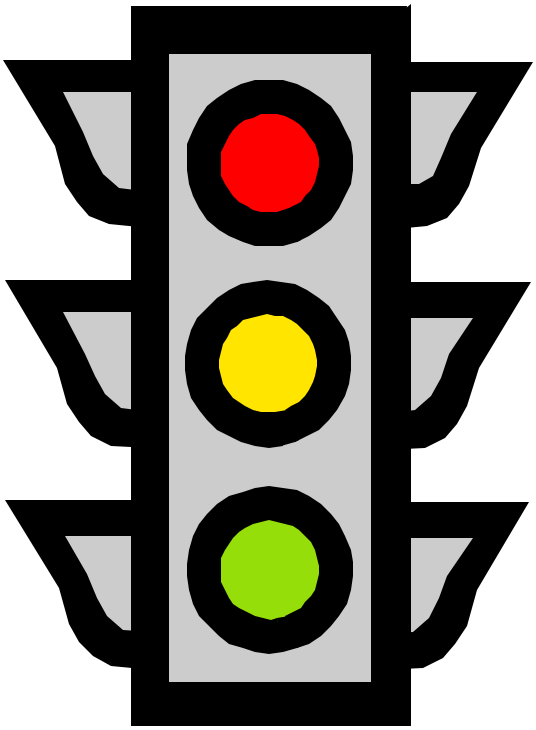
The Red Light Running Crisis
Is it Intentional?



Office of the Majority Leader
U.S. House of Representatives

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Executive Summary

There's a hidden tax being levied on motorists today. In theory, this tax is only levied on those who violate the law and put others in danger. But the reality is that the game has been rigged. And we're all at risk.

We are told to accept the idea that our laws should be administered by machines—not human beings—because it is a matter of *safety.* We must accept this expansion of government and this Orwellian threat to our privacy because cameras are the solution to the so-called red light running crisis.

This is a federal issue, not just a local one. The federal government is promoting and offering funding for this "solution", because the safety benefits are supposed to be indisputable.

After all, who's going to object? Nobody likes a red light runner. They endanger themselves and others. They must be penalized.

But why have so many people become wanton red light runners all of a sudden? The answer seems to be that changes made to accommodate camera enforcement have produced yellow light times that, in many cases, are shortened to the point that they are inadequate. And when people come upon an intersection with inadequate yellow time, they are faced with the choice either of stopping abruptly on yellow (risking a rear end accident) or accelerating. The options for those confronting such circumstances are limited and unsafe. But each time a driver faces this dilemma, government increases its odds for hitting the jackpot.

This report suggests there is something that can be done to address this hazard. It cites examples of problem intersections where yellow times have been raised by about 30 percent and the number of people entering on red fell dramatically. It cites, in addition, controlled scientific studies that confirm the hypothesis that longer yellows are better. The following reductions in red light entries are documented:

Mesa, Arizona	73%
Georgia	75%
Virginia site 1	79%
Virginia site 2	77%
Virginia site 3	Problem "virtually eliminated"
Maryland	Problem "virtually eliminated"

It is no coincidence that each of the "problem" intersections mentioned above happened to have yellow times that fell short by about 30 percent. Today's formula for calculating yellow times yields yellow times that can in some cases be about 30 percent shorter than the older formula.

And one should ask the question, if there's a problem with an intersection, why don't safety engineers in the field just go out and fix the timing?

In fact, before red light cameras arrived in the United States, that's exactly what our regulations instructed them to do. If too many people enter on red at an intersection, engineers were supposed to lengthen its yellow time. But in the year that red light cameras first started collecting millions in revenue on our shores, those entrusted with developing our traffic safety regulations dropped the requirement to fix signal timing, instructing engineers to "use enforcement" instead.

Indeed, according to the Federal Highway Administration, these problem intersections serve as a great location to hold a press conference. The agency offers a script for local officials to exploit a tragically mistimed intersection to call for the installation of additional red light cameras and tout their safety benefits.

But none of the reports that are supposed to tell us that red light cameras are responsible safety benefits actually say that. First, they dismiss increases in rear-end collisions associated with red light cameras as "non-significant," despite evidence to the contrary. Second, they do not actually look at red light intersection accidents. The latest accident study in Oxnard, California, for example, only documents accident reductions "associated with"—not caused by—red light cameras. Although that statement has little scientific value, it does have great marketing appeal if you don't look too closely.

