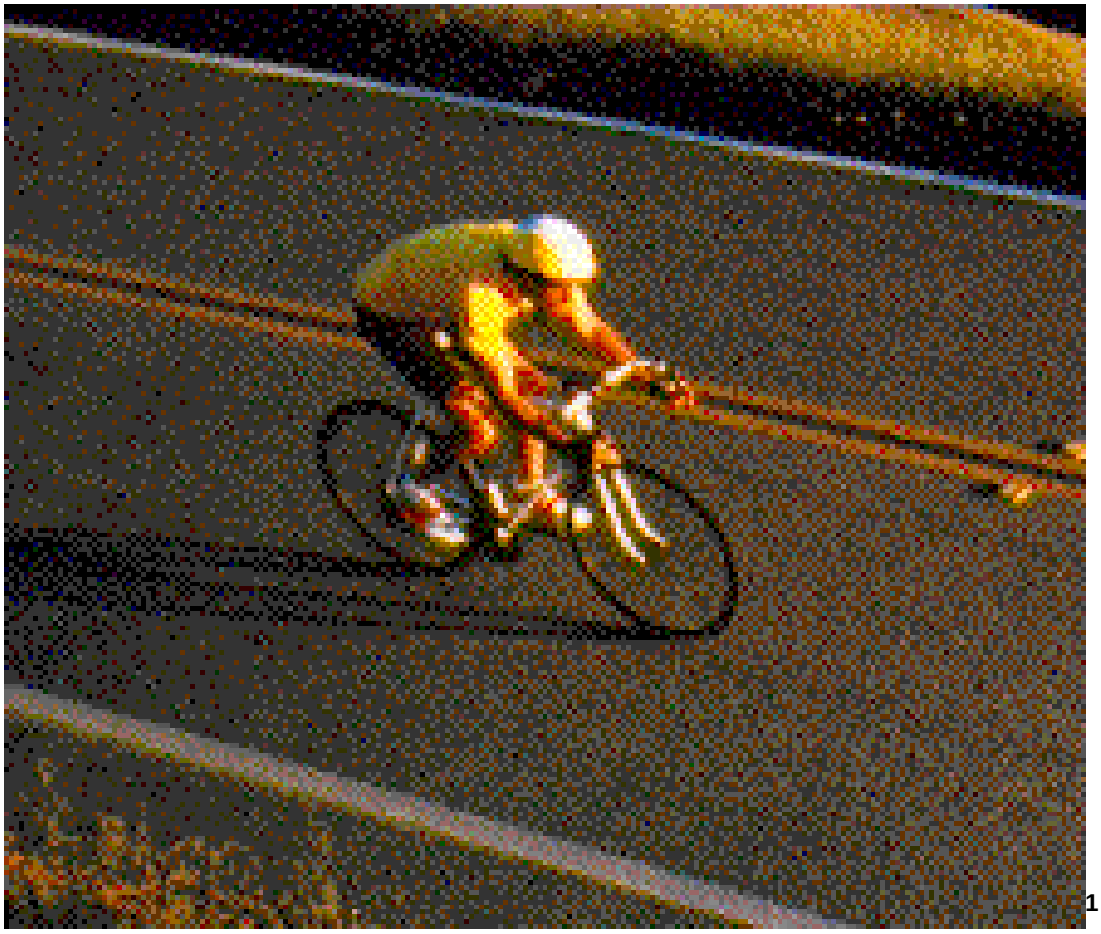
1995 Bicycle and Pedestrian Safety Report

 [1]

North Central Texas Council of Governments
Bicycle and Pedestrian Transportation Task Force

[1] Photo from *Effective Cycling* by John Forester

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ABSTRACT

TITLE:	1995 Bicycle and Pedestrian Safety Report
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ABSTRACT:	This report provides a review of the current data on bicycle and pedestrian safety across the United States, finding that safety and education programs could significantly improve bicycle and pedestrian safety in the Dallas-Fort Worth Metropolitan Area.

EXECUTIVE SUMMARY

Federal, state and regional transportation and air quality plans identify bicycling and walking as important transportation modes for the future. These forms of non-motorized transportation can improve mobility, prevent automobile pollution, and increase the livability of our communities. Planning for non-motorized travel often centers on providing safer transportation opportunities. As bicycling and walking increase in popularity, safety remains an important issue in North Central Texas. Nationwide, about 900 bicyclists and 6,500 pedestrians are killed annually. In 1993, 51 bicyclists and 455 pedestrians were killed in Texas alone.

The purpose of this report is to establish a base line of knowledge on safety issues and to set strategies and goals for the improvement of bicycle and pedestrian safety in North Central Texas. Key findings of this Report include the following:

- 62% of child bicycle - motor vehicle and 61% of child pedestrian - motor vehicle collisions are caused by the child's failure to yield right-of-way to the motorist.

- 71% of teenage bicyclist - motor vehicle collisions are caused by wrong-way bicycling or the bicyclist's error at an intersection.

- 74% of adult bicycle - motor vehicle collisions resulted from the failure of motorists and bicyclists to properly share the road through an intersection.

- 44% of all bicycle - motor vehicle collisions involve the motorists failure to scan, search, and correctly react to bicycles.

- 66% of bicycle - motor vehicle and 61% of pedestrian injuries involved a clear violation of standard traffic rules.

In response to these findings, this report recommends a four-point safety strategy to reach various groups through engineering, education, enforcement, and encouragement. Further, specific training goals have been identified to target education programs for specific groups of the population. Similar multi-faceted programs in other parts of the country have documented a number of successful programs, including a 57% reduction in certain pedestrian injuries, and a 67% reduction in bicycle-related head injuries.

