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**Guide for Reducing Collisions Involving Bicycles:  
Guidance for Implementation of the  
AASHTO Strategic Highway Safety Plan  
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## **1 General**

### **1.1 Advance Summary**

In summary, this report is no more than a collection of actions, some good but many irrelevant, that is not organized according the aim of reducing car-bike collisions, and, therefore, cannot be expected to have much effect in doing so.

### **1.2 Failure to use existing information**

The Summary, and the Introduction, both start out with the inaccurate statement that safety improvements have awaited crash reports: "waiting for crashes before responding with countermeasures carries a high price because many bicycle crashes tend to be severe." This is false on two counts: most bicycle crashes are minor, and we have had adequate car-bike collision data since 1976 (the Cross report) that we have failed to use in making countermeasures.

### **1.3 Crash Reduction Goal**

This report repeats, without apparently understanding it, the combined usage volume and crash reduction goals adopted by the FHWA in 1994. That is, to double the number of trips while reducing the number of crashes by 10%. This means reducing the crash rate by 55%. The report fails to consider whether the measures (I don't call many of these countermeasures) that it considers will produce such an enormous reduction.

### **1.4 Known Problem Areas**

The report describes the known problem areas of deficient nighttime equipment, wrong-way cycling, and sidewalk cycling. Deficient nighttime equipment is discussed in a reasonable way in its own section. The other two are never discussed further, presumably because there are no physical countermeasures to them.

### **1.5 Collision Classification**

This report uses the classification of Parallel Path collision to include those collisions caused by turns or merges. This gives an improper picture and improper relationship to potential countermeasures, because turns and merges are associated with intersection conditions and their appropriate countermeasures involve considerations of intersection maneuvers. This misclassification also overstates the proportion of car-bike collisions of the parallel path type, which thereby overstates the desirability of bike lanes and bike paths. One wonders whether this misclassification is a deliberate means to advocate bikeways over better methods of making cycling safer.

## **2 Recommended Strategies**

### **2.1 Reduce Bicycle Crashes at Intersections: Class A**

**2.1.1 Improve Visibility at Intersections: A1**  
General traffic safety improvements

**2.1.2 Improve Signal Timing and Detection: A2**

- 1: Longer clearance interval to allow for very slow cyclists.
- 2: Advance green for cyclists. The argument makes no sense.
- 3: Better signal detectors. Good

### **2.1.3 Improve Signage: A3**

Use the standard signs wherever appropriate. There apparently is no good information on effectiveness, but probably useful and rarely harmful.

### **2.1.4 Improve Pavement Markings at Intersections: A4**

Considers only bike-lane stripes, and has all the defects of that system. The comments about advanced stop lines (bicycle boxes) are interesting. "The primary purpose of a bicycle box is to improve the visibility of bicyclists at intersections ... where they are in full view of motorists on all sides of the intersection." This is nonsense. Cyclists enter the box only on the red phase. Motorists coming from their right, on their own green phase, have no need at all to see those cyclists stopped before their red. When these motorists become stopped by their red, then they have no need to see the cyclists who will be starting out from their new green. Once the traffic flow has started, there will be no more cyclists in the bike box. Exactly the same logic applies to the motorists coming from the left of the cyclists. The motorists coming from the opposite direction will normally be stopped, but may be proceeding on a protected left turn signal phase. In neither case do these motorists have any reason to be concerned about cyclists stopped in the bike box. The motorists stopped immediately behind the cyclists who are in the bike box can certainly see the cyclists, but what advantage is that? Without the bike box, the waiting cyclists would either be alongside the line of motorists, or in the line of motorists, directly behind some and directly ahead of others, and equally visible to the motorists behind them.

Another stated advantage of the bike box is that it "Reduces conflicts between turning bicycles and motor vehicles by clearly delineating locations for the movements to occur." I fail to see that it persuades right-turning cyclists to start adjacent to the curb, or that it persuades left-turning cyclists to start adjacent to the centerline, particularly in a multi-lane street where the bike box extends only across the outside lane. And, of course, if any cyclist is persuaded to use the box during a green signal phase, he has likely endangered himself.

