FIXED RED LIGHT AND SPEED CAMERAS IN CANBERRA: EVALUATING A NEW DIGITAL TECHNOLOGY

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ABSTRACT

Excessive travel speeds and running of red lights is the source of many traffic crashes in urban areas. The ACT Government introduced fixed digital speed and red light cameras at three locations in Canberra in early 2001. The cameras were unique to Australia at the time, applying digital technology to a combined speed and red light camera. A study to examine the effectiveness of these devices in reducing speeding and accidents was commissioned in early 2001. The study investigates the 'before and after' situation, using three corresponding control sites. This paper briefly outlines the technical and operational advantages of the new technology and then covers the evaluation of the first three camera sites. A community survey that compared attitudes to red light and speed cameras with other road safety measures was also conducted.

Results to date show that the rate of speeding has significantly reduced at two sites, but there were mixed results at the third location – where speeds in excess of double the speed limit are regularly recorded. Crash record changes at the trial sites to date, have not been significant for Right Angle (RUM type 2) and Right Turn Into Opposite (RUM type 1) crashes. Rear end crashes (RUM type 3) have increased as expected. However, these crash analyses must be treated with considerable caution, given the very limited number of crashes involved. The preliminary conclusion is that whilst the camera sites have reduced speeding offences they have had a variable effect in reducing serious crashes.

INTRODUCTION

The Australian Capital Territory (ACT) has recently adopted new technology measures of installing combined speed and red light cameras at several sites in the ACT. Whilst these devices have been in use individually in many regions of Australia and overseas, this is believed to be the first location in Australia using this technique. Whilst individual speed and red light cameras have been shown to be effective in reducing particular types of crashes, with red light cameras really targeting adjacent approaches and speed cameras reducing single vehicle crashes, there have been no installations that have combined the two enforcement measures together with the single device.

The three camera sites were installed in December 2000 and January 2001 after a three month trial period of two different types of camera installation and operation. The type that was selected as the basis for permanent installation at least for the duration of the trial was the Poltech digital speed and redlight camera.

While there had been some previous consideration of traffic camera options for the ACT (Edgar and Cairney, 2000), independent assessment was needed of permanent camera sites in the ACT because:

- The traffic signal timing parameters within the ACT generally focus on safety rather than capacity with the result that amber and all red periods are set to at least the desirable minimum rather than the absolute minimum as is often the case where capacity is a major concern.
- The combined effect of the speed and red light detection systems may cause drivers to stop at the amber, rather than the alternative of perhaps increasing speed to travel through the intersection. This may result in a different result for the change in rear end crashes at red light sites to that observed by other jurisdictions.
- Whilst public opinion has been sought on red light and speed cameras and other road safety initiatives in other studies and other jurisdictions, a comparative survey was conducted in order to determine which road safety initiative achieved the highest level of community support.

STUDY METHODOLOGY

This paper is based on an evaluation study being conducted by Maunsell Australia PL for the ACT Department of Urban Services (Maunsell P/ L, 2001). The study approach covered three broad areas:

1. Identify the community attitude to the combined speed and red light cameras compared to other road safety measures.
2. Identify the change in accident frequency for each accident type at each location before and after the installation. This was achieved by simply comparing two data sets and identifying if there are any differences between the data sets. A set of control intersections was also adopted for this part of the analysis in order to identify global changes to accident patterns in the ACT
3. Identify the ongoing changes to speed patterns at each of the sites.

In comparing this program with other study findings, it is firstly important to highlight the different reporting standards that apply in the ACT compared to other jurisdictions. In the ACT every accident involving either personal injury or any damage to property is required to be reported to the police. Unfortunately there has been quite a variable level of application of this requirement and this has led to significant variability in the quality of accident reports.

COMMUNITY ATTITUDINAL SURVEY

Three hundred and one households were selected using a random digit dialing technique and interviewing the person over sixteen years of age who had celebrated the most recent birthday. It was reasoned during the design phase, that to gather data on red light cameras without also measuring attitudes to other methods of road safety used in the ACT, would leave us little further advanced in our understanding of public opinion.