Various education programs exist that this region could adopt to improve local bicycle and pedestrian safety. Programs such as *Effective Cycling* from the League of American Bicyclists, Bicycle Rodeos based on the Adventure Cycling guide, the Federal Highway Administration's *Safe Street Crossings for Kids*, and others have a track record of achievement and offer the potential for the reduction of injury rates for bicyclists and pedestrians. The combined efforts of educators, parents, bicyclists, motorists, local governments, and law enforcement officials have made a difference in bicycle and pedestrian safety throughout the country. Reaching this region's potential for improvement is dependent only on establishing regional goals and developing local "know-how" to implement effective safety programs.

BACKGROUND

As bicycle and pedestrian travel increases due to new federal, state and local government programs, the North Central Texas region has begun to concentrate on improving bicycle and pedestrian safety. The *1990 Clean Air Act Amendments* (CAAA) requirements and the *1991 Intermodal Surface Transportation Efficiency Act* guidelines encourage the increased use of non-motorized transportation. The North Central Texas Council of Governments (NCTCOG) has developed a long-range transportation plan, *Mobility 2010*, which addresses bicycle and pedestrian issues. NCTCOG also sponsors the **Bicycle and Pedestrian Transportation Task Force** as a regional forum to encourage safety and efficiency in this growing field.

The Task Force has the responsibility for developing the *Bicycle and Pedestrian Design Manual*, compiling this *Safety Report*, and coordinating bicycle and pedestrian safety training opportunities. The Task Force also works to implement the following *Mobility 2010* goals:

- "to provide for effective, cost efficient, safe intermodal access for bicyclists and pedestrians; and,
- to achieve a combined 8% bicycle and pedestrian mode share by the year 2010."[2]

The Safety/Education Working Group of the Task Force coordinates strategies for providing safer bicycle and pedestrian facilities. Over the past year, the Safety/Education Working Group has published *Go Friendly*, a widely distributed public safety piece for bicyclists, motorists and pedestrians. The Task Force also sponsors the "Bicycle Traffic Seminar," which provides safety information on bicycling to law enforcement officials. Research data and recommendations presented in this report were reviewed by the Task Force.

This regional work complements an aggressive federal effort to incorporate bicycle and pedestrian transportation opportunities as standard choices in the multi-modal transportation mix. The Federal Highway Administration has established the following goals:

- "to double the current percentage (from 7.9% to 15.8%) of total trips made by bicycling and walking; and,
- to simultaneously reduce by 10% the number of bicyclists and pedestrians killed or injured in traffic crashes."[3]

Nationwide, meeting both of these federal safety goals would require more than 50% reduction in the rate of bicycle injuries/fatalities. Studies from across the nation have shown that through coordinated safety and education efforts, safety is increased and fewer lives are lost when effective safety programs are established.[4] Finally, while this report provides statistics on

[2]North Central Texas Council of Governments, Mobility 2010: Executive Summary, (Arlington: NCTCOG, 1995).

[3]U.S. Department of Transportation, Federal Highway Administration. The National Bicycling and Walking Study: Final Report, (Washington D.C.: U.S. Government Printing Office, 1994).

[4]For example, see Rivara et al, "The Seattle Children's Bicycle Helmet Campaign" Pediatrics 1994; 93: 567-569, which reports an 85% reduction in the risk of bicycling-related head injuries.

improving safety, it is also meaningful to consider the people behind the numbers. Case Study #1 takes a look the human costs of a bicycle collision.

CASE STUDY #1

By Steve Lusky, President TEXINS Bicycle Club,

On the Scene

"Bike commuting to work September 8, 1994, I rolled up to a scene near UT Dallas where a cyclist had just crashed. He was unconscious, his face already a dark red/blue. I removed his helmet; it was broken in half but still tightly attached. He had no clear pulse, no breathing. He had been down about two minutes when I arrived. Quickly, myself and another bystander began to administer CPR. We turned the man over; she did the breathing; and I did the heart massage. His pulse and breathing soon came back. CPR works! Emergency personnel arrived quickly and a Care Flight chopper whisked him away.

Meanwhile, I looked over the rest of the scene. The man had no identification. His bike was in good condition. According to witnesses, a motorist pulled in front of the cyclist and abruptly turned right. The cyclist, apparently breaking too hard, was reported to have flipped over the top of the bars well behind the motorist.

A few days later I was stunned to see his picture in the paper. He had regained consciousness, but his neck was broken. He asked that life support be terminated. With family and friends at his side, he died September 11. At the memorial service I met the family. They were grateful to have the last days with him. He was a great teacher in life, and finally, he was a greater teacher in death.

Dr. William Hanson was the Cecil and Ida Green Professor and Director of the Center for Space Sciences and UTD. Bill "was one of the most influential people in the world within the Space Sciences Community." -- Dr. David Dunn. Bill is "not the kind of guy you ever replace." --Dr. Ron Heelis. Bill "was a living example of a philosophy that we should all aspire to; live life to its fullest, but not at the expense of those around you; guide, but do not direct, those who choose to follow you. I will miss Bill Hanson.: -- Matt Kirkland, UTD Graduate Student. His loss is felt around the world.

This brilliant man was also enthusiastic about physical fitness, sponging up relevant information as he took up new activities. He bicycled two to three hours per week regularly for the past several years. If he knew that bike safety education was important and available, he would have learned it. If the motorist had respected his right-of-way or if Bill had known how to do an Effective Cycling maneuver called a 'panic stop', this fall would most likely have been avoided. Bill's death highlights the need for a quality program on bike safety and respect for all road users."

