-2.771	2.050028	-3.54364	0.170281	4.447664	-1.34699	0.232131	2.848319	-2.31525
	0.0057	0.0407	0.0004	0.8648	0.0001	0.1784	0.8165	0.0045	0.0209

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	10	11	12
1	3.223093	11.92871	2.771004
	0.0013	0.0001	0.0057
2	-1.46748	6.319269	-2.05003
	0.1426	0.0001	0.0407
3	3.998682	13.9599	3.543638
	0.0001	0.0001	0.0004
4	0.373832	8.979062	-0.17028
	0.7086	0.0001	0.8648
5	-3.79093	3.444851	-4.44766
	0.0002	0.0006	0.0001
6	1.856476	11.07712	1.346995
	0.0638	0.0001	0.1784
7	0.259128	7.414733	-0.23213
	0.7956	0.0001	0.8165
8	-2.2607	4.994664	-2.84832
	0.0241	0.0001	0.0045

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: MEANMPH

i/j	10	11	12
9	2.760628	10.71728	2.31525
	0.0059	0.0001	0.0209
10	.	5.96456	-0.44085
		0.0001	0.6594
11	-5.96456	.	-6.6298
	0.0001		0.0001
12	0.440854	6.629795	.
	0.6594	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1
SENSOR	3	1 2 3

Number of observations in data set = 789

General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	112177.54181812	10197.95834710	26.10	0.0001
Error	777	303548.28571948	390.66703439		
Corrected Total	788	415725.82753760			

R-Square	C.V.	Root MSE	MPH85 Mean
0.269835	28.35026	19.76529874	69.71822779

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	9565.27593788	9565.27593788	24.48	0.0001
POLICE	1	18091.53053266	18091.53053266	46.31	0.0001
DRONE*POLICE	1	42.41910484	42.41910484	0.11	0.7419
SENSOR	2	79142.14495230	39571.07247615	101.29	0.0001
DRONE*SENSOR	2	802.97365757	401.48682879	1.03	0.3583
POLICE*SENSOR	2	581.38155935	290.69077967	0.74	0.4755
DRONE*POLICE*SENSOR	2	3951.81607353	1975.90803677	5.06	0.0066

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	4738.50204298	4738.50204298	12.13	0.0005
POLICE	1	9208.65207144	9208.65207144	23.57	0.0001
DRONE*POLICE	1	448.36816744	448.36816744	1.15	0.2844
SENSOR	2	75198.77059776	37599.38529888	96.24	0.0001
DRONE*SENSOR	2	538.21988475	269.10994237	0.69	0.5025
POLICE*SENSOR	2	1292.46525756	646.23262878	1.65	0.1919
DRONE*POLICE*SENSOR	2	3951.81607353	1975.90803677	5.06	0.0066

General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	70.0668325	3.482709 0.0005
1	69.4946118	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	70.1795735	4.855061 0.0001
1	69.3818709	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4

0	0	70.5536935	1	.	5.185269	3.406015	5.430667
					0.0001	0.0007	0.0001
0	1	69.5799715	2	-5.18527	.	-1.07071	1.621243
				0.0001		0.2846	0.1054
1	0	69.8054535	3	-3.40601	1.070708	.	2.3054
				0.0007	0.2846		0.0214
1	1	69.1837702	4	-5.43067	-1.62124	-2.3054	.
				0.0001	0.1054	0.0214	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

SENSOR	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3
1	70.1016845	1	.	8.841109	-3.63094
				0.0001	0.0003
2	68.3573809	2	-8.84111	.	-13.2677
			0.0001		0.0001
3	70.8831011	3	3.630939	13.26768	.
			0.0003	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

DRONE	SENSOR	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4	5	6
0	1	70.5206815	1	.	8.036518	-2.26343	2.676834	9.641981	-0.63723
					0.0001	0.0239	0.0076	0.0001	0.5242
0	2	68.6296871	2	-8.03652	.	-10.9788	-3.47368	2.267294	-7.0368
				0.0001		0.0001	0.0005	0.0236	0.0001
0	3	71.0501289	3	2.263428	10.97883	.	4.527026	12.41409	1.130869
				0.0239	0.0001		0.0001	0.0001	0.2585
1	1	69.6826875	4	-2.67683	3.473684	-4.52703	.	5.043666	-2.86009
				0.0076	0.0005	0.0001		0.0001	0.0043
1	2	68.0850747	5	-9.64198	-2.26729	-12.4141	-5.04367	.	-8.47595
				0.0001	0.0236	0.0001	0.0001		0.0001
1	3	70.7160733	6	0.637226	7.036805	-1.13087	2.860088	8.475951	.
				0.5242	0.0001	0.2585	0.0043	0.0001	

General Linear Models Procedure
Least Squares Means

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

POLICE	SENSOR	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4	5	6
0	1	70.3603050	1	.	5.23042	-3.09345	1.652241	9.697956	-0.57052
					0.0001	0.0020	0.0989	0.0001	0.5685
0	2	68.9482832	2	-5.23042	.	-8.9346	-3.08425	4.92001	-5.57631
				0.0001		0.0001	0.0021	0.0001	0.0001
0	3	71.2301323	3	3.093453	8.9346	.	4.614619	13.70397	2.34959
				0.0020	0.0001		0.0001	0.0001	0.0190
1	1	69.8430640	4	-1.65224	3.084255	-4.61462	.	7.215739	-2.12656
				0.0989	0.0021	0.0001		0.0001	0.0338
1	2	67.7664786	5	-9.69796	-4.92001	-13.704	-7.21574	.	-9.80849
				0.0001	0.0001	0.0001	0.0001		0.0001
1	3	70.5360698	6	0.570517	5.576309	-2.34959	2.126561	9.808492	.
				0.5685	0.0001	0.0190	0.0338	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