Accordingly, respondents were asked to rate each of seven different road safety techniques, including red light cameras, for effectiveness in achieving four different ends:

- Increasing road safety
- Reducing road deaths
- Improving driver behaviour
- Being fair and reasonable to drivers

Red light cameras were rated third out of the seven road safety techniques on achieving each of the four different ends. In each case the red light camera score was moderately high indicating a positive public assessment of the technique.

Red light cameras were rated at 7.1 points out of 10 for effectiveness in making ACT roads safer. Random Breath Testing and 40km/h school speed zones were both rated higher at 7.5 and 7.9 points out of 10 respectively. Red light cameras were rated ahead of four other methods; 50km/h speed zones, Police Road Law Enforcement, Speed Camera Vans, and Fixed Speed Cameras.

All methods measured rated higher than five out of ten indicating that at least on average the weight of public opinion is positive about their effectiveness. Of some note is that although surveys of public opinion towards the 50km/h general urban speed limit show a relatively high level of support at around 70%, the 50km/h limit is not generally considered by the community to be a very strong road safety device. This may indicate that support for the lower limit may also be amenity based. Similarly traditional police enforcement is not considered as effective as other methods of achieving road safety objectives

In order to ensure that there was a clear understanding by the interviewee they were also asked to consider how effective each technique is at reducing road deaths. The public rate the methods similarly, although each technique is rated slightly less than it was for "Make ACT roads safer". Respondents were also asked to rank each of the methods in terms of improving driver behaviour and being fair and reasonable. The results of these four questions are shown in Table 1.

Table 1 Percieved Effectiveness of Various Road Safety Measures - Different Methods Compared

Road Safety Measure	Making Roads Safer	Reducing Deaths	Improving Driver Behaviour	Fair and Reasonable to Drivers
		Mean score out of 10		
50km Speed Zones	5.8	5.9	5.8	6.9
Police Road Law Enforcement	6.1	6.0	6.5	7.0
Speed Camera Vans	6.7	6.0	6.5	7.6
Fixed Speed Cameras	6.8	6.3	6.5	7.6
Red Light Cameras	7.1	6.6	6.8	7.8
Random Breath Testing	7.5	7.3	7.2	8.3
40km School Zones	7.9	7.3	7.2	8.5

Multiple regression analysis was used to examine the contributions that sex, age, having a driver licence and other characteristics of the individual has on their attitudes toward the efficacy and fairness of red light cameras.

It was found that there is little systematic difference in public opinion that can be accounted for by demographic characteristics. No differences were found by age or having a drivers licence or being a professional driver. Males and females had only one instance of significantly differing opinions – where males rated the behaviour improving characteristics of red light cameras half a point less than females.

In the ACT the sites are well signed with advice that the cameras exist and of the prevailing speed limit. Respondents were asked a question about whether in future the location of speed cameras should be kept secret or made known to the public. Those who believe that the location should be secret have more positive opinions about red light cameras making roads safer and about them being fair and reasonable than do those who believe locations should be made public.

Four questions measuring public knowledge of facts about red light cameras were also asked. Knowledge of red light cameras appears to have no effect on respondent opinion of their efficacy.

CAMERA OPERATION

Three piezo strips are installed at each of the camera sites the first of which is immediately in front of the stop line. The strips are placed at 1.5 metre centers. The strips detect speeds of all vehicles which is averaged between the readings between strips 1 and 2, 2 and 3 and 1 and 3. At the termination of the amber traffic signal the camera takes a general photograph of the intersection. This photo records the time that the photo was taken and the position of all vehicles within the intersection upon the display of the red signal. An offence is not recorded if any part of the vehicle is entering or within the intersection in front of the stop line at the time the red signal is displayed.

Upon either a speeding or red light violation a photo is taken as the vehicle proceeds through the intersection. This second photo provides two scenes: one a general overview of the vehicle within the intersection and the other a close up of the number plate and the vehicle.

These photos are recorded on a Write Once Read Many (WORM) Drive. These are recovered every three days from the sites, processed and infringements issued.