CASE STUDY #1

CURRENT CONDITIONS - BICYCLING

Bicycle safety is a primary concern for kids, adolescents, college students, parents, commuters and seniors who enjoy the health, mobility, environmental and economic benefits of bicycling in North Central Texas. [5] According to the National Highway Traffic Safety Administration (NHTSA), about 900 bicyclists are killed each year as a result of collisions with motor vehicles.[6] Table 1 below shows the number of bicyclists killed in just four local urbanized counties between 1980 and 1992.

Table 1: Urban Bicycle Fatalities[7]

County	Bicycle Related Fatalities, 1980 - 1992
Collin	2
Dallas	68
Denton	7
Tarrant	29

These fatalities, of course, only represent the most dramatic segment of the bicycle safety problem. In addition to fatalities, there are also a large number of injuries each year. The Texas Department of Public Safety (DPS) identified over 300 bicycle related injuries reported to the police in Collin, Dallas, Denton and Tarrant counties in 1993 alone. This total may seriously under-represent the number of bicycle injuries. In several studies, the number of bicycle related injuries reported to emergency rooms has considerably exceeded the number reported to police over the same period.[8] While bicycle injury statistics may be under-reported, the human costs reported in Table 1 alone make it clear that a serious bicycle safety problem exists in the North Central Texas region.

Children, who often use the bicycle for transportation and/or recreation, experience a particularly high rate of bicycling injuries and collisions. The Texas Department of Health (TDH) reports that the age group with the highest death rate from bicycle related crashes is 10 to 14 years of age. A recent study found that children were involved in 62% of all bicycle-motor vehicle crashes.[9]

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[5]For more information on the health benefits of bicycling, see the American Medical Association's Cycling Towards Health and Safety, (Oxford: Oxford University Press, 1992), which states, "cycling, as part of the daily routine, could represent an ideal, straight-forward, and ... widely available means of maintaining fitness and gaining other considerable health advantages..." (28).

[6]NHTSA, Fatal Accident Reporting System, (Washington, D.C.: NHTSA, 1990).

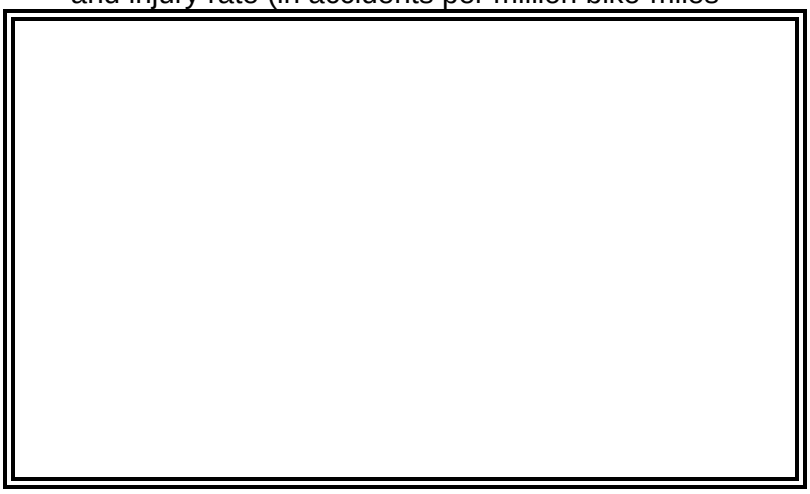
[7]These statistics represent automobile related bicycle fatalities as reported by the Texas Department of Health, Injury Prevention and Control in August of 1994.

[8]For a review of these studies, see Stutts, *An Analysis of Bicycle Accident Data from Ten North Carolina Hospital Emergency Rooms*, (Chapel Hill: Highway Safety Research Center/University of North Carolina, 1986).

[9]Thunder, JoAnne Pruitt, "Institutionalizing Child Bicyclist Education Programs," Pro Bike/ Pro Walk 94 Resource Book (Portland, Oregon: Eighth International Symposium on Bicycling and Walking, September 6 - 9, 1994).

A review of the various federal, state, and private studies on bicycle safety indicate that the root of this bicycle safety problem may be a lack of education, experience and training. For example, the injury rate for elementary school bicyclists is 720 injuries per one million bicycling miles, while the injury rate for adult club bicyclists is a mere 113 injuries per one million.[10] The following statistics (see Figure 1) show additional information on the variation of injury rate by annual mileage:

Figure 1: The relationship between annual mileage (in thousands of miles) and injury rate (in accidents per million bike-miles[11]



This curve demonstrates that the bicyclists logging the bulk of the bicycling miles (those at the end of the curve) are also the safest bicyclists. Conversely, some bicyclists (like those at the top of the curve) may not be comfortable operating in standard traffic flow patterns because of youth, lack of training, fear or inexperience. Overcoming this 'learning curve' is a key to reducing the number of bicycling injuries. Table 2 below shows estimated levels of effort to overcome this learning curve.