DRONE	POLICE	SENSOR	MPH85 LSMEAN	LSMEAN Number

0	0	1	71.2088512	1
0	0	2	69.0226483	2
0	0	3	71.4295810	3
0	1	1	69.8325117	4
0	1	2	68.2367259	5
0	1	3	70.6706769	6
1	0	1	69.5117587	7
1	0	2	68.8739180	8
1	0	3	71.0306837	9
1	1	1	69.8536163	10
1	1	2	67.2962314	11
1	1	3	70.4014628	12

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	1	2	3	4	5	6	7	8	9
1	.	6.114114	-0.63193	3.925121	8.65953	1.546846	4.075081	6.299707	0.434738
		0.0001	0.5276	0.0001	0.0001	0.1223	0.0001	0.0001	0.6639
2	-6.11411	.	-7.5101	-2.51534	2.504029	-5.16635	-1.24578	0.432815	-5.20789
	0.0001		0.0001	0.0121	0.0125	0.0001	0.2132	0.6653	0.0001
3	0.631933	7.510096	.	5.106432	10.48887	2.450524	4.980138	7.628437	1.055518
	0.5276	0.0001		0.0001	0.0001	0.0145	0.0001	0.0001	0.2915
4	-3.92512	2.515338	-5.10643	.	5.215686	-2.69317	0.830269	2.849301	-3.15999
	0.0001	0.0121	0.0001		0.0001	0.0072	0.4066	0.0045	0.0016
5	-8.65953	-2.50403	-10.4889	-5.21569	.	-8.0375	-3.35893	-1.93863	-7.50438
	0.0001	0.0125	0.0001	0.0001		0.0001	0.0008	0.0529	0.0001
6	-1.54685	5.166352	-2.45052	2.69317	8.037502	.	3.019222	5.386242	-0.95583
	0.1223	0.0001	0.0145	0.0072	0.0001		0.0026	0.0001	0.3395
7	-4.07508	1.245779	-4.98014	-0.83027	3.358935	-3.01922	.	1.576637	-3.44632
	0.0001	0.2132	0.0001	0.4066	0.0008	0.0026		0.1153	0.0006
8	-6.29971	-0.43281	-7.62844	-2.8493	1.938633	-5.38624	-1.57664	.	-5.42267
	0.0001	0.6653	0.0001	0.0045	0.0529	0.0001	0.1153		0.0001

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: MPH85

i/j	1	2	3	4	5	6	7	8	9
9	-0.43474	5.207887	-1.05552	3.15999	7.50438	0.955826	3.446317	5.422673	.
	0.6639	0.0001	0.2915	0.0016	0.0001	0.3395	0.0006	0.0001	
10	-2.75056	1.757801	-3.37824	0.045141	3.499949	-1.75532	0.659057	2.029634	-2.29269
	0.0061	0.0792	0.0008	0.9640	0.0005	0.0796	0.5101	0.0427	0.0221
11	-10.3812	-4.92739	-12.0885	-7.38776	-2.80145	-9.90975	-5.39984	-4.33782	-9.25365
	0.0001	0.0001	0.0001	0.0001	0.0052	0.0001	0.0001	0.0001	0.0001
12	-1.67511	2.98738	-2.25877	1.24713	4.804938	-0.59284	1.749547	3.238051	-1.25064
	0.0943	0.0029	0.0242	0.2127	0.0001	0.5535	0.0806	0.0013	0.2114

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	10	11	12
1	2.750561	10.38119	1.675112
	0.0061	0.0001	0.0943
2	-1.7578	4.927395	-2.98738
	0.0792	0.0001	0.0029
3	3.378237	12.08851	2.258771
	0.0008	0.0001	0.0242
4	-0.04514	7.387757	-1.24713
	0.9640	0.0001	0.2127
5	-3.49995	2.801448	-4.80494
	0.0005	0.0052	0.0001
6	1.755324	9.909745	0.592836
	0.0796	0.0001	0.5535
7	-0.65906	5.399843	-1.74955
	0.5101	0.0001	0.0806
8	-2.02963	4.337821	-3.23805
	0.0427	0.0001	0.0013

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: MPH85

i/j	10	11	12
9	2.292689	9.253654	1.250637
	0.0221	0.0001	0.2114
10	.	5.245753	-0.95667
		0.0001	0.3390
11	-5.24575	.	-6.51433
	0.0001		0.0001

12	0.956674	6.514327
	0.3390	0.0001

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1
SENSOR	3	1 2 3

Number of observations in data set = 789

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	11	8835475.88118074	803225.08010734	37.66	0.0001
Error	777	16570164.99945580	21325.82368012		
Corrected Total	788	25405640.88063660			

R-Square	C.V.	Root MSE	PERC10 Mean
0.347776	289.7198	146.03363886	50.40513284

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	1011549.83525205	1011549.83525205	47.43	0.0001
POLICE	1	1308367.27629712	1308367.27629712	61.35	0.0001
DRONE*POLICE	1	18597.35569787	18597.35569787	0.87	0.3507
SENSOR	2	6311047.39629499	3155523.69814749	147.97	0.0001
DRONE*SENSOR	2	49633.84696739	24816.92348369	1.16	0.3129
POLICE*SENSOR	2	5290.37020935	2645.18510467	0.12	0.8834
DRONE*POLICE*SENSOR	2	130989.80046197	65494.90023098	3.07	0.0469