This section also considers colored bike lanes, where the color indicates the section where the cyclist and the motorist are directed, by their own lanes, into direct conflict. There is no consideration of not using bike lanes where these force cyclists into direct conflict with motorists and relying on the standard procedure, and distance, for allowing both motorists and cyclists to judge for themselves when it is best to make their lateral movements, and to do so before they reach the intersection.

### **2.1.5 Improve Intersection Geometry: A5**

The first recommendation is to reduce the crossing distance by narrowing the lanes to be crossed. This is the very old argument that cyclists are the mechanical ducks in a shooting gallery. Even if the lanes are narrowed, the cyclist still has to cross the same number of lanes with the same amount of traffic, and at a location where the motorists are having to adjust to the narrowing of their lanes.

The second recommendation is to change the angles of diagonal intersecting streets to be more orthogonal. Says this is a good idea for all classes of traffic.

The third recommendation concerns merges to and diverges from the main road. The standard two movement patterns are offered for each situation, the sharp swerve across the incoming or outgoing traffic lane, and the straight continuation as if nothing was occurring. There is no consideration for the cyclist making his own judgement and positioning himself as is best for that location and the specific motor traffic in view.

The fourth recommendation is for raised median islands. Often reasonable according to present practice.

### **2.1.6 Restrict Right Turn on Red Movements: A6**

This is to prevent collisions between right-turning motorists and wrong-way cyclists. This protects wrong-way cyclists only at signalized intersections, not at other intersections or drive-ways. No consideration given to persuading cyclists to ride on the right-hand side.

### **2.1.7 Accommodate Bicyclists through Roundabouts: A7**

The recommendation is for roundabouts without bike lanes. Good for both motorists and cyclists.

### **2.1.8 Provide an Overpass or Underpass: A8**

What appear to be a reasonable set of warrants are suggested, including consideration of most relevant variables.

## **2.2 Reduce Bicycle Crashes along Roadways: Class B**

### **2.2.1 Provide Safe Roadway Facilities for Parallel Travel: B1**

- 1: Bike lane striping
- 2: Shared lane marking
- 3: Paved shoulder
- 4: Colored bike lane

Nothing new here, same usual simplistic discussions. Wide outside lanes are mentioned without a heading, with a statement that cyclists might not recognize a wide lane when they see it.

### **2.2.2 Provide Contraflow Bicycle Lanes: B2**

Why? Doesn't answer. After all, these are one-way streets for motorists, who have to return by some way. Why not require cyclists to follow in the same direction as motorists? Well, if the cyclist's destination is more than half way around the one-way circuit, it makes no difference to the cyclist. But if the cyclist's destination is less than half way round the circuit, then he will save distance by riding wrong-way for either going or coming. Big deal, the typical distance for one-way streets far exceeds the distance a cyclist can ride, doesn't it?

### **2.2.3 Improve Bicyclists' Visibility: B3**

Both street lighting and cyclists' nighttime protective equipment. Reasonable discussion.

### **2.2.4 Improve Roadway Signage: B4**

Share the Road signs, bicycle route signs, and such. Largely so what; safety effect unknown.

### **2.2.5 Provide Bicycle-Tolerable Shoulder Rumble Strips: B5**

This is an excuse for providing rumble strips to waken motorists, but that are not too harmful to cyclists. The number of cyclists who might also be saved from collisions with drowsy motorists who are awakened by contact with such strips is unknown. Only grooved strips are considered, typically 5" wide in the direction of travel, 3/8" deep, and 6" apart in the direction of travel, and with a width across the direction of travel of 12" to 16". Not pleasant to cycle over, but probably not dan-

gerous. These are supposed to be placed so there is the typical bike-lane width between the line of rumble strips and the edge of the paving. The effect of such rumble strips on the behavior of cyclists is unknown but probably depends greatly on the characteristics of the road on which they are installed. Note that these rumble strips narrow the usable width of the roadway by a foot or more, and the effect of this characteristic on the status of cyclists is also unknown.

