

Red-Light Cameras (RLCs): Why Does Enforcement Trump Engineering?

Dale Gedcke*

It seems almost universal that Red-Light Cameras are installed without a concerted Engineering effort to find other, less obtrusive solutions for improving intersection safety. Why does Enforcement so often trump Engineering, when an Engineering solution would work at a much lower cost to society? This article will illuminate reasons why municipalities frequently place the cart before the horse. It will also outline the process recommended by the Federal Highway Administration and the Institute of Transportation Engineers for improving safety at intersections with traffic signals.

Red-Light Cameras: Primarily an Enforcement Tool

Red-Light Cameras are marketed to the public as a safety tool, whereas their primary purpose is more efficient and more lucrative enforcement of the law. The safety claim would be great, if it were unequivocally true. But the statistically sound and exhaustive studies^{1, 2, 3} have shown that Red-Light Cameras have an insignificant effect on the rate of angle collisions (front into side), and a statistically significant tendency to increase rear-end and other types of collisions at the intersections where they are installed.

On the other hand, there is solid documentation^{2, 4} that Red-Light Cameras automatically issue large volumes of red-light running citations, and the rate of citations drops by as much as 58% over a period of 2 years⁴.

Why do the red-light running citations drop drastically, but the angle collision frequency stays essentially the same? Extensive studies^{1, 2} have demonstrated that 70% to 80% of the red-light running happens in the first second of red. These are primarily rational drivers who misjudge the time to the intersection, and/or speed up to make it through on yellow. These first-second violators account for an insignificant fraction of the angle collisions, because most intersections hold the lights red in all directions for 1 to 2 seconds. This allows the marginal red-light runners to clear the intersection before the cross traffic starts up on green. The red-light runners that cause the majority of serious angle collisions enter the intersection much more than one second after their light turns red². These later violators are either distracted, didn't see the red light, are impaired drivers, or are irrationally reckless. The track record shows that Red-Light Cameras are successful in suppressing the first second of red-light running by modifying the behavior of those rational drivers. But, the cameras fail to have a significant effect on the distracted, impaired or irrationally reckless drivers that run the red light well after the first second, and who cause the major angle collisions.

Red-Light Cameras are a very attractive tool for Police Departments, because they increase the number of tickets issued by at least an order of magnitude, without adding any patrol cars. The Red-Light Camera companies absorb all the up-front capital investments, and earn a return on that investment by taking the lion's share of the ticket revenue. This removes the capital investment barrier for the municipalities, in exchange for a smaller share of the ticket revenue. Today's Red-Light Cameras have impressive technology for recording videos of what happens at an intersection. This is appealing to Police, because it makes prosecution more objective and more certain. It can also document what happened in angle-collision accidents within the intersection, because there is usually a video record of the event.

* Dale Gedcke, B.Eng., M.Sc., Ph.D., Marketing and Technical Consultant, Oak Ridge, TN 37830.

Additionally, the cameras very accurately document the drop in red-light running citations over the first two years after installation, giving the Police Department an easily marketed success story. What the cameras do not facilitate is a reliable statistical analysis of their effect on the accident rate. Because accident rates are extremely low, and many confounding factors can influence the before/after comparison, there is a huge uncertainty in what the before/after data demonstrates. Sound statistical studies ratio the before/after rates at RLC intersections to comparable non-RLC intersections, and apply statistical tests to determine whether the differences are random variations or statistically significant. Police Departments rarely have the skills for doing this analysis. Consequently, they tend to select and promote the simple numbers that make the program look successful. At best, this crude analysis is inconclusive, and, at worst, it can be misleading. For further information, see “*The Placebo Effect and Red-Light Cameras*”, and “*Red-Light Cameras: The Good, the Bad, and the Uncertain*” at www.TNLiberty.org.