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	569486.06317056	569486.06317056	26.70	0.0001
POLICE	1	768365.31661363	768365.31661363	36.03	0.0001
DRONE*POLICE	1	1971.83710179	1971.83710179	0.09	0.7612
SENSOR	2	5940638.80118021	2970319.40059011	139.28	0.0001
DRONE*SENSOR	2	43543.27325032	21771.63662516	1.02	0.3608
POLICE*SENSOR	2	11320.55709996	5660.27854998	0.27	0.7670
DRONE*POLICE*SENSOR	2	130989.80046197	65494.90023098	3.07	0.0469

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	53.7230539	5.167597
		0.0001
1	47.4499199	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	54.2298033	6.002483
		0.0001
1	46.9431705	

DRONE	POLICE	PERC10 LSMEAN	i/j	1	2	3	4
0	0	57.5509349	1	.	5.517917	4.092344	7.275445
					0.0001	0.0001	0.0001
0	1	49.8951728	2	-5.51792	.	-0.65138	3.269861
				0.0001		0.5150	0.0011
1	0	50.9086717	3	-4.09234	0.651378	.	3.471977
				0.0001	0.5150		0.0005
1	1	43.9911681	4	-7.27545	-3.26986	-3.47198	.
				0.0001	0.0011	0.0005	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

SENSOR	PERC10 LSMEAN	i/j	1	2	3
1	52.1655722	1	.	9.49809	-5.72809
				0.0001	0.0001
2	38.3203122	2	-9.49809	.	-16.3194
			0.0001		0.0001
3	61.2735763	3	5.728092	16.31942	.
			0.0001	0.0001	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

DRONE	SENSOR	PERC10 LSMEAN	i/j	1	2	3	4	5	6
0	1	56.4298012	1	.	8.604669	-3.95712	3.687241	11.39121	-1.25742
					0.0001	0.0001	0.0002	0.0001	0.2090
0	2	41.4706820	2	-8.60467	.	-13.3822	-2.87123	3.550278	-8.12908
				0.0001		0.0001	0.0042	0.0004	0.0001
0	3	63.2686785	3	3.95712	13.38223	.	6.885783	15.9228	1.828265
				0.0001	0.0001		0.0001	0.0001	0.0679
1	1	47.9013433	4	-3.68724	2.871229	-6.88578	.	5.440032	-4.26187
				0.0002	0.0042	0.0001		0.0001	0.0001
1	2	35.1699424	5	-11.3912	-3.55028	-15.9228	-5.44003	.	-10.5121
				0.0001	0.0004	0.0001	0.0001		0.0001
1	3	59.2784741	6	1.25742	8.129079	-1.82826	4.26187	10.51209	.
				0.2090	0.0001	0.0679	0.0001	0.0001	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

General Linear Models Procedure
Least Squares Means

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

POLICE	SENSOR	PERC10 LSMEAN	i/j	1	2	3	4	5	6
0	1	55.4976114	1	.	6.4952	-4.40525	2.881185	10.82903	-1.05441
					0.0001	0.0001	0.0041	0.0001	0.2920
0	2	42.5423290	2	-6.4952	.	-11.7158	-2.93507	4.75796	-7.29903
				0.0001		0.0001	0.0034	0.0001	0.0001
0	3	64.6494695	3	4.405246	11.71578	.	7.121695	16.36026	3.093589
				0.0001	0.0001		0.0001	0.0001	0.0020
1	1	48.8335330	4	-2.88118	2.935065	-7.1217	.	6.930086	-3.7646
				0.0041	0.0034	0.0001		0.0001	0.0002
1	2	34.0982953	5	-10.829	-4.75796	-16.3603	-6.93009	.	-11.4078
				0.0001	0.0001	0.0001	0.0001		0.0001
1	3	57.8976831	6	1.054414	7.299027	-3.09359	3.764598	11.40782	.
				0.2920	0.0001	0.0020	0.0002	0.0001	

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Least Squares Means

DRONE	POLICE	SENSOR	PERC10 LSMEAN	LSMEAN Number
0	0	1	61.7895480	1
0	0	2	44.1263860	2
0	0	3	66.7368708	3
0	1	1	51.0700544	4
0	1	2	38.8149779	5
0	1	3	59.8004861	6
1	0	1	49.2056748	7
1	0	2	40.9582721	8
1	0	3	62.5620681	9
1	1	1	46.5970117	10
1	1	2	29.3816126	11
1	1	3	55.9948801	12

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	1	2	3	4	5	6	7	8	9
1	.	6.685932	-1.91704	4.137635	9.059935	0.77379	4.089739	7.60698	-0.25513
		0.0001	0.0556	0.0001	0.0001	0.4393	0.0001	0.0001	0.7987
2	-6.68593	.	-9.54865	-2.91893	2.290445	-6.65047	-1.75101	1.247825	-6.47142
	0.0001		0.0001	0.0036	0.0223	0.0001	0.0803	0.2125	0.0001
3	1.917037	9.548648	.	6.779927	12.41494	3.031487	6.161621	10.41458	1.495171
	0.0556	0.0001		0.0001	0.0001	0.0025	0.0001	0.0001	0.1353
4	-4.13763	2.918932	-6.77993	.	5.421298	-3.79682	0.65318	4.068009	-4.10216
	0.0001	0.0036	0.0001		0.0001	0.0002	0.5138	0.0001	0.0001
5	-9.05994	-2.29044	-12.4149	-5.4213	.	-9.37949	-3.70489	-0.88259	-8.63288
	0.0001	0.0223	0.0001	0.0001		0.0001	0.0002	0.3777	0.0001
6	-0.77379	6.65047	-3.03149	3.796822	9.379491	.	3.735821	7.645017	-0.99238
	0.4393	0.0001	0.0025	0.0002	0.0001		0.0002	0.0001	0.3213
7	-4.08974	1.751006	-6.16162	-0.65318	3.704891	-3.73582	.	2.759225	-4.10165
	0.0001	0.0803	0.0001	0.5138	0.0002	0.0002		0.0059	0.0001
8	-7.60698	-1.24782	-10.4146	-4.06801	0.882587	-7.64502	-2.75923	.	-7.35175
	0.0001	0.2125	0.0001	0.0001	0.3777	0.0001	0.0059		0.0001