TRIAL AND CONTROL SITES

The three trial sites were selected on the basis of the most frequent form of crashes that are amenable to reduction by the installation of the cameras. These sites were signalized intersections where adjacent approaches (generally right angle crashes) had the highest frequency of these type of crashes or where there were right turning into opposite direction type crashes. The three selected sites for the trial installations were:

- Northbourne Avenue / Barry Drive in the City
- Southern Cross Drive / Coulter Drive in Belconnen and
- Drakeford Drive / Marconi Crescent in Tuggeranong

Three control sites were initially selected on the basis of proximity to the trial sites, consistency of intersection form and control during the before and after periods and characteristics similar to the trial sites. However it was found that the initial selections had too few accidents to produce a statistically reliable comparison. Three additional control sites were therefore selected on the basis of similar site characteristics and a relatively higher accident record.

INFRINGEMENTS

The three types of infringements of speeding, redlight running and combined speed and red light offences at the three trial sites were recorded as monthly results with the first eighteen months shown in Figures 1, 2 and 3. The chart shows a rate per 100,000 vehicles passing the sites.

Figure 1 Speeding Offences / 100,000 vehicles

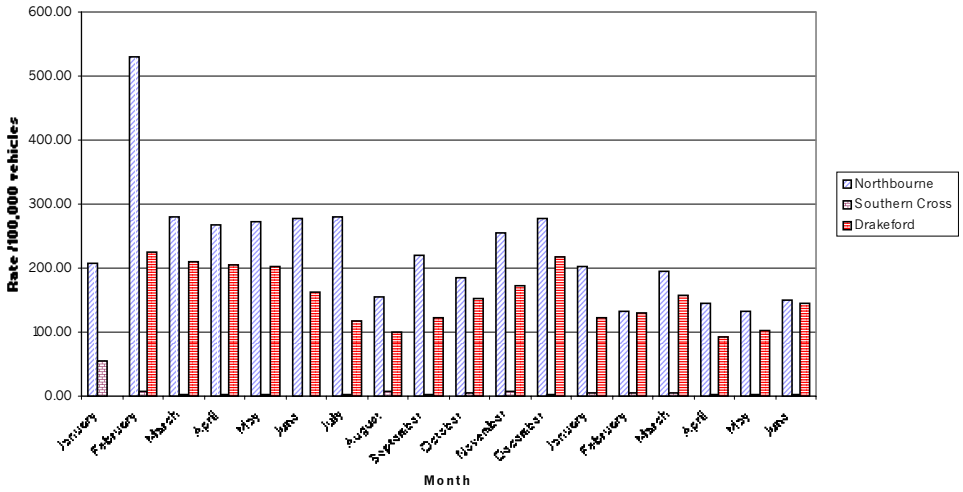


Figure 2 Red Light Offences /100,000 vehicles

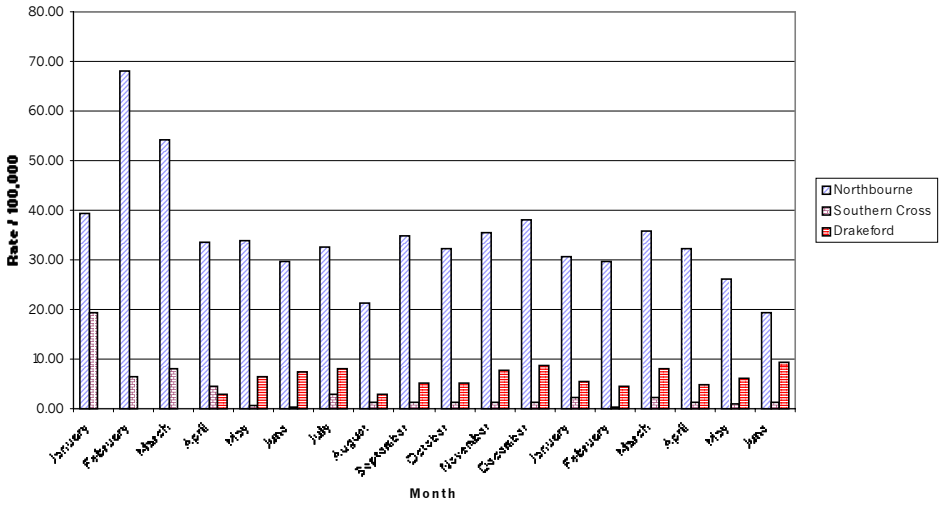
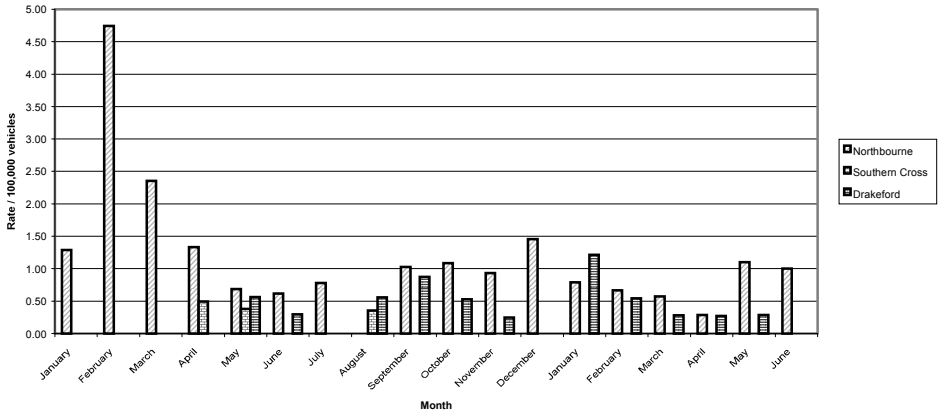