Table 2: Distance and time required to learn traffic-safe bicycling[12]

Type of Learning	Miles of riding	Years of riding
Self-teaching	50,000	10-20
Club bicycling	5,000	2
Learning from books	2,500	1
Formal instruction	800	0.25

Clearly, the transition from novice bicyclist to experienced bicyclist is not an automatic transition. However, from a public safety stand point, it is a critical transition. A recent report from the University of North Carolina Highway Research Center indicates that, for bicycle-motor vehicle crashes, the bicyclist was at fault in 53% of injury cases and the motorist in 30% of injury cases. Both were considered at fault in 14% of injury cases.[13] Thus, education and

[10]Forester, John, Bicycle Transportation, (Cambridge, MIT Press, 1983) 53.
[11]Forester, Bicycle Transportation, 52.
[12]Forester, Effective Cycling, 6th ed., (Cambridge, MIT Press, 1993) 271.
[13]Hunter, Bill, "Pedestrian and Bicyclist Crash Types in the 1990s," Pro Bike/ Pro Walk 94 Resource Book (Portland, Oregon: Eighth International Symposium on Bicycling and Walking, September 6 - 9, 1994).

training for bicyclists could directly address up to 67% of injury cases, as well as providing collision avoidance skills to mitigate the cases where the motorist is at fault.

One researcher's synthesis of several bicycle injury studies concluded that competence-related injury counter measures are crucial to improving safety.[14] The following charts were integral to this conclusion and show estimates for the factors responsible for bicycling injuries (Table 3) as well different types of bicycle injuries (Table 4):

Table 3: Factors Responsible for Bicycling Injuries and Fatalities

Factor	Percentage
Bicyclist Error	50%
Road-surface defect	20%
Motorist error	8%
Bicycle equipment failure	6%
Pedestrians	4%
Other	12%

Table 4: Bicycling Injury Typology

Cause	Percentage
Falls	50%
Bicycle-Automobile collisions	17%
Bicycle-bicycle collisions	17%
Bicycle-dog collisions	8%
All other	8%

While falls constitute the bulk of bicycle injuries, the bicycle - automobile collision presents a special concern because up to 90% of bicycle-related fatalities involve a motor-vehicle.[15] The latest data on this collision type comes from the University of North Carolina Highway Safety Research Center, which analyzed over 3,000 bicycle motor vehicle collisions occurring from 1990 to 1991. This University of North Carolina (UNC) project serves to update the watershed research of Cross and Fisher, who published *A Study of Bicycle/Motor-Vehicle Accidents: Identification of Problem Types and Countermeasure Approaches* for the National Highway Traffic Safety Administration in 1977. The following information (Table 5) on bicycle - automobile collision types shows basic types of collisions identified in the UNC study:

Table 5: Basic Bicycle - Automobile Collision Types[16]

Collision Type	Percentage
Turning, Merging or Crossing Paths	77%
Parallel Paths	16%

[14]Forester, Bicycle Transportation, 87.

[15]For more detailed information, see Kraus, J.F., Fife, D. and Conroy, C. "Incidence, severity and outcomes or brain injuries involving bicycles. American Journal of Public Health (1986) or see Stutts, *An Analysis of Bicycle Accident Data from Ten North Carolina Hospital Emergency Rooms* (1986:3) for a review of Kraus and studies with similar results.

[16]This data is taken from Bill Hunter's "Pedestrian and Bicyclist Crash Types in the 1990s," Pro Bike/ Pro Walk 94 Resource Book (1994) which offers an alternate means of dividing the basic collision sub-types.

Specific circumstances	7%

This basic breakdown shows that traffic movements requiring the greatest level of skill and confidence are also prone to result in collision. Maintaining proper traffic flow and observing right-of-way laws are essential during any turning, merging or crossing actions. Inexperienced or untrained bicyclists may lack the skills to negotiate the situation. Parallel path accidents are generally associated with poor visibility, sudden movements and wrong-way riding. Just as with automobile collisions, failure to observe basic traffic laws can lead to serious, even fatal consequences. The following charts show the breakdown of bicycle - automobile collisions by sub-type for the turning, merging or crossing path collisions (Table 6) and the parallel path collisions (Table 7) based on the UNC research:[17]

Table 6: Turning, merging or crossing paths

Sub-type	**Percentage**
Motorist failed to yield to the bicyclist	22.3%
Bicyclist failed to yield to the motorist at intersection	16.0%
Motorist turned or merged into the path of the bicyclist	12.1%
Bicyclist failed to yield to the motorist, midblock	11.8%
Bicyclist turned or merged into the path of the motorist	7.6%
Crash occurred at intersection	2.7%
Bicyclist did not clear intersection before signal turned green for cross traffic	1.4%
Insufficient information	1.2%
Bicyclist turning hits crossing motorist	0.8%
Motorist turning hits crossing bicyclist	0.6%

Table 7: Parallel paths

Sub-type	**Percentage**
Motorist overtaking vehicle	8.5%
Operator on wrong side of street	2.8%
Bicyclist overtaking a motor vehicle	2.8%
Operator lost control and swerved into the path of the other vehicle	1.7%
Unknown if parallel or crossing	0.5%

This data provides excellent guidance on the movements of automobiles and bicyclist preceding a collision. For example, the event where a motorist turns or merges into the path of bicyclist represents 12.1% of all bicycle - automobile collisions. Notably, 66% of collisions involved a failure of one party to yield right-of-way or another standard traffic violation. This data indicates that bicyclists approaching intersections should be particularly cautious and mindful of proper lane position in the given traffic stream. For motorists, the data suggests

[17]Hunter, Bill, "Pedestrian and Bicyclist Crash Types in the 1990s," Pro Bike/ Pro Walk 94 Resource Book (1994).

that the standard search and scan of the roadway must include identifying bicyclists. Given the current levels of bicycle use, our region's motorists may be particularly out of practice at finding and reacting to bicyclists in the traffic flow. As Tables 6 and 7 show, nationwide 44% of bicycle - is automobile collisions involve motorist failure to properly share the road. As further analysis is done with the UNC data, this region will benefit from more detailed guidance on bicycle accident typology.

