Discussion of the paper by David Mahalel and David Zaidel
"A Probabilistic Approach for Determining
the Change Interval"

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The critique of the ITE procedures for timing signal change intervals by David Mahalel and David Zaidel, "A Probabilistic Approach for Determining the Change Interval," is based on the assumption that the ITE formula and procedures are based on the behavior of a "reasonable" driver. They argue for an approach to signal change interval timing that is based on driver stopping probabilities, calculated for individual intersections. Potential tradeoffs between rear-end and right-angle crashes that might result from changes in signal timing relative to the ITE formula are also discussed.

The ITE procedures are not based on some arbitrary "reasonable" driver but on extensive research and observation of thousands of vehicles and their drivers' responses to yellow signals.\textsuperscript{3,10,11,12} This research led to the adoption of values currently recommended in the ITE procedures. The most controversial parameter in the ITE procedures is the acceptable driver deceleration rate for stopping after the yellow signal. Research has documented that for most intersections, the vast majority of drivers that can decelerate at 10 ft/sec\textsuperscript{2} or less will, in fact, do so. The ITE procedures allow for the calculation of a minimum time required for drivers who choose not to stop to be able to clear the intersection before cross-street traffic is allowed to proceed. Consequently, the ITE procedures have incorporated a conservative estimate of driver stopping probability. The authors' recommendation that stopping probability curves be developed for individual intersections would be a cumbersome task and is unnecessary for most intersections.

The authors are also concerned that at a given distance upstream
from the intersection, some drivers will make the choice to go through the intersection and others will stop; they label this an "indecision zone." The authors recommend short change intervals, hypothesizing that drivers in this zone are subject to a higher risk of rear-end collisions. Their discussion is academic because driver reaction is largely independent of actual yellow time and intersection geometry. The ITE procedures provide a safer, conservative approach to timing yellow signals based on having longer yellow signals that provide sufficient time for the drivers who will make the wrong stop-or-go decision.

Two recent studies have compared the adequacy of signal change intervals relative to the ITE procedures with rear-end and right-angle crash rates. Both of these studies reported evidence that directly contradicts the authors' hypothesis and recommendations:

Intersections with short change intervals relative to the ITE formula had significantly higher rear-end and right-angle crash rates compared to intersections with more adequate change intervals. Notably, the intersections with the highest crash rates tended to have slower traffic and wider cross streets than the intersections with lower crash rates. The interpretation of these results is that the drivers of vehicles at these poorly timed intersections did not have real choices in responding to the signal change interval. The change intervals were, perhaps, adequate to serve as warning time but lacked clearance time. Drivers did not significantly adjust their behavior for the inadequate timing; they were forced to brake abruptly to avoid entering the intersection or go through the intersection without protection from cross-street traffic.