Every study claiming red light cameras increase safety is written by the same man. Before joining the Insurance Institute for Highway Safety (IIHS), he was a top transportation official in New York City at the time the city began looking into becoming the first jurisdiction in the country to install red light cameras. In other words, the father of the red light camera in America is the same individual offering the "objective" testimony that they are effective.

A similar conflict of interest affects those entrusted with writing safety regulations for our traffic lights. The Institute of Transportation Engineers is actively involved in lobbying for, and even drafting legislation to implement, red light cameras. They are closely tied to the Insurance Institute for Highway Safety (IIHS), which in turn is funded by companies that stand to profit handsomely any time points are assessed to a driver's license.

In short, the only documented benefit to red light cameras is to the pocketbook of local governments who use the devices to collect millions in revenue.

We traded away our privacy for this. We gave up our constitutional protections for this. In return, we are less safe. That is the red light camera scam, and it has gone on for far too long.

All documents cited in this report are available online at ***www.freedom.gov/auto***

I. Something Funny is Going On

A local television station in Beaverton, Oregon (KOIN-TV) discovered the effects of inadequate yellow light times when investigating the red light camera controversy in its area. The following is excerpted from a newscast broadcast February 14, 2001:

ELAINE MURPHY (reporting): So it got us to wondering just how this program is working. About how many people are getting tickets and, most importantly, is there something funny about how this is set up?

…

MURPHY: So we took out the stopwatch. The yellow here [where there is a red light camera] is three seconds and a fraction. It's a big intersection—we measured 111 feet across. Yet a few blocks away at 107th and Beaverton-Hillsdale at an intersection measuring a mere 75 feet, the yellow lasts almost a second longer. *Why?*

LINDA ADLARD (Beaverton City Official): I really don't know why that would have a different timing.

MURPHY: We kept checking. The intersection with a camera, a little over three seconds for yellow. The next intersection to the east, four seconds. The one after that, four seconds. And the one after that, and the one after that.

ADLARD: I think probably this is timed this way because of the volume of traffic.

MURPHY: By the way another red light running camera goes into service next Tuesday at Lombard and Allen. The length of yellow? Three seconds. Just thought you'd like to know.

It is clear from this example that there is something funny going on. This jurisdiction has been caught red-handed playing with signal timing on lights that have red light cameras. But that's just the beginning of the story.

To understand why a jurisdiction would do something like this, one needs to know a little more about the incentives behind red light cameras.

II. Red Light Cameras and Revenue

Red light cameras raise a tremendous amount of money for the jurisdictions that use them. It is easier to set up a camera than it is to employ a human being to enforce the law. Consequently, about 50 cities across the country in ten states issue tickets to motorists with red light cameras. And the number of cameras continues to grow.

It's not surprising that local and state governments are jumping at the opportunity to collect revenue from motorists with these devices. Consider the examples below:

- **Washington, D.C.** A single camera collected $1 million in revenue. A line item in the city's FY2001 budget assumed there would be $16 million in fines collected from the 37 cameras deployed throughout the city. *The Washington Post*, May 19, 2000.

- **San Diego, CA.** A single camera collected $6.8 million in revenue in 18 months. The 19 camera program as a whole has brought in nearly $30 million in the same period. *San Diego Union Tribune*, May 5, 2001.

- **Sacramento, CA.** The program collects an estimated $800,000 a year. *Sacramento Bee*, April 16, 2001.

- **Ventura, CA.** The program will collect an estimated $3.2 million during its first 12 months. *Ventura County Star*, March 29, 2001.

- **West Hollywood, CA.** The program collects an estimated $4.9 million a year. *Los Angeles Times*, March 25, 2001

- **Baltimore County, MD.** The program has collected $6 million as of January 2001. *Baltimore Sun*, January 28, 2001.

- **Howard County, MD.** The program has collected $4 million from more than 70,000 tickets issued between 1998 to 2000. *Baltimore Sun*, January 28, 2001.

- **Charlotte, NC.** The program will collect over $1 million. *Minneapolis Star Tribune*, April 4, 2001.

- **New York, NY.** In its first full year of operation, the 15 red-light cameras racked up 168,471 tickets, collecting $5,435,815 in fines. *Car & Driver*, May 1999. "The city last year sent out more than 400,000 tickets to drivers caught on camera running red lights and collected $9 million in revenue, said city Department of Transportation spokesman Thomas Cocola." *New York Post*, May 9, 2001.

The fines are trending upward

Consider how fee structures are changing:

- **California.** The highest in the nation fine of $271 is collected from motorists and one point is assessed against the driver's license.