Currently, the best detailed breakdown of bicycle - automobile collisions comes from the previously mentioned Cross/Fisher collision study. An analysis of this data done in 1983 provides data on collision types separated by urban and rural location as well as by the age of the bicyclists. This delineation results in some very revealing data. The charts below show urban bicycle - automobile collisions for children (Table 8), teenagers (Table 9), and adults (Table 10):[18]

Table 8: Child Urban Bicycle - Automobile Collisions

Collision sub-type	**Percentage**
Bicyclist on proper side runs stop sign	35%
Bicyclist exits residential driveway	16%
Bicyclist on sidewalk turns to exit driveway	11%
Motorist exiting commercial driveway hits bicyclist on sidewalk	9%
Bicyclist swerves left	5%
Wrong-way bicyclist swerves right	5%
Motorist turning left hits bicyclist riding in opposite direction on sidewalk	5%

These charts can serve as a guide in development of training curriculums for each age group. For example, child bicyclists collisions are dominated by issues like sidewalk riding, unpredictable behavior and a lack of knowledge of basic traffic laws. The failure to yield right-of-way is at the root of over 62% of child urban bicycle collisions. Case Study #2 describes the implications of failure to yield right-of-way for children. Additionally, a total of 36% of collisions are driveway-related. This indicates that sight distances should be calculated so that motorists can identify children on bicycles and so that children (who have a narrow field of vision) can identify motorists.

Table 9: Teenage Urban Bicycle - Automobile Collisions

Collision sub-type	**Percentage**
Wrong-way bicyclist hit by car	38%
Bicyclist turns left in front of overtaking car	14%
Bicyclist exits commercial driveway	9%
Uncontrolled intersection collision	5%
Motorist exists commercial driveway	5%
Bicyclist runs red light	5%

[18]The data in the following three charts (Tables 8, 9, & 10) was presented in aggregate form in John Forester's Bicycle Transportation, (60). Forester only reported data for collision types representing more than 1% of total urban bicycle - automobile collisions. Thus, collision types shown in each of the three figures represent only 85% of the total collisions for each table.

Bicyclist turns left from curb lane hits opposing car	5%
Motorist overtaking does not see bicyclist	4%

CASE STUDY #2

By W.J. 'Bud' Melton, Director of Education, Texas Bicycle Coalition

FAILURE TO YIELD RIGHT OF WAY -- #1 KILLER OF YOUNG CYCLISTS

"Tuesday, September 20, 1994, Dallas, Texas -- As a bike shop owner for the past twenty-two years, I've been asked, , to present a bicycle safety program to a group of local elementary school students in Dallas. This year I was proud to be introduced as the newly appointed education director for the Texas Bicycle Coalition, the non-profit organization advocating the advancement of bicycling access, safety and education in Texas. Typically, working with the PTA safety chair and the local police department, I show a video and talk about bicycle safety and the importance of wearing helmets, then, on another day, we set up a bicycle skills practice course for children to get hands-on experience with their newly learned knowledge.

Every year, I try to say something during the assembly to capture the children's interest, hoping to leave them as safer bicycle drivers. This year was no different, but I was having little success thinking of yet a new way of presenting the subject that would be effective in holding their attention.

On the morning of this year's appearance, as I sat down to coffee and a newspaper, I was thinking about what I would say to five-hundred fidgety elementary school children. As usual, I flipped through the Metropolitan section, then scanned the obituaries. There, on page 27A, was the stark, agonizing justification for my job. The headline read *"6-year old's services set for today, James Eric Mastroleo killed after van hit bike."*

The story said the boy's parents were burying their 6-year-old son a week after he rode his new birthday bicycle from the driveway into the street in front of his home. A passing van hit him, causing severe head injuries when he darted from behind his father's car. Little James was declared brain dead after the accident, and died the next day. I knew at that moment that it was necessary to tell his story to these children I was about to address, to alert them to the number one killer of young cyclists ~~-~~*the failure to yield right of way.*

In the school auditorium later that morning, I related that story to the children. Before I could finish, the entire auditorium was in tears, including me. Not in the saddest of movie scenes have I ever seen an entire auditorium break into tears. I know on this day, these children got the message about the seriousness of their responsibilities while riding bicycles."

CASE STUDY #2

The teenage bicyclist statistics show a similar picture. The collision types shown in Table 9 are generally associated with violations of standard traffic laws. By operating bicycles counter to traffic flow, teenage wrong-way bicyclists avoid the scan and search patterns of many motorists. As Table 9 shows, 38% of teenage urban collisions involve wrong-way riders. Preventing this mistake is a key to reducing collisions. An additional 33% of teenage urban bicyclist collisions involve bicyclist error at an intersection. Clearly, this indicates a need for enforcement, education, and positive examples from parents (i.e., wearing a helmet).

Table 10: Adult Urban Bicycle - Automobile Collisions

Collision type	**Percentage**
Motorist turning left hits bicyclist headon	25%
Bicyclist hit on light change	19%
Motorist turns right	16%
Motorist restarts from stop sign	14%
Motorist overtaking too closely	5%
Bicyclist hits slower car	4%

The adult urban collision types (Table 10) paint a much different picture about safety needs. As teenagers learn automobile driving skills, many begin to obey traffic laws while bicycling, thus avoiding wrong-way rider and intersection collisions. This improvement indicates that driver's education is helpful to roadway users with all types of vehicles, and that it may be useful to teach traffic flow patterns and traffic laws at a younger age. Collision rates for adult bicyclist errors at an intersection and wrong-way rider collision rates are much lower than rates for teenagers. Despite improvements in bicyclist behavior, a full 74% of urban adult bicycle - automobile collisions still occur at intersections. Safety efforts should focus on (1) building facilities which enhance intersection safety and (2) providing education opportunities which improve motorist and bicyclist road sharing behavior.