Figure 3 Combined Offences / 100,000 vehicles



Analysis shows that there was a significant drop off in speed after the initial installation at the Northbourne Avenue / Barry Drive site and variable results for the other two sites. The data also shows that there are wide variations in the offence rate with Northbourne Avenue having a greater offence rate than the other two sites. The Southern Cross Drive site shows a very high conformance rate with the speed limit.

The red light offence chart again shows a much higher offence rate for Northbourne Avenue than for the other two sites. At this time the values are too small to clearly identify a trend.

The combined red light and speeding chart shows that Northbourne Avenue has a higher combined offence rate than the other two sites. However the results show a much reduced incidence for the combined offences at about one per 100,000 vehicles compared to 30 / 100,000 vehicles for redlight offences and over 200/100,000 vehicles for speeding.

CRASHES

Only limited data is as yet available to assess the results of the changes in crashes arising from the camera installations.

The annual average for the previous five years of crashes has been compared to the first 12 months of operation for the three camera sites, with the results shown in Table 2

Table 2 Before and After Annual Crash Rate at Trial Sites

Crash Type	Annual Average Number of Crashes Before Installation			Annual Number of Crashes After Installation		
	Northbourne Avenue / Barry Drive	Southern Cross Drive / Coulter Drive	Drakeford Drive / Martconi Crescent	Northbourne Avenue / Barry Drive	Southern Cross Drive / Coulter Drive	Drakeford Drive / Marconi Crescent
Adjacent approaches and opposing direction	5.4	4.6	4.4	5	3	3
Vehicles from same direction	68.6	32.6	16.6	78	23	17
Other	2.2	1.6	1.8	6	7	1
Total	76.2	38.8	22.8	89	33	21

A review of this table shows that there may be an apparent increase in accident frequency for vehicles travelling in the same direction at Northbourne Avenue / Barry Drive of about 14%; a corresponding decrease in these type of crashes at Southern Cross Drive of 15%; and no change at Drakeford Drive. However this cross sectional analysis needs to be confirmed with a longitudinal analysis. An indicative analysis follows later in this paper.

The annual crash frequencies for the three control sites are shown in Table 3

Table 3 Control Sites Annual Crash History

	"Before" Crash Annual Rate			"After" Crash Annual Rate		
Crash Type	Ginninderra Drive/ Haydon Drive	Belconnen / Way / Bindubi Street	Hindmarsh Drive / Yamba Drive	Ginninderra Drive/ Haydon Drive	Belconnen / Way / Bindubi Street	Hindmarsh Drive / Yamba Drive
Adjacent Approaches	3.4	4	1.8	5	3	3
Same Direction	56.6	29	52	49	25	54
Other	2	2.4	3.6	5	0	2
Total	62	35.4	57.4	59	28	59

The combined site history for the control sites and the trial sites is shown in Figures 4 to 6.

Figure 4 Same Direction Historical Crash Comparison.