- **Montgomery County, MD.** "Local officials have asked the state Legislature to approve a fine increase to $250. Current fines in the county are $75 if caught on camera." *USA Today*, February 6, 2001.

- **Arizona.** The legislature is considering a bill to raise the fine statewide to $250. Phoenix raised a $125 fine to $175, plus two points against the driver's license. *Arizona Republic*, January 16, 2001.

- **Delaware**. The fine was raised from $25 to $75 in July 2000. *USA Today*, February 6, 2001.

III. The Theory: If There's a Problem, Lengthen the Yellow

There is no doubt that red light cameras present an attractive option for those interested in collecting additional revenue. But there may be another way to solve the red light running "crisis"—lengthening yellow times.

A little yellow makes a lot of difference

A case study of two intersections entitled "The Influence of the Time Duration of Yellow Traffic Signals on Driver Response" (1980), reported that a 30 percent increase in yellow time yielded substantial safety benefits. "The Results in Table 3 show that the extension of yellow duration reduced the frequency of potential conflicts in all cases studied," (page 27).

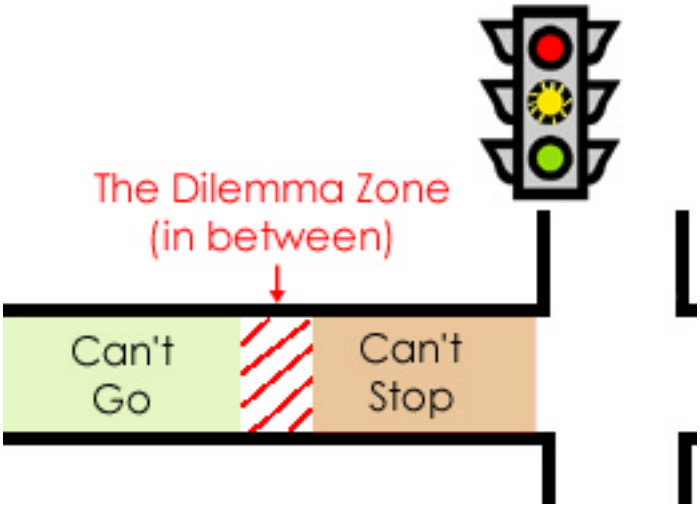
The first site studied found an extra second and a fraction of yellow had an immediate and definitive safety pay-off: "An increase of 1.4 seconds or about 30 percent in yellow duration virtually eliminated *all* potential conflicts at the Maryland site," (page 27, emphasis added).

Similarly, the second site in Georgia realized a 75 percent reduction in potential conflicts following a 32 percent increase in yellow time. These figures agree with those found in Section 4 of this report, below.

The yellow light's purpose

To understand why an increase in yellow has such a significant safety impact, one must consider the traditional purpose of the yellow traffic light. The yellow indication is designed to warn a motorist approaching an intersection that the signal is about to turn red. The yellow light should be long enough for the approaching motorist to either, (a) come to a safe stop before the intersection, or (b) continue clear through the intersection before the red light appears.

An inadequate yellow time will either prevent motorists from coming to a safe stop or force them to enter the intersection on a red light. Neither option should be considered acceptable.



The diagram above illustrates what happens when an automobile approaching an intersection sees the yellow light. Drivers who are in the "Can't Go" zone as the light turns yellow know they are too far back and won't be able to reach the intersection before the light turns red—they must stop. Drivers who are in the "Can't Stop" zone know they're too close to the intersection to stop safely—they must proceed. But when the yellow time is inadequate, there is place in between both zones where the driver can neither proceed safely, nor stop safely. Engineers call this the "Dilemma Zone."

A properly timed signal will have enough yellow time that driver's will never be faced with the impossible choice presented by the dilemma zone. By determining the stopping and clearing distances for a given approach speed, one can always calculate a safe yellow time that offers drivers a safe option, by design, every time.

What if there's a problem?

Still, an engineering formula may not perfectly account for all the variables that might exist at an intersection. In such cases, the engineer has a tool, known as a countermeasure, that he must employ to remedy the situation. Namely, the engineer must lengthen the amount of yellow time. Even the 1985 ITE proposed recommended practice provides for this yellow time "measure of effectiveness":

> When the percent of vehicles that are last through the intersection which enter on red exceeds that which is locally acceptable (many agencies use a value of one to three percent), the yellow interval should be lengthened until the percentage conforms to local standards. (Page 6.)