## **2.3 Reduce Motor Vehicle Speeds: Class C**

### **2.3.1 Implement Traffic Calming Techniques: C1**

Slow the motor traffic or send it elsewhere, by speed berms, chicanes, and narrowing. There is no consideration of the very narrow range of streets on which any of these might be done, or of the prevailing speeds on these streets before treatment. They don't say so, but speed berms of proper design are probably the most useful of these installations.

### **2.3.2 Implement Speed Enforcement: C2**

Apparently there is much information available about such programs, but apparently not much information about the effectiveness in reducing car-bike collisions.

## **2.4 Reduce Bicycle Crashes at Mid-block Crossings: Class D**

### **2.4.1 Improve Driveway Intersections: D1**

The justification for the measures in this group is all wrong. The justification states that 20% of car-bike collisions are caused by motorists or cyclists exiting the driveway. However, almost all the measures are aimed at slowing motorist entry to the driveway. In any case, only 2.1% of car-bike collisions are caused by motorists entering driveways; nearly all the car-bike collisions have to do with cyclists exiting without yielding 8.2% or with cyclists riding on the sidewalk.

The recommendations do include smooth entries (no lip to trip cyclists) and, for gravel driveways, sufficient length of paving to prevent gravel from getting into the roadway.

### **2.4.2 Implement Access Management: D2**

Standard methods for managing the spacing of driveways and the access to them, including

raised medians to prevent left turns into or from driveways. Reduces all types of collisions, including car-bike to some extent.

## **2.5 Improve Safety Awareness and Behavior: Class E**

Justified by reference to the large proportions of car-bike collisions in which cyclists have been found at fault. Greater proportions for young cyclists, smaller proportions for older cyclists.

### **2.5.1 Provide Bicyclist Skill Education: E1**

This is a very strange discussion that never touches its title subject, development of traffic operating skills in cyclists, traffic-cycling skills. Several pages of general descriptions and considerations regarding education, but never a specific statement that the object is to teach cyclists how to operate according to the rules of the road for drivers of vehicles.

There are several references to the fact that most Americans refuse to take the time to learn proper cycling, but no recognition of the consequences of this attitude.

Oh, yes, there's the Wear Your Helmet advocacy also.

### **2.5.2 Improve Enforcement of Bicycle-related Laws: E2**

This discussion lists many programs for training police officers; some may be good, some deficient, but no criteria are listed by which to evaluate these. However, there is continuous emphasis on "bicycle-related laws", no discussion of the difference between cyclist harrassing laws and genuine traffic laws, and almost no mention of the fact that the standard traffic laws apply to cyclists. A thoroughly disappointing performance.

## **2.6 Increase Use of Bicycle Safety Equipment: Class F**

### **2.6.1 Increase Use of Bicycle Helmets: F1**

The usual propaganda, including quoting the most optimistic of injury-reduction statistics.

### **2.6.2 Increase Rider and Bicycle Conspicuity: F2**

This starts out with the usual statement that a motorist must recognize the object ahead or approaching as a bicyclist before he will decide not to hit it. I have never understood that logic, but it is repeated endlessly.

There's the usual bit about retroreflective clothing, without stating the limited proportion of situations in which these might be effective.

There is solid endorsement of the need for headlamps at night and at least a reflector to the rear. There is criticism of the all-reflector regulation of the Consumer Product Safety Commission of the United States, both for its regulation and for its effect on public opinion, reducing the understanding of why headlamps are a safety necessity.

## **2.7 Reduce Effects of Hazards: Class G**

### **2.7.1 Fix or Remove Surface Irregularities: G1**

There is a lengthy discussion of diagonal railroad crossings. However, there is no discussion of the general principle that grooves or slots parallel to travel are very dangerous, and no mention of such grooves that often exist between the sections of concrete roads. There is reasonable discussion of drainage grates.

### **2.7.2 Provide Routine Maintenance of Bicycle Facilities: G2**

Reasonable discussion of surface maintenance problems, particularly near the right-hand edge of the roadway, including sweeping of debris. It is here that the danger of slots or ridges parallel to travel is mentioned.