Together, these statistics point toward the need to customize the safety training to individual groups. Children, teenagers, and adult bicyclists tend to be involved in very different types of collisions. Training curriculums for each age group should be customized to address the specific weakness of each group. The "Safety Improvement Strategies" portion of this report establishes primary training goals based on these statistics. Overall, the fact that 50% of all bicycling injuries result not from a collision, but from a fall, offers clear guidance that including on-bicycle training opportunities is crucial to any training program. Bicyclist's stability and handling skills are likely to not only reduce the rate of falls, but also to increase the ability of bicyclists to avoid conflicts and ride defensively. Through an aggressive safety education program, the region can address these bicyclist and motorist training needs and reduce the number of bicycling fatalities.

Finally, there are essentially two types of safety programs, one reducing the likelihood of collisions and another lessening the severity of collisions. Education programs generally teach bicycle handling skills, increase motorist awareness, and discourage illegal riding. These program elements help individuals reduce the likelihood of having a collision. Because avoiding injury can be so effective, the strategies developed in this Report concentrate on reducing collisions. The other strategy, reducing the severity of an injury after a collision, is limited to helmets. Helmets are extremely effective in reducing the seriousness of brain injuries. Case Study #3 describes one cyclist's experience with a helmet.

CASE STUDY #3

By Carl Hodges, Effective Cycling Instructor

BICYCLE HELMETS

"A good helmet is essential. For years, smart young cyclists have denied that they could ever fall, be in a collision or be the cause of one, much less not be able to put their arms around their heads in time to save themselves in case of a fall. I used to keep used helmets around my bicycle shop to show the value of these devices to people. The battle scars a helmet acquires are a dramatic reminder of the good work that they have done. I used to say, "one little crack, one little dent, or one impact is all it takes, to render a helmet useless. One crash per helmet, that's all. It costs much less than a head x-ray, and an x-ray doesn't do you a bit of good like a helmet does. Somehow, I always seem to meet kids, men, and women who only tell me how ugly or how inconvenient a helmet is to use. I just wait and when their last stories are done, I tell them about my years of experience in safety education, about bicycle commuting, and about my remarkable record of going through my first two years in bicycle racing without a crash. Then, I tell them about the day that something got caught in the spokes of my front wheel, and about how one goes down from a bicycle so fast in a fall that the mind doesn't track reality. You are simply up, then without any other message to the brain, you are on your ear sharing the pavement. One moment riding along, the next second on the ground.

There is no question that my helmet saved my life. Shortly after my crash, the junior's coach from my old bicycling club went on a ride without his helmet. Something caught in the spokes of his front wheel...and he perished."

CASE STUDY #3

CURRENT CONDITIONS - PEDESTRIAN

Pedestrian safety is a concern for all the residents of North Central Texas simply because as a National Highway Traffic Safety program reminds us, 'everyone is a pedestrian sometimes.' Children, people in wheelchairs, seniors, bicyclists, motorists and bureaucrats all utilize the public right-of-way as a pedestrian at some time. Unfortunately, more than 100,000 pedestrians are injured each year.[19] Additionally, over 6,500 pedestrians are killed each year as a result of motor vehicle collisions.[20] In fact, The National Highway Traffic Safety Administration (NHTSA) found that across the entire nation, a pedestrian is fatally injured about once an hour. Table 11 below shows statistics from the Texas Department of Public Safety on the number of pedestrians killed in motor vehicle collisions in 1993.

Table 11: 1993 Pedestrian Fatalities

Jurisdiction	Fatalities
Collin County	0
Dallas County	46
Denton County	2
Tarrant County	21
State of Texas	455

Children are a special risk group for pedestrian fatalities. They are smaller, harder to identify, more erratic, and less knowledgeable about traffic than adults. The American Academy of Pediatrics reports that young children's awareness of sounds and the direction from which they emanate, their peripheral vision, their focus and concentration levels, and their overall concept of traffic danger are not fully developed until after eight years of age.[21] Thus, children under age eight may simply not be capable of safely navigating through traffic by themselves.

Nationwide, the leading cause of trauma death for kids ages five to nine is a pedestrian-related injury.[22] This fact highlights the tremendous need to concentrate on forming safe pedestrian habits at a very young age. Currently, these efforts may be lacking in childhood development. One recent study reported that the parent's expectations of their child's behavior in traffic is much different than the child's actual behavior.[23] Thus, knowledge and respect for automobiles is a crucial element for educators and parents to reinforce with all children.