It is the duty of an engineer to double-check his work and make sure that there is not a problem with red-light entries at each intersection.

Red Light Camera proponents agree

This truth is not disputed. Even in literature intended to promote the use of red light one finds the inescapable truth that lengthening the yellow can be the appropriate thing to do if there's a problem. In the study "Red Light Running and Sensible Countermeasures", author Richard Retting agrees that longer yellow times can often substantially reduce accidents and red-light running:

> Signals that provide insufficient yellow intervals cause some drivers to run red lights inadvertently. However, many drivers who run red lights are provided adequate opportunity to stop safely but choose instead to proceed through a red light signal…. (Page 1.)
>
> Increases in the length of the yellow signal toward values associated with the ITE-proposed recommended practice significantly decreased the chance of red-light running. (Page 2.)

What is surprising is that the author, despite acknowledging that insufficient yellow *causes* red light running, considers red light cameras as the only solution. In the first citation given above, he makes an effort to blame motorists for running lights, even when the yellow time is inadequate. Furthermore, in the report's "summary and conclusion" (page 4), "signal modification" rates only a passing mention in half of a sentence—he devotes the rest of the discussion to the virtues of red light cameras. Note that the signal modification he refers to is the already shortened ITE practice, not the longer yellow times a properly timed intersection would use (see Section 5, below).

> 'Longer yellow signals reduce red light running, there is no question about it,' said Richard Retting, senior transportation engineer at the Insurance Institute for Highway Safety. 'I can't say with any certainty if that has any effect on crashes, but there is some evidence that longer yellows can cut down on crashes.' (*Las Vegas Review Journal*, October 20, 2000.)

Eighty percent of entries occur during the first second of red

The relation between yellow time and red light running is most clearly found in the Insurance Institute for Highway Safety's study of red light running entitled "Red Light Running and Sensible Countermeasures" (1998). Although the report's intention is to prove the need for red light camera enforcement, the data in the report provides additional insight into the red light running question. A chart found on page 2 of the report (summarized below) indicates quite clearly that almost 80 percent of red light entries occur within the first second of the red light indication.

This strongly suggests that inadequate yellow time is the major cause of red-light entries. If the vast majority of red light entries occur in the first second after the yellow light expires, it is reasonable to assume an additional second of yellow time on that light will yield a nearly 80 percent decrease in red light entries.

Red Light Entries at Site 1		***Red Light Entries at Site 2***	
Hourly Average	Hourly Avg. (after one second of red)	Hourly Average	Hourly Avg. (after one second of red)
5.6	1.2	1.3	0.3
79% entered on first second of red		**77% entered on first second of red**	

IV. The Fact: Longer Yellow Reduces Red Entry

Mesa, Arizona

When yellow times are lengthened at intersections, red light entries plunge. Mesa, Arizona found a 73 percent drop in citations after the yellow light was extended.

> Mesa increased the left-turn yellow arrow duration to four seconds, from three seconds, on Nov. 14, after complaints from drivers who felt the time was too short to safely complete their turns. The change was made at 30 intersections with dual left-turn lanes and left-turn arrows. In November, the city issued 1,639 left-turn arrow citations at the six intersections patrolled by cameras. In December, the month after the change, the number fell to 716. In October, the month prior to the change, Mesa issued 2,645 citations. (*Arizona Republic,* February 6, 2001.)

To most, this decrease in red-light running violations would be most welcome news. But it was not welcome news to the city of Mesa. That's because once yellow signal timing changes were made, the camera went from a money-maker to a $10,000 money-loser. The response of the local bureaucracy was typical:

> Meanwhile, the department will propose eliminating the three-tenths of a second grace period that [the camera] allows from the time a light turns red to the time the camera flashes. 'We want to establish a zero tolerance policy for red light running in Mesa,'" [Mesa police Commander Richard] Clore said. (*Arizona Republic,* February 6, 2001.)

> Some of Mesa's red-light cameras are working so well that police are talking about disconnecting them… In some cases, it's only catching one person a day. [Mesa police Commander Richard] Clore said that may be because the city recently lengthened its yellow lights by a second. (*Arizona Republic,* May 22, 2001.)

Fairfax County, Virginia.

Like Arizona, Virginia, has also seen outstanding results from increased yellow times. In testimony before the Kentucky State Senate, IIHS study author Richard Retting reported that, on average, someone runs the red light at US50 in Arlington, Virginia every 12 minutes.