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: PERC10

i/j	1	2	3	4	5	6	7	8	9
9	0.255128	6.471424	-1.49517	4.102165	8.632883	0.992377	4.101649	7.351755	.
	0.7987	0.0001	0.1353	0.0001	0.0001	0.3213	0.0001	0.0001	
10	-4.17338	0.707364	-5.8432	-1.29495	2.279947	-3.83921	-0.68069	1.581095	-4.20886
	0.0001	0.4796	0.0001	0.1957	0.0229	0.0001	0.4963	0.1143	0.0001
11	-11.6381	-5.69587	-14.7868	-8.55055	-3.80315	-12.0908	-6.53954	-4.30809	-11.1281
	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001
12	-1.6272	3.480412	-3.19422	1.461094	5.161237	-1.13426	1.806963	4.314098	-1.76668
	0.1041	0.0005	0.0015	0.1444	0.0001	0.2570	0.0712	0.0001	0.0777

T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

i/j	10	11	12
1	4.173377	11.63808	1.627197
	0.0001	0.0001	0.1041
2	-0.70736	5.695872	-3.48041
	0.4796	0.0001	0.0005
3	5.843197	14.78676	3.194217
	0.0001	0.0001	0.0015
4	1.294948	8.550553	-1.46109
	0.1957	0.0001	0.1444
5	-2.27995	3.803149	-5.16124
	0.0229	0.0002	0.0001
6	3.839209	12.09076	1.134257
	0.0001	0.0001	0.2570
7	0.680685	6.53954	-1.80696
	0.4963	0.0001	0.0712
8	-1.58109	4.308089	-4.3141
	0.1143	0.0001	0.0001

General Linear Models Procedure
Least Squares Means

Least Squares Means for effect DRONE*POLICE*SENSOR
T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|

Dependent Variable: PERC10

i/j	10	11	12
9	4.208862	11.12805	1.766681
	0.0001	0.0001	0.0777
10	.	4.779465	-2.22119

		0.0001	0.0266
11	-4.77947	.	-7.55656
	0.0001		0.0001
12	2.221187	7.556562	.
	0.0266	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 211

General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	7314.60037929	2438.20012643	7.97	0.0001
Error	207	63289.57599145	305.74674392		
Corrected Total	210	70604.17637074			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.103600	26.77718	17.48561534	65.30043205

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	1632.53734598	1632.53734598	5.34	0.0218
POLICE	1	4228.75975733	4228.75975733	13.83	0.0003
DRONE*POLICE	1	1453.30327598	1453.30327598	4.75	0.0304

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	2356.32698362	2356.32698362	7.71	0.0060
POLICE	1	2128.49719765	2128.49719765	6.96	0.0090
DRONE*POLICE	1	1453.30327598	1453.30327598	4.75	0.0304

General Linear Models Procedure
Least Squares Means

DRONE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	65.6304779	2.776111
		0.0060
1	64.8616416	

POLICE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	65.6114212	2.638491
		0.0090
1	64.8806984	

DRONE	POLICE	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	66.2977401	1	.	4.302059	3.725711	3.440273
					0.0001	0.0003	0.0007
0	1	64.9632158	2	-4.30206	.	0.111519	0.399022
				0.0001		0.9113	0.6903
1	0	64.9251022	3	-3.72571	-0.11152	.	0.276589
				0.0003	0.9113		0.7824
1	1	64.7981810	4	-3.44027	-0.39902	-0.27659	.
				0.0007	0.6903	0.7824	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 329

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General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	15542.10355149	5180.70118383	11.52	0.0001
Error	325	146129.34795256	449.62876293		
Corrected Total	328	161671.45150405			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.096134	33.48999	21.20445149	63.31581592

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	2897.09757139	2897.09757139	6.44	0.0116
POLICE	1	11775.53573670	11775.53573670	26.19	0.0001
DRONE*POLICE	1	869.47024340	869.47024340	1.93	0.1653

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	3644.90188981	3644.90188981	8.11	0.0047
POLICE	1	12468.36549162	12468.36549162	27.73	0.0001
DRONE*POLICE	1	869.47024340	869.47024340	1.93	0.1653

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General Linear Models Procedure
Least Squares Means

DRONE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	63.6437867	2.847186
		0.0047
1	62.9100955	

POLICE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	63.9554380	5.265962
		0.0001
1	62.5984342	

DRONE	POLICE	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	64.1431152	1	.	2.965872	1.01817	5.562125
					0.0032	0.3094	0.0001
0	1	63.1444583	2	-2.96587	.	-1.76767	3.032106
				0.0032		0.0781	0.0026
1	0	63.7677609	3	-1.01817	1.767667	.	4.396228
				0.3094	0.0781		0.0001
1	1	62.0524102	4	-5.56213	-3.03211	-4.39623	.
				0.0001	0.0026	0.0001	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 249

General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	6103.08748384	2034.36249461	8.14	0.0001
Error	245	61240.38689921	249.96076285		
Corrected Total	248	67343.47438306			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.090626	23.96217	15.81014746	65.97960253

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	594.69056035	594.69056035	2.38	0.1243
POLICE	1	5481.68932515	5481.68932515	21.93	0.0001
DRONE*POLICE	1	26.70759834	26.70759834	0.11	0.7440

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	1120.89182078	1120.89182078	4.48	0.0352
POLICE	1	4682.63220826	4682.63220826	18.73	0.0001
DRONE*POLICE	1	26.70759834	26.70759834	0.11	0.7440

General Linear Models Procedure
Least Squares Means

DRONE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	66.0869012	2.11761 0.0352
1	65.5865385	

POLICE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	66.3480697	4.328218 0.0001
1	65.3253700	

DRONE	POLICE	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	66.5596330	1	.	3.816668 0.0002	1.399724 0.1629	4.183256 0.0001
0	1	65.6141694	2	-3.81667 0.0002	.	-1.73375 0.0842	1.590124 0.1131
1	0	66.1365064	3	-1.39972 0.1629	1.73375 0.0842	.	2.733147 0.0067
1	1	65.0365705	4	-4.18326 0.0001	-1.59012 0.1131	-2.73315 0.0067	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 211

General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	8546.94741404	2848.98247135	7.55	0.0001
Error	207	78104.44338937	377.31615164		
Corrected Total	210	86651.39080341			

R-Square	C.V.	Root MSE	MPH85 Mean
0.098636	27.69156	19.42462745	70.14638412

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	2358.41908823	2358.41908823	6.25	0.0132
POLICE	1	3246.45307739	3246.45307739	8.60	0.0037
DRONE*POLICE	1	2942.07524842	2942.07524842	7.80	0.0057

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	2799.30087417	2799.30087417	7.42	0.0070
POLICE	1	1066.48223547	1066.48223547	2.83	0.0942
DRONE*POLICE	1	2942.07524842	2942.07524842	7.80	0.0057

General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	70.5206815	2.72378
		0.0070
1	69.6826875	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	70.3603050	1.681218
		0.0942
1	69.8430640	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	71.2088512	1	.	3.99396	4.14655	2.798802
					0.0001	0.0001	0.0056
0	1	69.8325117	2	-3.99396	.	0.84483	-0.04593
				0.0001		0.3992	0.9634
1	0	69.5117587	3	-4.14655	-0.84483	.	-0.67062
				0.0001	0.3992		0.5032
1	1	69.8536163	4	-2.7988	0.045933	0.670616	.
				0.0056	0.9634	0.5032	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 329

General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	11346.77741169	3782.25913723	8.09	0.0001
Error	325	151975.34811778	467.61645575		
Corrected Total	328	163322.12552947			

R-Square	C.V.	Root MSE	MPH85 Mean
0.069475	31.62059	21.62444117	68.38721373

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	1546.16962474	1546.16962474	3.31	0.0699
POLICE	1	8739.45200741	8739.45200741	18.69	0.0001
DRONE*POLICE	1	1061.15577955	1061.15577955	2.27	0.1329

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	2008.27172782	2008.27172782	4.29	0.0390
POLICE	1	9456.67972536	9456.67972536	20.22	0.0001
DRONE*POLICE	1	1061.15577955	1061.15577955	2.27	0.1329

General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	68.6296871	2.072365 0.0390
1	68.0950747	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	68.9482832	4.497016 0.0001
1	67.7664786	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	69.0226483	1	.	2.288748 0.0227	0.395604 0.6927	4.503766 0.0001
0	1	68.2367259	2	-2.28875 0.0227	.	-1.77196 0.0773	2.560596 0.0109
1	0	68.8739180	3	-0.3956 0.6927	1.77196 0.0773	.	3.964881 0.0001
1	1	67.2962314	4	-4.50377 0.0001	-2.5606 0.0109	-3.96488 0.0001	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 249

General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	3251.25001131	1083.75000377	3.61	0.0139
Error	245	73468.49421231	299.87140495		
Corrected Total	248	76719.74422362			

R-Square	C.V.	Root MSE	MPH85 Mean
0.042378	24.39872	17.31679546	70.97418650

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	294.22823732	294.22823732	0.98	0.3229
POLICE	1	2938.19825006	2938.19825006	9.80	0.0020
DRONE*POLICE	1	18.82352395	18.82352395	0.06	0.8024

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	499.61025257	499.61025257	1.67	0.1980
POLICE	1	2156.70575933	2156.70575933	7.19	0.0078
DRONE*POLICE	1	18.82352395	18.82352395	0.06	0.8024

General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	71.0501289	1.290768
		0.1980
1	70.7160733	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	71.2301323	2.681809
		0.0078
1	70.5360698	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	71.4295810	1	.	2.797015	1.204762	2.57815
					0.0056	0.2295	0.0105
0	1	70.6706769	2	-2.79702	.	-1.09097	0.67666
				0.0056		0.2764	0.4993
1	0	71.0306837	3	-1.20476	1.090975	.	1.427471
				0.2295	0.2764		0.1547
1	1	70.4014628	4	-2.57815	-0.67666	-1.42747	.
				0.0105	0.4993	0.1547	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 211

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	590519.48945732	196839.82981911	6.95	0.0002
Error	207	5863020.86919096	28323.77231493		
Corrected Total	210	6453540.35864828			

R-Square	C.V.	Root MSE	PERC10 Mean
0.091503	316.9943	168.29667945	53.09138977

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	215539.96152706	215539.96152706	7.61	0.0063
POLICE	1	309419.60212495	309419.60212495	10.92	0.0011
DRONE*POLICE	1	65559.92580531	65559.92580531	2.31	0.1297

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	289940.45340067	289940.45340067	10.24	0.0016
POLICE	1	177030.45628986	177030.45628986	6.25	0.0132
DRONE*POLICE	1	65559.92580531	65559.92580531	2.31	0.1297

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	56.4298012	3.199476
		0.0016
1	47.9013433	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	55.4976114	2.500049
		0.0132
1	48.8335330	