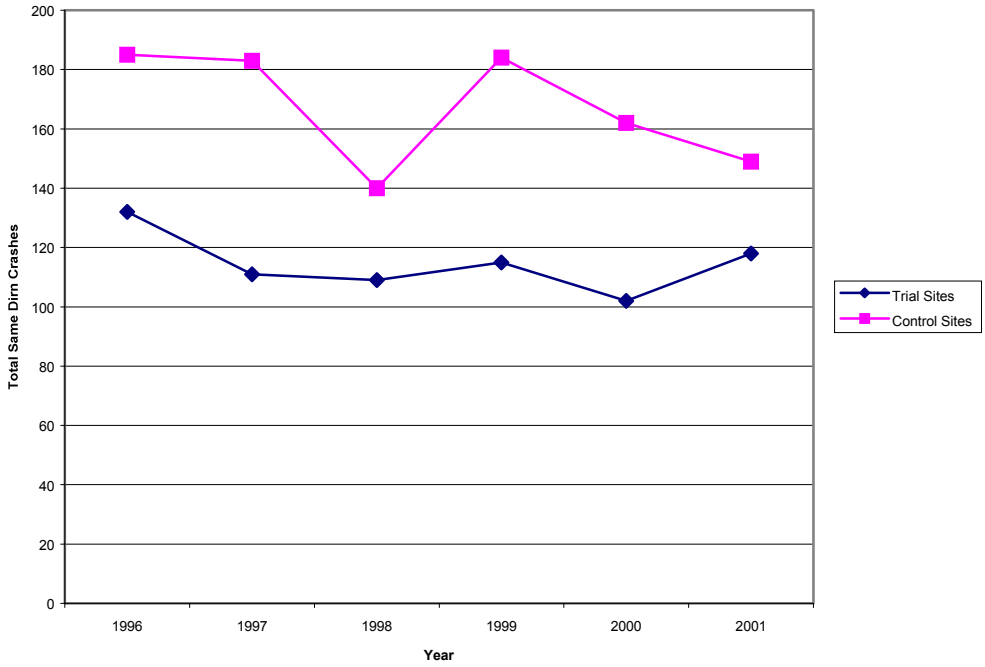


Figure 5 Adjacent Approaches and Opposing Vehicles Historical Crash Comparison

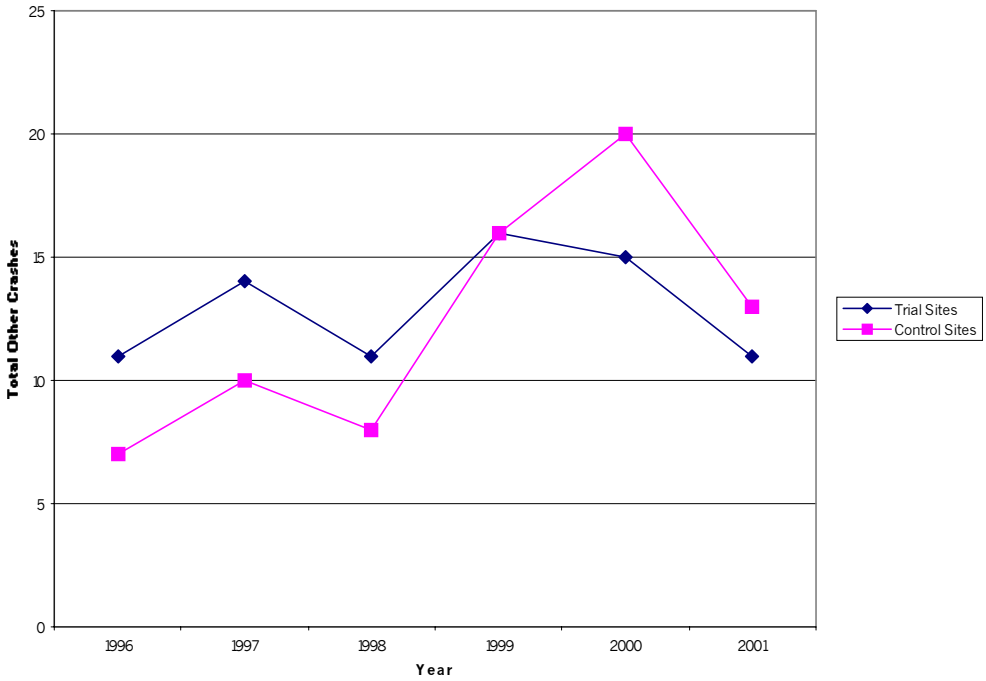
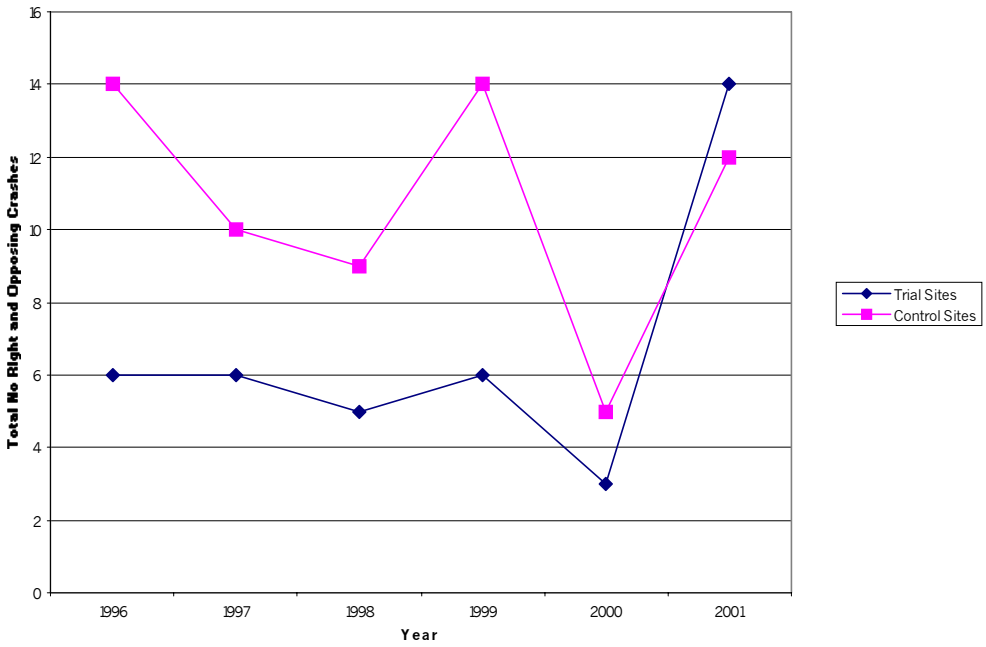


Figure 6 Other Crash Type Historical Crash Comparison



The conclusion drawn from this longitudinal analysis is that there appears to be an increase in rear end crashes at the trial sites. Observation of the trend for same direction crashes indicates a declining frequency at the control sites but an increase at the trial sites.

The trend for crashes involving adjacent approaches and opposing directions would appear to be inconclusive at this stage due mainly to an unexplained sudden drop in the increasing frequency at the control sites between 1998 and 2000. It may be that the installation of cameras has improved driver behaviour at all sites; or more likely the changes to the accident reporting processes has resulted in some anomalies.

The results from this analysis can only be described as inconclusive at this stage.

CONCLUSIONS

The study to date and this paper has provided an assessment of the initial effectiveness of the combined digital speed and red light cameras. A community attitude survey has also been conducted. The overall conclusions to date from the study are:

- The community supports the installation of red light cameras and believe that they are the third most effective measure in improving road safety and reducing road trauma, after random breath testing and 40km/h school speed zones
- The incidence of speeding at the sites has in general reduced, although there is still a high rate of speeding at the Northbourne Avenue / Barry Drive site.
- The impact on crashes is uncertain at this stage. However the initial results indicate that there has been an increase in same direction crashes with variable results in adjacent/opposing direction crashes that may amount to an increased accident cost at the trial sites.

The bottom line is ‘the jury is still out’ and it is hoped that future monitoring of all nine ACT sites can provide a better indication of overall road safety outcomes.

REFERENCES

1 Edgar A and Cairney P , 2000 , Options for a Red Light Camera Program in the ACT, ARRB Transport Research Report NIS ACT RE90026

2 Maunsell McIntyre P/L 2000, Evaluation of Fixed Digital Red Light and Speed Cameras, First Progress Report

DISCLAIMER

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