Yet just a few miles down the road at the intersection of westbound US50 and Fair Ridge, the Virginia Department of Transportation (VDOT) raised the yellow to 5.5 seconds from 4.0 seconds last summer. Since the change, red light running has almost disappeared at the location.

This is very significant and substantial evidence to show that increased yellow times reduce entries on red at problem intersections.

V. Changes in the Safety Codes

Where do the problem intersections come from? We've seen that experience tells us that if there's a red light running problem, yellow light times should be increased. And the theory tells us the same. So why have yellow signal times decreased? The answer is that the organizations responsible for maintaining our intersection safety codes have altered the regulations *specifically* to accommodate camera enforcement and decrease yellow times.

The chart below provides the theoretical *minimum* yellow clearance signal times based on speed and intersection width from the 1976 edition of the Institute of Transportation Engineers (ITE) handbook. Note that the 100-foot intersection in Beaverton, Oregon had a 3.1 second yellow signal time in a 30MPH zone, as mentioned in Chapter 1 above. As one can see from the chart, that time would be inadequate for any condition. But it's quite profitable for the red light camera installed at that location.

Approach Speed (mph)	**Width**				
	30'	50'	70'	90'	110'
20	3.8	4.4	5.6	5.7	6.4
30	3.6	4.1	4.5	5.0	5.5
40	3.9	4.2	4.5	4.9	5.2
50	4.1	4.4	4.7	5.0	5.2
60	4.5	4.7	4.9	5.1	5.4

Source: 1976 Transportation & Traffic Engineering Handbook

To understand more fully the extent of changes to the signal timing codes, one must first examine the prior formula used for calculating yellow times.

The 1976 ITE Handbook

In 1976, yellow time was known as the "yellow clearance interval." This was the theoretical minimum amount of time needed for an automobile to clear the far side of the intersection from a given distance away, or come to a safe stop. This was calculated by adding three variables:

(1) *Reaction time:* How long it takes, on average, to recognize the situation and decide whether to stop or continue through the intersection. Usually this is 1.0 seconds.

(2) *Stopping time:* This figure is calculated based upon the length of the intersection and the average deceleration rate for automobiles.

(3) *Time needed to clear the intersection:* Based on the approach speed, how long it would take an automobile to traverse the length of the intersection.

The 1985 ITE Proposed Recommended Practice

By 1985, ITE had begun to change the way signal times were calculated in the past. The first modifications were published in their "Proposed Recommended Practice" a mere three years after New York City began researching how it would implement the first red light cameras in the United States.

These changes were further explained in the 1989 ITE Journal article, "Determining Vehicle Signal Change Intervals." This report begins by clearly stating that the ITE's intent is to change laws across the country because, "adopting a uniform method cannot precede adoption of uniform laws" (page 27). In other words, for red light cameras to be adopted nationwide, the laws must change nationwide. And they provide at least three methods that have as their result a reduction, in most cases, of yellow signal time as well as easy adoption of camera enforcement.

1. Their goals are not entirely safety related

The goals and objectives of the 1985 and 1989 documents are clearly related to red light camera enforcement. Consider:

> Goal: Recommend legal definitions for the various aspects of the change interval and a defensible methodology for calculating and evaluating change intervals. (1985, page 5; 1989 page 27.)

And the second signal timing objective listed:

> Allow easy identification of violators by law enforcement agents. (1985, page 5; 1989, page 28.)

This is a strange goal for someone who wants to design safer intersections. Yet it is a perfect goal for one whose true intent is not safety but rather the convenient installation of a red light camera.

2. Reduced Yellow I: Ignore the Actual Speed of Traffic

The first method for reducing yellow time is found on page 29 (1989) where the document states, "It may be possible to use the posted speed as the approach speed."

What that means is that signal times would be determined by the *speed limit* rather than the actual speed 85 percent of traffic is traveling, known as the '85th percentile speed." The result of this change in practice would be an underestimate of the actual speed of vehicles at the intersection. And this factor alone can result in yellow time shortfalls of 20 percent or more.

The laws of physics dictate that the distance required to stop your car is based entirely on the speed at which you are traveling, not what is printed on a sign on the side of the road. No

rational safety consideration would lead one to choose posted speed over actual speed. *But it does allow for a reduction in yellow light time.*

3. Reduced Yellow II: Replace yellow time with "all-red clearance"

Take the traditional definition and formula for calculating the duration of the yellow light signal. You might need three seconds of yellow to warn approaching motorists that they need to stop, and two more seconds of yellow on top of that to allow vehicles enough time to clear before opposing traffic is given the green light. The total yellow time for such an intersection would be five seconds.