A crucial element of pedestrian safety, not only children, but also for adults, is an awareness of the walking environment. Safety programs suggest that there is a standard 'safety sequence'

[19]U.S. Department of Transportation, National Highway Traffic Safety Administration, *Pedestrian Accident Reduction Guide*, (Washington D.C.: U.S. Government Printing Office, 1981).
[20]Hunter, Bill, "Pedestrian and Bicyclist Crash Types in the 1990s," Pro Bike/ Pro Walk 94 Resource Book (1994).
[21]American Academy of Pediatrics, "Beyond the family car--protecting young walkers, cyclists, school bus users, ATV riders" *Pedestrian Safety: No Easy Answers*, (American Academy of Pediatrics, 1992).
[22]Farina, Dr. Alfred and D'Ambrosio, LuAnn, "Pedestrian Education Issues," Pro Bike/ Pro Walk 94 Resource Book (Portland, Oregon: Eighth International Symposium on Bicycling and Walking, September 6 - 9, 1994).
[23]Farina, Dr. Alfred and D'Ambrosio, LuAnn, "Pedestrian Education Issues," Pro Bike/ Pro Walk 94 Resource Book (1994).

which most pedestrians already follow.[24] This sequence begins with searching, detecting, and evaluating potential conflicts, and ends with a decision to act, avoiding a collision with another roadway user. These 'conflicts' are not completely unpredictable. According to NHTSA research, motorist - pedestrian collisions are not random events, rather they are a repeated occurrence consisting of similar and potentially avoidable collision types.[25] Table 12 below shows the seven most common collision types reported in the Knoblauch study of nearly 6,000 injury cases.

Table 12: Pedestrian Injury Typology[26]

Collision Type	Description	Frequency
Dart-Out	A pedestrian appears suddenly in midblock, often between parked cars.	35%
Intersection Dash	A person runs across the intersection, too late to be seen by the driver.	17%
Vehicle Turn or Merge	The driver, concentrating on turning into or merging with traffic, fails to see the pedestrian.	9%
Multiple Threats	A vehicle stops for a pedestrian who is crossing and the halted vehicle blocks the pedestrian from the view of the driver of an overtaking vehicle.	2%
Backing Up	A pedestrian is struck by a vehicle which is backing up.	2%
Bus Stop Related	A pedestrian crosses in front of a stopped bus, which screens him from the driver of an overtaking vehicle.	1%
Vendor Related	A pedestrian, usually a young child, is struck by a passing vehicle while moving to or from the vendor's vehicle.	1%

Each of these collision types offer specific insight on the causes and potential solutions to pedestrian safety problems. For example, the leading cause of collisions, the pedestrian "dart-out', generally involves children of preschool and elementary age. Teaching children about the need to stop and look left-right-left is the key to reducing this collision type. Additionally, the combined 26% of collisions occurring at an intersection or turning and merging, indicate a need to reinforce rules of right-of-way and intersection crossing issues. The top three collision types all relate to the failure to yield right-of-way and account for 61% of collisions. Certain of the collision types, like the vendor related collision, may have specific counter measures which

[24]U.S. Department of Transportation, National Highway Traffic Safety Administration, *Pedestrian Accident Reduction Guide*, (1981).

[25]Unfortunately, pedestrian injury research is not available at the same level of detail as bicycling statistics. However, the University of North Carolina Highway Safety Research Center is currently developing an extensive report based on a study of over 5,000 pedestrian - motor vehicle crashes from 1990 and 1991. The breakdown in Table 12, however, does cover the basic crash types identified in the 1981 U.S. DOT, National Highway Traffic Safety Administration, *Pedestrian Accident Reduction Guide*.

[26]This data is summarized from Knoblauch, Richard L., "Accident Data Base for Urban Pedestrians," *Transportation Research Record 629*, (Washington D.C.: Transportation Research Board, National Academy of Sciences, 1977).

can effectively prevent injuries without a major education campaign. For the vendor-related collisions, many jurisdictions have already passed legislation regulating where ice cream and other vendors operate, and requiring motorists to stop before passing them. However, this represents only a small portion of the overall pedestrian safety problem. To have a meaningful impact, pedestrian safety programs must concentrate on modifying the traffic-related behavior of both motorists and pedestrians.

The Knoblauch study also revealed information on the behavior of pedestrians and motorists preceding a collision. In cases involving children, motorists tended to report that the child appeared suddenly, coming too close to the automobile for them to stop in time. The charts below summarize these findings.[27] Table 13 shows various motorist behaviors preceding a collision, and Table 14 shows pedestrian behaviors preceding a collision.

Table 13: Motorist Behavior Before Collision

Driver's action	**Percentage**
Driver attempting evasive action.	40%
Driver engaged in a turning or merging maneuver.	12%
Driver attending to other traffic and not seeing pedestrian.	11%
Driver under the influence of alcohol or drugs.	3%
Driver exceeding the speed limit.	2%
Driver disobeying a sign or signal.	1%

Table 14: Pedestrian Behavior Before Collision

Pedestrian's Action	**Percentage**
Appearing suddenly in path of vehicle.	44%
Running.	39%
Walking or running into vehicle.	17%
Under the influence of alcohol or drugs.	6%

These statistics identify at-risk behavior which could be addressed in pedestrian safety education programs. The 44% of pedestrian collisions involving a pedestrian suddenly appearing in the path of the vehicle could be addressed, for example: by encouraging children to stop and observe traffic before crossing the street; by encouraging motorists to expand their scanning and searching to include sidewalk activity; by maintaining greater separation between sidewalks and roadways; and, one of several other strategies. While everyone is a pedestrian at some point, there is no promise that they will be looking for potential conflicts with pedestrians while they are driving. All of the collision types listed in Table 12 involve either a failure of the pedestrian to yield to existing motor vehicle traffic or the failure of the motorist to identify the potential for a pedestrian collision. Either of these problems can be addressed and lives could be saved through targeted public safety education.

[27] Ibid.

SAFETY IMPROVEMENT STRATEGIES

Federal Highway Administration guidance suggests that a multi-faceted strategy is appropriate to address bicycle and pedestrian safety.[28] The traditional "4 E's" of bicycle and pedestrian programs, "Engineering, Enforcement, Education and Encouragement", apply directly to increasing bicycle and pedestrian safety. Collision and injury studies indicate that safety training is the key to improving safety. In some cases, properly engineered facilities can educate through signage, pavement markings, and structural facilities which incorporate bicycles into standard traffic flow. Sidewalks engineered to meet *Americans with Disabilities Act* (ADA) standards are a good start toward safer pedestrian facilities and other structures, like improved midblock crossings, also promise a safer environment for pedestrians.

Education efforts for pedestrians and bicyclists must begin at home. Even the youngest children utilize the public right-of-way for walking and bicycling. No school lesson on intersection rules, right-side bicycle riding and left-side walking, or bicycle helmet use is meaningful unless parents provide a positive role model. Likewise, multi-media public service announcements, promotions and other encouragement strategies fail if parents do not lead by example. Enforcement work by local police officials is essential to reinforcing traffic rules taught by parents or educators. In some cases, a few friendly words from an officer may be the only education a child requires. The chart below (Table 15) shows a summary of regional strategies for improving bicycle and pedestrian safety.

Table 15: Bicycle and Pedestrian Safety Strategies

Strategy	**Potential Regional Program**[29]	**Target Group**
Engineering	• Bicycle and Pedestrian Facilities Design Manual • Injury/ Fatality Tracking	Local Government Transit Authorities Texas Department of Transportation
Education	• Bicycle Rodeo Instructor's Training • *Effective Cycling* Instruction • Pedestrian Safety Educator's Training	Independent School Districts Defensive Driving/ Driver's Education Programs Bicycling Clubs
Enforcement	• Bicycle Traffic Seminar	Local law enforcement officials
Encouragement	• *Go Friendly* newsletter • Employee Transportation Coordinator's Training	General population Businesses Parent-Teacher Associations

[28]There are two primary publications which provide FHWA guidance on the issue: U.S. Department of Transportation, FHWA, The National Bicycling and Walking Study: *Case Study #11: Balancing Engineering, Education, Law Enforcement and Encouragement*, (Washington D.C.: U.S. Government Printing Office, 1994) and U.S. Department of Transportation, FHWA, The National Bicycling and Walking Study: *Case Study #12: Incorporating Consideration of Bicyclists and Pedestrians into Education Programs*, (Washington D.C.: U.S. Government Printing Office, 1994.

[29]For details on these programs, see the "Bicycle and Pedestrian Safety Programs" section of this report.

	• Parent's information	

By working with each of the target groups listed in Table 15, a full range of children, teenagers and adult bicyclists and pedestrians as well as other interests, such as motorists, law enforcement officers and local government officials, can be reached. For example, by working with Independent School Districts (ISDs), and offering training opportunities for persons in the ISDs to sponsor and lead youth bicycle rodeos, our region could positively impact bicycle safety. The statistics offered in the "Current Conditions" sections of this report indicate that each group would require specific educational information. Table 16 below shows training goals developed by the Bicycle and Pedestrian Transportation Task Force for each group.

Table 16: Primary Training Goals

Audience • target group	**Key Issue**	**Primary Goal**	**Ultimate Potential Safety Improvement**
Children • ISDs/ PTAs • Parents	Failure to yield right of way (ROW)	Teaching kids to handle a bicycle and observe ROW rules while cycling and walking	62% reduction in child bicycle collisions[30] 61% reduction in child ped. collisions[31]
Teenagers • Driver's Ed • ISDs/ PTAs • Parents	Wrong way bicycling Intersection errors	Teaching teenagers to bike on the right, walk on the left and follow intersection rules	71% reduction in teenage bicycle collisions[32]
Adults • Businesses • Bicycle Clubs	Intersection safety	Improving motorist and bicyclist skill at sharing the road through intersections	74% reduction in adult bicycle collisions[33]
Motorists • Defensive Driving • Businesses • Driver's Ed.	Failure to identify and properly react to bicyclists and pedestrians	Improve scan and search to include bicyclists and pedestrians	44% reduction in total bicycle collisions[34] Increased pedestrian awareness
Law enforcement • Police Departments	Violations of standard traffic rules	Enforcing the law and insuring safety	66% reduction in total bicycle collisions[35] 61% reduction in ped. collisions[36]
Transportation officials • Local Gov. • TxDOT	Building safe facilities	Utilization of the Bicycle and Pedestrian Facilities Planning and Design Manual	Safer transportation, leading to increased bike and ped. traffic and increased motorist awareness of bicyclists and pedestrians

[30] see page 7
[31] see page 10
[32] see page 8
[33] see page 8
[34] see page 4
[35] see page 6
[36] see page 10

Thus, for a teenage bicyclist and pedestrian audience, the key issues to address with various driver's education groups, ISDs, Parent Teacher Associations (PTAs) and parents are "wrong way" bicycling, and intersection errors. By emphasizing these two issues, trainers may be able to teach teenagers to bicycle on the right, walk on the left, and follow intersection rules. If this message is reinforced by adult role models as well as law enforcement officials, reductions in collisions will occur.

Strategies are available to address and overcome bicycle and pedestrian problems. Any one particular program may not immediately have the total impact shown under the "Potential Safety Improvement" column in Table 16. However, through a multi-faceted safety campaign, significant improvements in bicycle and pedestrian safety are possible. The relationship between annual bicycle mileage and injury rate, which shows a dramatic decline in the injury rate for bicyclists riding more than 1,000 miles per year, provides basic evidence that training and education programs can make a difference.

Two recent safety programs provide well-documented evidence of the potential for success of local bicycle and pedestrian safety programs. The first, a program in Dade and Hillsborough Counties, Florida, concentrated primarily on teaching kids in grades K - 3 to look "Left - