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A Retort to “Red Light Cameras Reduce Crashes”

Purpose

This paper responds to the common defense pro-camera activists use to justify red light camera enforcement. Though any pro-camera report exemplifies poor investigative technique, I chose the paper [Evaluating the Use of Red Light Running Photographic Enforcement](#) written by Christopher Cunningham and Joseph Hummer of the [Institute of Transportation Research \(ITRE\)](#) at North Carolina State University (NCSU). I chose to pick on Hummer and Cunningham because they performed their investigation with red light cameras in Raleigh, North Carolina which is near where I live, and so I *know* the intersections in their paper. I also chose their paper because Dr. Hummer is one of the Town of Cary’s [expert witnesses](#) in the case *Ceccarelli vs. Town of Cary*.

The Wrong Type of Investigation

Hummer and Cunningham performed a before-and-after investigation. They analyzed red light running and crash data before and after the activation of red light cameras. They made conclusions based solely on this data. Hummer and Cunningham never addressed why red light running or crashes occur in the first place. They ignore causes because a before-and-after analysis does not seek initial causes. By the type of investigation, Hummer and Cunningham chose to assume that the causes were not relevant and chose to present to law enforcement that punishment can be dispensed on drivers whether innocent or guilty.

But the causes are relevant, the causes being traffic engineering errors. The blame rests on the shoulders of traffic engineers—the profession of Hummer and

Cunningham. Had Hummer and Cunningham complied with the scientific method, Hummer and Cunningham should not have performed a before-and-after investigation but rather a forensic investigation. A forensic investigation starts at the problem then works backwards to find initial causes. The goal of forensic analysis is to identify the causes and prevent them when possible. In the case of red light running, a forensic investigation would start at crash and red light running data and then proceed backwards to examine why drivers were running red lights and crashing in the first place. A proper forensic investigation would examine the on-the-ground geometrics of the intersections to discover what makes these intersections particularly dangerous. A proper investigation would examine approach speeds, yellow change intervals, all-red clearances and lengths of green phases to see whether they complied with NCDOT specifications and that those specifications accommodated the real traffic patterns. A proper investigation would even examine the formulas and procedures behind the specifications to determine whether the NCDOT applied those formulas and procedures correctly. The honest investigator simply knows that drivers are subject to these initial causes and that drivers' behavior is a direct consequence.

Hummer and Cunningham ignored initial causes. Without investigation they blamed drivers for everything bad. Hummer and Cunningham's attitude is that drivers should be punished for engineering errors. It is an attitude we verified when we deposed the Town of Cary's expert witnesses, including Dr. Hummer. Even when shown the [graph of red light violations versus time at northbound Kildaire Farms Rd at Cary Parkway](#), a graph showing a sharp 600% spike in red light violations caused by a decrease in a yellow light duration, Dr. Hummer and the rest of Cary's expert witnesses accepted no responsibility and blamed all consequent red light running on drivers.

In their report, Hummer and Cunningham did mention that good engineering is the first countermeasure against red light running. But then Hummer and Cunningham neither did it nor saw to it that was done. And so in the unpredictability of uninvestigated initial conditions with an unfounded implicit trust of the North Carolina Department of Transportation (NCDOT), Hummer and Cunningham carried out their experiments. Garbage in. Garbage out. Their conclusions are fictitious. To get a handle on the magnitude of the fiction, examine the engineering analyses of the intersections of [Peace Street @ West](#) and [New Hope Church @ Brentwood](#). Hummer and Cunningham used the bad data coming from these intersections and the bad data from other similar intersections to justify red light camera enforcement. Their chosen intersections have the greatest number of engineering problems. There are no exceptions. It is because of such engineering problems why drivers run red lights, why crashes occur and why Affiliated Computer Services (ACS) reaps a huge profit.

An Analogy

Examining red light running data without considering the traffic signal plans is like having videos of houses catching fire from start to finish but watching only the last 5 minutes when the residents flee and burn. By confining one's view to the fleeing and burning, the investigator does not notice that every fire started at a faulty furnace. He jumps to the wrong conclusion that all residents are pyromaniacs and suicidal. To remedy the problem, the investigator recommends "modifying the residents' behavior." Take a picture of the fleeing resident by his burning house. Use the picture to punish them for setting the fires.

But the fires are not going away and the engineers are still building defective furnaces. Residents are still fleeing and burning, the only difference now being that the residents have 50 less dollars and a higher insurance premium.

The red light running problem is identical. The problem is not suicidal drivers but an engineering problem, a problem emanating from a 50 year old false-physics formula traffic engineers neither question nor understand. It is the formula that sets yellow light durations—the most critical part of the signal--a formula which countermands a law of physics and thus creates dilemma zones which force drivers to run red lights. Investigators such as Cunningham and Hummer do not look at the on-the-ground geometrics of the intersection, the intersection's signal plans or even think to question an assumption like the formula. Instead such investigators limit their vision and conclude that drivers must be punished with red light camera-induced penalties. The penalty does not make red light running go away.

Obviously Engineering Error, Not Bad Driver Behavior

What tipped me off that it is the traffic engineer's fault and not the driver's was the raw red light camera citation data. If anything good can be said about red light cameras, it is the fact these cameras are precision measuring tools. In engineering parlance, they make great quality control instruments. In about 5 days, they produce enough data to check the quality of the traffic engineer's work. The cameras produce extremely accurate data and lots of it. There are 1 to 4 magnitudes more red light running counts than crash counts and unlike the crash counts, the red light camera counts are statistically significant and form obvious patterns. The patterns numerically scream at you saying, "Engineering errors!" With a look at the Excel sheet of citation counts

hanging on the bulletin board in the Town of Cary's Redflex office, in ten seconds I could deduce with 100% certainty that traffic engineers are responsible for all red light running problems.

The huge disparity in citation counts between one intersection and the next makes it obvious. On the Excel sheet for a given year, I saw 1294 violations at one intersection. 86 at another. 373 at the next. 267 at the next then 8488 at one intersection. Counts at all 17 approaches followed this same pattern--a pattern of disparity. By living in the area for decades I knew that these intersections were equally busy intersections. The traffic volume is about the same. I also knew that some intersections were less busy but had far more citation counts. Contradictions. Assuming that Cary drivers as a group behave the same, the only explanation was that traffic engineers made mistakes local to each intersection.

So I asked the Town of Cary for the traffic signal plans. Given the ITE Traffic Engineering Handbook, the signal plans and knowledge of basic physics, I reached the revelation that the only reason the red light camera industry exists is because of the mistakes made by *all* traffic engineers. Every traffic engineer in the world uses the same incorrect formula and uses it without questioning it. They have embedded a nasty error into every intersection on the planet. After about a year of examining why Redflex places its cameras where it does, I realized that Redflex knows what I know. Redflex knows the failures in the yellow light duration formula and exploits those failures. I now can do what Redflex does. I can take a look at the phase diagrams and timing charts on the traffic signals plans of a city and predict with 95% accuracy where all the red light running and crashes are going to be.

I know that the Federal Highway Administration (FHWA) reports 100,000 injuries and 1000 deaths due to red light running in the USA each year. I now believe that most of those injuries and deaths are caused by the use of that false-formula for yellow durations. What I suspected all along and now know with certainty is true. Drivers as a whole are not reckless, do not wish to run red lights and do not have a death wish. There is simply a severe engineering defect at all signalized intersections.

Lack of Controls

Let me address more inadequacies in ITRE's report which other pro-camera reports share. In addition to using the wrong investigation technique, the reports describe experiments lacking scientific controls and experiments that do not take into account

engineering changes made during the experiment period. Every report also finishes with a contradictory conclusion.

The experiments behind these reports lack required controls which render their conclusions unreliable. Controls are devices which define fixed markers against which the experiment's results can be objectively measured. One necessary control for such an experiment would be a year's worth of daily traffic volume counts at the intersection before and after the red light camera was installed. Crashes per person is a meaningful metric. Crashes as a solo metric is meaningless. Simple things like businesses moving out of the area or drivers taking an alternate route away from a red light camera intersection would both skew the data and invalidate the results.

These reports tend never to include the effects of engineering changes made to the intersections during the experiment period. For example the Town of Cary boasts of better safety but Cary tampers with its all-red and yellow intervals about every year. The same tampering happens in Raleigh. We have seen Cary increase a yellow duration by 0.5 seconds and thus decrease red light running by 80%. We have seen Cary decrease a left turn yellow by 1.0 second and thus increase red light running by 1000%. Likewise we know that an increase of an all-red interval dramatically decreases crashes but does not affect the number of people running red lights. Cities like Cary, North Carolina use that ploy to defraud the public by stating that crashes decreased at intersections with red light cameras. Yes, crashes decreased but red light running did not. In this manner cities pacify the public and keep their revenue stream flowing at full pace.

The Conclusion of No-Conclusion

All reports conclude one of four things:

1. The majority of crashes still exist.
2. The number crashes did not significantly change or just changed type.
3. The number of crashes increased.
4. The number of crashes increased at some intersections but decreased at others.

The conclusion of these conclusions is that there is no conclusion. There is no answer to the red light running problem. The mystery of systematic red light running and crashes has not been solved.

ITRE's report ends with conclusion 1. The majority of the crashes still exist (83%). ITRE does not proceed to the next obvious step: investigate why 83% of crashes have not been avoided in the presence of red light cameras. ITRE concludes that 1 less crash

per 5 warrants that 100% of all drivers should be punished for some uninvestigated cause.

In the presence of red light cameras but in the absence of good engineering, thousands of drivers will run red lights and crash. Drivers subjected to crazy engineering do crazy things. A 17% decrease may suggest that a red light camera alters human behavior, but that may mean only an added ability to overcome engineering failures to a small degree. What would happen if one simply removed the engineering failures?

In the presence of good engineering, with or without the presence of red light cameras, red light running and crashes will decrease by 99.99% all around. That conclusion can be inferred from the raw Cary red light camera data and assured by the immutable laws of physics.