A comparison of old and new calculations

1976 & earlier	*Yellow time:*	Reaction time + Stopping time + Clearance time
	Clearance time:	Included in yellow time, plus all-red of 1-2 seconds at the option of the engineer.
	The result:	Entries on red happen, but are rare.
1982–1985	*Yellow time:*	Reaction time + Stopping time
	Clearance time:	Has changed from yellow to all-red.
	The result:	Yellow is reduced by a third from '76 values, and more red entries occur.
1999–present	*Yellow time:*	Reaction time + Stopping time
	Clearance time:	All-red clearance time is now optional.
	The result:	Yellow time is the same as '85, but opposing traffic gets the green while people going the other way are entering and clearing the intersection against their own red signal.

On page 30 of the 1989 report, the ITE proposes to take that five seconds of yellow in the hypothetical intersection above and reduce it to three seconds of yellow, and two seconds in which all sides of the intersection are given the red light (this is known as the "all-red period"). Eliminating that much yellow time, again, is of questionable safety value. But there is no question that in practice this method would yield an increase in the number of vehicles that enter the intersection on red, given the two second reduction in the amount of time one would have to clear the intersection legally. Again, it is unlikely that a rational safety consideration would lead you to choose this method. *But it does allow for a reduction in yellow light time.* And it will increase red light running. Why? Because the light turns red faster.

*Changes were made to the code **specifically** for camera enforcement*

These changes are significant. But if it was not clear enough in the above documents that ITE had cameras in mind in 1985, they make it explicit a few years later. The 1994 ITE "Determining Vehicle Signal Change and Clearance Interval" states:

> When the percentage of vehicles that entered on a red indication exceeds that which is locally acceptable, the yellow change interval may be lengthened (or shortened) until the percentage conforms to local standards, *or **enforcement** can be used instead.* (Page 5, emphasis added).

In other words, if too many people are running red lights, jurisdictions need not address deficiencies in intersection design or signal timing. Instead, they can simply "use enforcement"

by putting up a red light camera. They are suggesting creation of an intersection that will have a perpetually high level of red light runners *by design*. Since enforcement by police officers wouldn't be 24-hours a day, it is hard to conceive that they had anything other than 24-hour red light cameras in mind.

Changes in the yellow light formula linked to red light running

The changes in the yellow signal timing regulations have resulted in the inadequate yellow times. And these inadequate yellow times are the likely cause of almost 80 percent of red light entries, as discussed above.

Yellow Times Compared
Posted speed, 35 MPH. Width: 80 feet. Grade: 2.6% downhill.

1976 ITE Formula	1999 ITE Formula
4.64 seconds (round up to 5)	3.8 seconds (round up to 4)

If we look closely at one of the intersections Retting studied, the signal at Columbia Pike at Greenbrier in Arlington, Virginia, we find that it has a measured yellow time of 4.0 seconds. This location was the second site studied in his "Red Light Running and Sensible Countermeasures." Using the 1999 formula results in a one second (20 percent) decrease in the yellow time compared to the 1976 formula. And, as mentioned above, according to Retting's study, 77 percent of red light entries happened in that first second the light was red instead of yellow.

Thus, if the old formula had been employed, the red light entry problem Retting studied would have been substantially reduced.

Elimination of the vehicle change interval, a chronology

It may be useful to consider the following excerpts from signal timing regulations that, when presented in chronological order, show a clear progression toward lowering yellow times to accommodate red light cameras:

1985—ITE, "Determining Vehicle Change Intervals: A Proposed Recommended Practice," states, "When the percent of vehicles that are last through the intersection which enter on red exceeds that which is locally acceptable (many agencies use a value of one to three percent), the yellow interval *should* be lengthened until the percentage conforms to local standards."

1988—Federal Highway Administration, "Manual on Traffic Control Devices" (MUTCD) states, "Signal Operation Must Relate To Traffic Flow" (Section 4B-20). Note that red light camera promoters use the opposite principle: they wish to use signals to modify traffic flow.

1994—ITE, "Determining Vehicle Signal Change and Clearance Intervals" states, "When the percentage of vehicles that enter on a red indication exceeds that which is *locally acceptable*, the yellow change interval *may* be lengthened *(or shortened)* until the percentage conforms to local standards, *or enforcement can be used instead."*

1999—ITE, "Traffic Engineering Handbook: Fifth Edition" states, "The red clearance interval is an *optional* interval that follows a Yellow Change Interval and precedes the next conflicting green interval. The red clearance interval is used to provide additional time following the Yellow Change Interval before conflicting traffic is released" (page 482).

2000/2001—Federal Highway Administration, "Manual on Traffic Control Devices" (MUTCD) states, "47. Red Clearance Interval: an *optional* interval that follows a yellow change interval and precedes the next conflicting green interval" (page 4A-5, Part 4, Highway Traffic Signals). Yellow time is calculated from "E. The posted speed or statutory speed limit *or* the 85th percentile speed on the uncontrolled approaches to the intersection" (page 4C-3).

In all the above citations, emphasis is added to the key changes. The words in italics mark the differences between the old and new codes. Namely:

1. The "should" in 1985 was changed to "may" in 1994.
2. "Or shortened" was added to the formulation in 1994.
3. "Or enforcement can be used instead" was added in 1994.
4. "Optional" was added to the definition of red clearance interval in 1999.
5. Finally, the Federal Highway Administration endorses all these changes in the December 2000 edition of the MUTCD.

VI. Why Have Reports Shown Cameras to be Effective?

Overview of U.S. Red Light Camera Studies

Jurisdictions that wish to claim safety as their motive for installing red light cameras will invariably cite studies that show the devices reduce red light running and the intersection collisions it causes. To date, the only case studies of red light running and camera use in the United States have taken place in Arlington, Virginia, City of Fairfax, Virginia and Oxnard, California.

The studies performed at these locations share a lot in common, mostly because they were all performed by the same researcher. Consequently, they also share many of the same flaws in methodology.

How to do a proper study: Australia

One can see the flaws more clearly when they are contrasted with the 1995 Australian Road Research Board report, one of the most comprehensive looks at the effect of red light cameras to date.

The report's conclusion is the most striking, particularly considering the American coverage of this issue: "There has been no demonstrated value of the RLC as an effective countermeasure" (page 1). And when one considers the study's methodology, one must also wonder why the same thoroughness is not found in Retting's American studies:

- *Comprehensive, ten-year study*. The report examined accidents five years before and five years after the installation of red light cameras.

- *Objective.* On pages 2-3, the report points out how prior Australian studies conveniently omitted crucial data that might have undermined any pro-red light camera conclusions.

- *Uses actual accident reports.* Prior Australian studies merely used accident databases to generate results and statistics. All accidents in the database marked with certain codes were deemed to relate to red light running. Unfortunately, that method assumed the accidents were always properly coded. Of the 6,200 accident report forms examined, 960 (15 percent) were found to be unrelated to the intersections studied, despite their coding. For example, accidents at an adjacent McDonalds parking lot were coded as if they took place in the nearby intersection. This shows that conclusions based merely on accident codes can be significantly misleading.

- *Signal Timing Considered.* Although ultimately unsuccessful, the study at least attempted to document any changes in signal timing that may have occurred during the study period:

> Inquiries were made of VicRoads traffic signals group about the changes at signals and it seems that the historical records have been archived. From the data that was obtained for three intersections… it was apparent that a number of changes had taken place. These changes included… changes in phases as well as phase and cycle times and provisions for green arrows. The changes to the intersections were apparent, but the dates these changes took effect was not. For this reason the changes could not be related back to subsequent changes in accident frequency. Further investigation into signal changes would be worthwhile to explain some of the abrupt changes at individual RLC sites. (Page 9)

Red Light Cameras and Rear-end Accidents

The Australian study goes on to conclude that red light cameras tend to cause rear-end accidents. "This study suggests that the installation of the RLC at these sites did not provide any reduction in accidents, rather there have been increases in rear end and adjacent approaches accidents on a before and after basis…" (Page 20).

This should come as no surprise. The goal of a red light camera is to make people fear being ticketed if they enter a camera-controlled intersection on red. Common sense dictates that if the desired effect of red light cameras is achieved, there will be an increase in rear-end accidents. This is because motorists fearing a ticket will panic and slam on their brakes to avoid entering an intersection. This sudden maneuver can surprise cars and trucks behind, causing a collision.

The 2001 IIHS Oxnard accident study admits a connection between red light cameras and rear end accidents:

> Some additional rear-end crashes might result from non-uniform changes in driver behavior. For example, if drivers stop more often for red lights, they may be struck from behind by drivers not intending to stop. (2001 Oxnard study, page 2.)

One wonders if Retting considers perhaps that those same individuals are *unable* to stop, because of inadequate yellow time. The increase in rear-end accidents in this report are passed off as insignificant. But are they?

These photos, found on the Oxnard, California police department website, were taken by red light

cameras. They illustrate rear end collisions apparently caused by motorists panic-stopping.

Yellow Light Timing

As we have seen, yellow signal timing is fundamentally linked to red light entries. The 1999 Oxnard study concludes that since red light cameras were installed that there was a 40 percent reduction in red light violations at intersections with cameras, and a 50 percent reduction at intersections without cameras. But the study did nothing to document whether signal times, including yellow light times, were held constant throughout the duration of the research. There is reason to believe, based on the Australian findings, that the signal timings did in fact change during the study. Despite this, the author merely says that the times were "checked" and "deemed adequate":

> The duration of yellow traffic signal timing has been found to influence red light running at urban intersections (Retting and Greene, 1997). Therefore, yellow signal times at the camera sites were checked against an Institute of Transportation Engineers (1985) proposed recommended practice and were found to be adequate. (1999 Oxnard study.)

The same language is used in the 1999 Fairfax and 2001 Oxnard studies. But, as discussed in Chapter 5 above, the 1985 proposed ITE yellow times can often be inadequate. It is reasonable to suspect they played a significant role in the red light entries that are documented in the report.

But the 1985 proposed recommended practice was not followed. The proscribed countermeasure for excessive red light entries is an increase in the yellow signal time (page 6 of the 1985 ITE guidelines). This was not performed. And if it had been implemented, it is likely that the pro-camera conclusion of the reports would have been undermined.

Moreover, if indeed the yellow time in the three studies was set to the numeric amounts resulting from the 1985 ITE practice, the excessive red light running that resulted tends to confirm the inadequacy of the yellow time from the practice itself.

Actual red light accidents not studied in 2001 Oxnard report

Incredibly, the 2001 IIHS Oxnard study did not actually study any accidents caused by red light running. "…the crash data did not contain sufficient detail to identify crashes that were specifically red light running events…" (2001 Oxnard report, page 1). Nor did it even study accidents at intersections that have red light cameras.

Instead, the study's author, Retting, merely looked at accident codes from a database over a 2 and a half-year period to claim that accidents throughout the Oxnard area dropped by about 30 percent as a result of the red light cameras. The connection between area accidents and red light cameras is only an *implied* connection. There is no scientific evidence in the report showing any demonstrable connection between the two.

That is why the 2001 report is entitled "Crash Reductions *Associated With* Red Light Camera Enforcement in Oxnard, California." Notice that it does not say, 'caused by.' But, nonetheless, the report is still used as a marketing tool to sell red light cameras.

Drops in "violations" are no measure of success

At times, jurisdictions that IIHS did not study will find other ways to "prove" the success of their red light camera program, particularly when they wish to order additional camera units. They simply cite the number of "citations" or "violations" at intersections. And they claim red light cameras are a success if there are any reductions. Of course, they fail to note that the number of both citations and violations given is entirely within the control of the camera operators.

It's easy, for example, to turn off the camera for a period of time to achieve the desired number. The camera can be loaded with half a roll of film. Shifting the cameras around will alter the data. Cameras malfunction and are taken out of service for repairs. Signal timings, including lengthening the yellow, can happen without being reported. These are just a few of the many "tricks" or potential oversights available.

It is clear, then, that the justifications given for red light camera installations are questionable.

VII. Conclusion

The subject of signal timing can be difficult and obscure. And for that reason, the proponents of red light cameras have been able to escape close scrutiny.

Transportation officials and engineers *know* that the yellow signal timing is essential to safety. The data showing this to be the case are found in their studies. Nonetheless, some have systematically and intentionally ignored the inescapable engineering fact that longer yellows would solve the so-called crisis caused by *shortened* yellows.

Red light cameras present a perverse disincentive for local jurisdictions to fix intersections with excessive red light entries. It's hard to fix a "problem" that brings in millions in revenue.

In other words, red light cameras aren't fixing a safety problem, they're creating one.

And, with the federal government's assistance, state and local governments are undermining the vital constitutional protections our Founders put in place. The right to face one's accuser in court and the presumption of innocence form the bedrock of our judicial system.

Camera-based law enforcement can only work when these principles are ignored.

We should never have allowed the personal privacy of our citizens to be undermined by these Big Brother devices. In the name of safety, we sacrificed our privacy. But now it is clear that we have been asked to relinquish our cherished freedoms for an entirely empty promise.

VIII. References

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