DRONE	POLICE	PERC10 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	61.7895480	1	.	3.59029	3.54873	3.621304
					0.0004	0.0005	0.0004
0	1	51.0700544	2	-3.59029	.	0.566774	1.123647
				0.0004		0.5715	0.2625
1	0	49.2056748	3	-3.54873	-0.56677	.	0.590641
				0.0005	0.5715		0.5554
1	1	46.5970117	4	-3.6213	-1.12365	-0.59064	.
				0.0004	0.2625	0.5554	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 329

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	738622.36466786	246207.45488929	12.55	0.0001
Error	325	6374023.89740296	19612.38122278		
Corrected Total	328	7112646.26207083			

R-Square	C.V.	Root MSE	PERC10 Mean
0.103846	361.6247	140.04421167	38.72639457

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	230944.76454070	230944.76454070	11.78	0.0007
POLICE	1	441232.28021679	441232.28021679	22.50	0.0001
DRONE*POLICE	1	66445.31991038	66445.31991038	3.39	0.0666

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	268800.73197823	268800.73197823	13.71	0.0003
POLICE	1	482777.81726617	482777.81726617	24.62	0.0001
DRONE*POLICE	1	66445.31991038	66445.31991038	3.39	0.0666

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	41.4706820	3.702116 0.0003
1	35.1699424	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	42.5423290	4.961449 0.0001
1	34.0982953	

DRONE	POLICE	PERC10 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	44.1263860	1	.	2.388403 0.0175	1.301192 0.1941	5.939474 0.0001
0	1	38.8149779	2	-2.3884 0.0175	.	-0.92033 0.3581	3.965803 0.0001
1	0	40.9582721	3	-1.30119 0.1941	0.920333 0.3581	.	4.492338 0.0001
1	1	29.3816126	4	-5.93947 0.0001	-3.9658 0.0001	-4.49234 0.0001	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 249

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	308290.21767533	102763.40589178	5.81	0.0008
Error	245	4333120.23286137	17686.20503209		
Corrected Total	248	4641410.45053670			

R-Square	C.V.	Root MSE	PERC10 Mean
0.066422	213.3485	132.98949219	62.33437869

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	45746.39992610	45746.39992610	2.59	0.1091
POLICE	1	262391.25467528	262391.25467528	14.84	0.0001
DRONE*POLICE	1	152.56307394	152.56307394	0.01	0.9261

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	71282.67760356	71282.67760356	4.03	0.0458
POLICE	1	204094.41501148	204094.41501148	11.54	0.0008
DRONE*POLICE	1	152.56307394	152.56307394	0.01	0.9261

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	63.2686785	2.007588 0.0458
1	59.2784741	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	64.6494695	3.397021 0.0008
1	57.8976831	

DRONE	POLICE	PERC10 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	66.7368708	1	.	3.328828 0.0010	1.641824 0.1019	3.507519 0.0005
0	1	59.8004861	2	-3.32883 0.0010	.	-1.08971 0.2769	1.245509 0.2141
1	0	62.5620681	3	-1.64182 0.1019	1.089713 0.2769	.	1.939964 0.0535
1	1	55.9948801	4	-3.50752 0.0005	-1.24551 0.2141	-1.93996 0.0535	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 293

General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	2781.28798655	927.09599552	4.14	0.0068
Error	289	64697.12168298	223.86547295		
Corrected Total	292	67478.40966953			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.041217	21.26036	14.96213464	70.37572329

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	314.91791246	314.91791246	1.41	0.2366
POLICE	1	1191.43984360	1191.43984360	5.32	0.0218
DRONE*POLICE	1	1274.93023050	1274.93023050	5.70	0.0177

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	451.13229965	451.13229965	2.02	0.1568
POLICE	1	1197.40463558	1197.40463558	5.35	0.0214
DRONE*POLICE	1	1274.93023050	1274.93023050	5.70	0.0177

General Linear Models Procedure
Least Squares Means

<table>
<tr><th>DRONE</th><th>MEANMPH
LSMEAN</th><th>T / Pr > |T| H0:
LSMEAN1=LSMEAN2</th></tr>
<tr><td>0</td><td>70.5386401</td><td>1.419575
0.1568</td></tr>
<tr><td>1</td><td>70.2596651</td><td></td></tr>
</table>

<table>
<tr><th>POLICE</th><th>MEANMPH
LSMEAN</th><th>T / Pr > |T| H0:
LSMEAN1=LSMEAN2</th></tr>
<tr><td>0</td><td>70.6264025</td><td>2.312741
0.0214</td></tr>
<tr><td>1</td><td>70.1719028</td><td></td></tr>
</table>

<table>
<tr><th>DRONE</th><th>POLICE</th><th>MEANMPH
LSMEAN</th><th colspan="5">T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T|</th></tr>
<tr><th></th><th></th><th></th><th>i/j</th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>0</td><td>0</td><td>71.0003810</td><td>1</td><td>.</td><td>3.318806
0.0010</td><td>2.65375
0.0084</td><td>2.547267
0.0114</td></tr>
<tr><td>0</td><td>1</td><td>70.0768992</td><td>2</td><td>-3.31881
0.0010</td><td>.</td><td>-0.65612
0.5123</td><td>-0.69362
0.4885</td></tr>
<tr><td>1</td><td>0</td><td>70.2524240</td><td>3</td><td>-2.65375
0.0084</td><td>0.656115
0.5123</td><td>.</td><td>-0.05217
0.9584</td></tr>
<tr><td>1</td><td>1</td><td>70.2669065</td><td>4</td><td>-2.54727
0.0114</td><td>0.693617
0.4885</td><td>0.052173
0.9584</td><td>.</td></tr>
</table>

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 325

General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	7118.63496486	2372.87832162	12.85	0.0001
Error	321	59257.39103968	184.60246430		
Corrected Total	324	66376.02600454			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.107247	19.56156	13.58684895	69.45688102

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	3757.04074158	3757.04074158	20.35	0.0001
POLICE	1	144.44888917	144.44888917	0.78	0.3770
DRONE*POLICE	1	3217.14533411	3217.14533411	17.43	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	3562.42792680	3562.42792680	19.30	0.0001
POLICE	1	113.82212999	113.82212999	0.62	0.4329
DRONE*POLICE	1	3217.14533411	3217.14533411	17.43	0.0001

General Linear Models Procedure
Least Squares Means

DRONE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	69.8301065	4.39293
		0.0001
1	69.0821866	

POLICE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	69.5229910	0.785226
		0.4329
1	69.3893021	

DRONE	POLICE	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	70.2523265	1	.	3.549525	6.161389	3.610404
					0.0004	0.0001	0.0004
0	1	69.4078866	2	-3.54953	.	2.588194	0.151869
				0.0004		0.0101	0.8794
1	0	68.7936556	3	-6.16139	-2.58819	.	-2.36871
				0.0001	0.0101		0.0184
1	1	69.3707176	4	-3.6104	-0.15187	2.368709	.
				0.0004	0.8794	0.0184	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 336

General Linear Models Procedure

Dependent Variable: MEANMPH
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	10375.76237634	3458.58745878	14.37	0.0001
Error	332	79904.65934799	240.67668478		
Corrected Total	335	90280.42172433			

R-Square	C.V.	Root MSE	MEANMPH Mean
0.114928	22.62440	15.51375792	68.57090187

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	1881.19073797	1881.19073797	7.82	0.0055
POLICE	1	1213.89570730	1213.89570730	5.04	0.0254
DRONE*POLICE	1	7280.67593108	7280.67593108	30.25	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	2128.62302288	2128.62302288	8.84	0.0032
POLICE	1	948.99644209	948.99644209	3.94	0.0479
DRONE*POLICE	1	7280.67593108	7280.67593108	30.25	0.0001

General Linear Models Procedure
Least Squares Means

DRONE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	68.8434573	2.973941
		0.0032
1	68.2545440	

POLICE	MEANMPH LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	68.7456101	1.985709
		0.0479
1	68.3523913	

DRONE	POLICE	MEANMPH LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	69.5846420	1	.	5.421759	5.85496	3.573211
					0.0001	0.0001	0.0004
0	1	68.1022727	2	-5.42176	.	0.686301	-1.83012
				0.0001		0.4930	0.0681
1	0	67.9065782	3	-5.85496	-0.6863	.	-2.4288
				0.0001	0.4930		0.0157
1	1	68.6025098	4	-3.57321	1.830123	2.4288	.
				0.0004	0.0681	0.0157	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 293

General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1816.99731072	605.66577024	1.91	0.1285
Error	289	91771.40858702	317.54812660		
Corrected Total	292	93588.40589774			

R-Square	C.V.	Root MSE	MPH85 Mean
0.019415	23.63872	17.81988009	75.38429557

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	703.12143328	703.12143328	2.21	0.1378
POLICE	1	436.67035747	436.67035747	1.38	0.2419
DRONE*POLICE	1	677.20551996	677.20551996	2.13	0.1453

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	824.15982194	824.15982194	2.60	0.1083
POLICE	1	439.30335157	439.30335157	1.38	0.2405
DRONE*POLICE	1	677.20551996	677.20551996	2.13	0.1453

General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	75.5889572	1.61102
		0.1083
1	75.2118899	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	75.5380701	1.17619
		0.2405
1	75.2627770	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	75.8975043	1	.	1.86206	2.141517	1.902242
					0.0636	0.0331	0.0581
0	1	75.2804101	2	-1.86206	.	0.319424	0.108093
				0.0636		0.7496	0.9140
1	0	75.1786360	3	-2.14152	-0.31942	.	-0.20117
				0.0331	0.7496		0.8407
1	1	75.2451439	4	-1.90224	-0.10809	0.201171	.
				0.0581	0.9140	0.8407	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 325

General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	7756.82746716	2585.60915572	8.26	0.0001
Error	321	100485.79241221	313.03985175		
Corrected Total	324	108242.61987936			

R-Square	C.V.	Root MSE	MPH85 Mean
0.071661	23.74450	17.69293225	74.51382470

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	3409.50398625	3409.50398625	10.89	0.0011
POLICE	1	494.84873496	494.84873496	1.58	0.2096
DRONE*POLICE	1	3852.47474594	3852.47474594	12.31	0.0005

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	3236.57771622	3236.57771622	10.34	0.0014
POLICE	1	431.20166202	431.20166202	1.38	0.2414
DRONE*POLICE	1	3852.47474594	3852.47474594	12.31	0.0005

General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	74.8688054	3.215461
		0.0014
1	74.1559111	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	74.6424627	1.173655
		0.2414
1	74.3822539	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	75.3877956	1	.	3.3505	4.835267	3.060256
					0.0009	0.0001	0.0024
0	1	74.3498152	2	-3.3505	.	1.464807	-0.20356
				0.0009		0.1440	0.8388
1	0	73.8971299	3	-4.83527	-1.46481	.	-1.63144
				0.0001	0.1440		0.1038
1	1	74.4146923	4	-3.06026	0.203563	1.631439	.
				0.0024	0.8388	0.1038	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 336

General Linear Models Procedure

Dependent Variable: MPH85
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	8219.33198738	2739.77732913	9.01	0.0001
Error	332	100920.68798669	303.97797586		
Corrected Total	335	109140.01997407			

R-Square	C.V.	Root MSE	MPH85 Mean
0.075310	23.85083	17.43496418	73.10003241

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	1113.37485009	1113.37485009	3.66	0.0565
POLICE	1	643.54012375	643.54012375	2.12	0.1466
DRONE*POLICE	1	6462.41701356	6462.41701356	21.26	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	1313.48403935	1313.48403935	4.32	0.0384
POLICE	1	465.46202974	465.46202974	1.53	0.2168
DRONE*POLICE	1	6462.41701356	6462.41701356	21.26	0.0001

General Linear Models Procedure
Least Squares Means

DRONE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	73.3106140	2.078698 0.0384
1	72.8480047	

POLICE	MPH85 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	73.2170031	1.237431 0.2168
1	72.9416156	

DRONE	POLICE	MPH85 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	73.9613693	1	.	4.235722 0.0001	4.62198 0.0001	2.389127 0.0174
0	1	72.6598587	2	-4.23572 0.0001	.	0.584237 0.5595	-1.83445 0.0675
1	0	72.4726368	3	-4.62198 0.0001	-0.58424 0.5595	.	-2.33135 0.0203
1	1	73.2233725	4	-2.38913 0.0174	1.834446 0.0675	2.331354 0.0203	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 293

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	23331.03831002	7777.01277001	2.32	0.0751
Error	289	966920.63043200	3345.74612606		
Corrected Total	292	990251.66874202			

R-Square	C.V.	Root MSE	PERC10 Mean
0.023561	423.1486	57.84242497	13.66952981

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	6316.65885059	6316.65885059	1.89	0.1705
POLICE	1	12205.65346980	12205.65346980	3.65	0.0571
DRONE*POLICE	1	4808.72598963	4808.72598963	1.44	0.2316

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	7976.43698438	7976.43698438	2.38	0.1237
POLICE	1	12242.68472047	12242.68472047	3.66	0.0567
DRONE*POLICE	1	4808.72598963	4808.72598963	1.44	0.2316

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	14.3091113	1.544038
		0.1237
1	13.1360584	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	14.4492284	1.912898
		0.0567
1	12.9959412	

DRONE	POLICE	PERC10 LSMEAN	i/j	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| 1	2	3	4
0	0	15.4911602	1	.	2.197688	1.912493	2.359323
					0.0288	0.0568	0.0190
0	1	13.1270623	2	-2.19769	.	-0.27096	0.247627
				0.0288		0.7866	0.8046
1	0	13.4072966	3	-1.91249	0.270963	.	0.505513
				0.0568	0.7866		0.6136
1	1	12.8648201	4	-2.35932	-0.24763	-0.50551	.
				0.0190	0.8046	0.6136	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 325

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	47986.90003988	15995.63334663	6.58	0.0002
Error	321	779908.63338575	2429.62191086		
Corrected Total	324	827895.53342563			

R-Square	C.V.	Root MSE	PERC10 Mean
0.057963	458.1916	49.29119506	10.75777003

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	27861.06126300	27861.06126300	11.47	0.0008
POLICE	1	5004.59969170	5004.59969170	2.06	0.1522
DRONE*POLICE	1	15121.23908519	15121.23908519	6.22	0.0131

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	27105.04019592	27105.04019592	11.16	0.0009
POLICE	1	4597.37278825	4597.37278825	1.89	0.1699
DRONE*POLICE	1	15121.23908519	15121.23908519	6.22	0.0131

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	11.7739095	3.340071 0.0009
1	9.7108721	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	11.1672128	1.375579 0.1699
1	10.3175689	

DRONE	POLICE	PERC10 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	12.9691838	1	.	2.769801 0.0059	4.196126 0.0001	3.287928 0.0011
0	1	10.5786352	2	-2.7698 0.0059	.	1.409341 0.1597	0.588054 0.5569
1	0	9.3652417	3	-4.19613 0.0001	-1.40934 0.1597	.	-0.78213 0.4347
1	1	10.0565025	4	-3.28793 0.0011	-0.58805 0.5569	0.782133 0.4347	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DRONE	2	0 1
POLICE	2	0 1

Number of observations in data set = 336

General Linear Models Procedure

Dependent Variable: PERC10
Weight: VEHCOUNT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	33634.20670785	11211.40223595	8.30	0.0001
Error	332	448622.51336508	1351.27263062		
Corrected Total	335	482256.72007293			

R-Square	C.V.	Root MSE	PERC10 Mean
0.069743	580.8963	36.75966037	6.32809335

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DRONE	1	15794.16949528	15794.16949528	11.69	0.0007
POLICE	1	1588.91433118	1588.91433118	1.18	0.2790
DRONE*POLICE	1	16251.12288139	16251.12288139	12.03	0.0006

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DRONE	1	16931.50764523	16931.50764523	12.53	0.0005
POLICE	1	1145.54359391	1145.54359391	0.85	0.3579
DRONE*POLICE	1	16251.12288139	16251.12288139	12.03	0.0006

General Linear Models Procedure
Least Squares Means

DRONE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	7.10533889	3.53978
		0.0005
1	5.44441465	

POLICE	PERC10 LSMEAN	T / Pr > |T| H0: LSMEAN1=LSMEAN2
0	6.49088874	0.920734
		0.3579
1	6.05886479	

DRONE	POLICE	PERC10 LSMEAN	T for H0: LSMEAN(i)=LSMEAN(j) / Pr > |T| i/j	1	2	3	4
0	0	8.13495603	1	.	3.178594	4.841841	3.213607
					0.0016	0.0001	0.0014
0	1	6.07572174	2	-3.17859	.	1.818856	0.052055
				0.0016		0.0698	0.9585
1	0	4.84682145	3	-4.84184	-1.81886	.	-1.76038
				0.0001	0.0698		0.0793
1	1	6.04200784	4	-3.21361	-0.05205	1.76038	.
				0.0014	0.9585	0.0793	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.