## **3 Outline for a Model Implementation Process**

I did not study this section carefully, but it appears to be a typical outline of the typical bureaucratic process. It does indicate that safety problems ought to be prioritized according to the combination of casualty quantity and likelihood of reducing them.

## **4 My Conclusions**

This is not a rational safety program. Rational safety programs consider the frequency and severity of the known types of accident, against the cost and effectiveness of the countermeasures that may be applied. Instead of such a rational program, this report presents a compendium of actions largely classified by area (intersections, roadways, driveways, surface defects, speed reduction devices) plus two other classes (safety equipment, safety awareness and behavior), without much concern to either evaluating their impor-

tance or their effectiveness. And those evaluations that are made are largely inaccurate.

This is supposed to be a program for reducing car-bike collisions. But, to its credit, it contains a bit more, considering road surface defects that cause only cyclist falls; and doing that fairly well.

But we have had for thirty years the most detailed study ever made of car-bike collisions, the subject of this program, a study whose pattern has been confirmed by recent studies to still exist, and this study fails to use this as the basic source of information and guidance. (The second Cross study of 1976.) Thereby the program fritters itself into a collection of independent programs, many of which have little significance for reducing car-bike collisions.

One obvious error is the collection of actions regarding driveways, which is largely devoted to methods of reducing the speed at which motorists enter commercial driveways. However, the Cross statistics demonstrated (thirty years ago) that the main car-bike collision problems with driveways have to do with sidewalk cyclists and cyclists who exit the driveway without yielding to traffic.

Probably at the heart of the systematic set of defects in this collection of actions are the twin hidden and false American beliefs about cycling, that cyclists cannot, even should not, be expected to operate lawfully and that facilities correct for this deficiency. I say hidden and false because the report, supposedly the nation's program for reducing car-bike collisions, never mentions these two prime causes and problems associated with car-bike collisions, nor the measures that they indicate to be appropriate.

The belief that facilities correct for this deficiency is the basis for the extensive coverage of bike lanes, which have never been shown to either be directed at the significant causes of car-bike collisions, nor to have significantly reduced car-bike collisions. Furthermore, there is no discussion of the problems caused when the bike-lane pattern deviates from the movements required by the rules of the road. The standard assumption appears to be that the cyclist must obey the bike-lane pattern, particularly at those locations where, because the bike-lane pattern strongly contradicts the rules of the road, the bike lane is painted a distinct color to show the greater danger of using it.

We have known, also for thirty years or so, that the largest cause of car-bike collisions is cyclist failure to obey the rules of the road for drivers of vehicles. And we have good evidence that cyclists who operate according to those rules also

manage to avoid a considerable proportion of those potential motorist-caused car-bike collisions that are incurred by other cyclists. Yet this program, if one could call it that, fails to mention these facts that ought to be firmly in the foundation of any bicycle safety program.

There is no consideration that the cyclist needs to operate according to the rules of the road and that operating in this manner requires the use of judgement. So the bike-lane and similar designs are intended to be followed without the use of traffic skill and judgement, regardless of the fact that such designs still require the cyclist to use both traffic skills and judgement.

It is true that there is one section, rather lengthy, that provides short descriptions of many cyclist training programs. But neither the report itself, nor any of the descriptions it provides, state that the objective of the training is to develop the skill of operating according to the rules of the road for drivers of vehicles, and the test of the program is the demonstrated ability of its students to operate according to those rules. Instead the report makes such diffuse statements as: "The most successful education programs encourage people to think about their own travel attitudes and behaviors and help them make informed, better choices." When we teach swimming, we require that the students pass a swimming test. When we teach motorists we require them to pass a driving test. And so on, ad infinitum. But we refuse to apply the same criteria for teaching traffic cycling, and, therefore, we can never get cycling done properly and safely.

In summary, this report is no more than a collection of actions, some good but many irrelevant, that is not organized according the aim of reducing car-bike collisions, and, therefore, cannot be expected to have much effect in doing so.