



## Misapplied Physics in the International Standards that Set Yellow Light Durations Forces Drivers to Run Red Lights

### Abstract

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The international standards that traffic engineers use to set yellow light durations are in opposition to the laws of motion. Misapplied physics creates systematic errors at signalized traffic intersections guaranteeing a steady stream of drivers running red lights. These errors are exploited by red light camera companies and governments. The systematic errors also induce thousands of vehicle crashes each year.

The problem is the Yellow Change Interval Formula, a formula invented by Denos Gazis of General Motors in 1959, adopted in 1965 by the Institute of Traffic Engineers (ITE), and since misapplied to all intersections in the world. The formula as originally designed confines itself to the one case of straight-movement drivers who can travel unimpeded to the intersection at the speed limit or more, with the assumption that drivers know exactly how far the critical distance, a mathematically exact value, is from the intersection. But ITE has been misapplying this formula to all types of drivers in all cases and instructing the world's traffic engineers to do the same. The misapplications result in two problems which guarantee a steady stream of red light runners and crashes.

1. When the light turns yellow, the misapplied formula forces drivers who need to decelerate before entering the intersection to run a red light. Affected drivers are left turn drivers, right turn drivers, U-turn drivers, drivers at two close-by intersections who must proceed through the first intersection but stop for the next, drivers who must slow down for vehicles emerging from business entrances, drivers who slow down for railroad tracks, dips or bumps, and drivers who simply drive defensively.

2. When the light turns yellow, the formula forces drivers to guess between stop and go. The misapplied formula provides no margin of error. The formula mathematically calls for the engineer to paint a line on the road where on the onset of yellow, the driver must stop if he has not yet crossed the line and go if he has crossed the line. If a driver incorrectly guesses where this line is by an inch, the driver runs a red light. Since engineers never paint the line, the formula forces drivers to supply their own margin of error. To help prevent being in the intersection when the light turns red, drivers either have to accelerate or slam on the brakes. Acceleration is better because the yellow light lasts half the time it takes for a driver to stop. It is true that the yellow light means "go fast."

Under the pretense of safety, red light camera companies mark cash-strapped governments to participate in exploiting the incompatibilities between enforcement, engineering and the laws of physics. Without exception one will find the cameras facing approaches where traffic engineers have most misapplied the formula. It is on these approaches where governments create the most crashes, the most red light runners and the most profit.