The Three E’s: Engineering, Education and Enforcement

There are two very productive resources for learning about traffic safety and the well-understood solutions that can be applied. These are the web sites for The Federal Highway Administration, <http://www.fhwa.dot.gov/>, and the Institute of Traffic Engineers, <http://www.ite.org/>. Both organizations joined forces to publish the manual, *Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red Light Running*⁵. This document provides an excellent analysis of the red-light running issue, and outlines a productive process for arriving at sound solutions. It categorizes the types of red-light runners and documents which of the three E’s is the most effective solution for each category.

But, more significantly, in Chapter 4, the manual proscribes the following process for analyzing and improving intersection safety:

1. Confirm that there is a safety problem;
2. Conduct an engineering analysis to identify the factors that might be causing the problem;
3. Identify alternative countermeasures;
4. Select the most appropriate single or combined set of countermeasures; and
5. Implement the countermeasures and monitor implementation of the solution to determine the extent of the continuance of the problem.

Step 1 usually includes comparing the accident rate to the corresponding rate for normal, safe intersections. If the accident rate is abnormally high, then progress to step 2 and examine accident reports to find the contributing factors. In step 4, it is advisable to choose the least obtrusive solutions that will be effective. Thus, it is preferable to implement engineering solutions first, because those may be the least obtrusive, most effective, and permanent. Education in the form of signage and public awareness programs may be helpful. Lastly, Enforcement tactics may be necessary, if Engineering and Education have not succeeded. Most importantly, the effectiveness must be continuously measured to test whether or not the solutions are producing the intended results.

The manual describes a plethora of engineering, education and enforcement solutions that is too extensive to summarize here. But, one does warrant mention, because it is documented by the statistical studies^{1, 2, 4, 5}. Lengthening the yellow light duration to eliminate any possible Dilemma Zone has been shown to reduce red-light running⁴ as much as 70%. A Dilemma Zone exists if the yellow light duration is too short for the approach speed. In that case, a driver caught in the

Dilemma Zone when the light turns yellow cannot make it to the intersection before the light turns red, nor can he/she safely stop in time.

What is clear from the FHWA/ITE manual⁵ is practical Engineering solutions should be the first choice. Only after the Engineering solutions have been applied and vetted, should stepped-up Enforcement be considered.

Why Cities Choose Enforcement over Engineering

Most cities have a Traffic Engineering Department that is continuously adjusting the traffic control devices to improve traffic flow and safety. After reading the safety engineering countermeasures in the FHWA/ITE manual⁵, one will begin to recognize intersections where some of those solutions have been applied.

But, when Red-Light Cameras show up as a proposal, engineering studies and solutions are almost never referenced. Most likely, this happens because the Red-Light Camera program is primarily an Enforcement Efficiency Tool that is most readily marketed and sold to the Police Department. Consequently, the Police Department becomes the passionate advocate to the exclusion of the Traffic Engineering Department. The more effective Engineering solutions get ignored, as the city focuses on intensifying Enforcement.

More efficient Enforcement would be acceptable, if the Red-Light Cameras delivered on their safety promise. Unfortunately, the sound statistical studies have demonstrated that the safety promise is not reliably fulfilled. In fact, Red-Light Cameras have been shown to increase the overall accident rate^{1, 2, 3}.

One has to carefully consider why traffic laws exist. The primary purpose is for promoting efficient traffic flow and safety. An Enforcement program that catches violators without improving safety or traffic flow is reduced to being nothing more than a revenue generator.

When faced with a passionate sales pitch from a Red-Light Camera company, public safety requires that the Mayor or City Manager put his Police Chief on hold, and dial the Traffic Engineering Manager to request an Engineering Study. What is critical is the process recommended by the Federal Highway Administration and the Institute of Traffic Engineers⁵: the discipline of an Engineering analysis of the safety issue at each intersection, and implementation of the appropriate, least-obtrusive Engineering solutions. Only if the Traffic Engineering Department's study finds Red-Light Cameras are the only viable solution, should the camera proposal proceed.

References

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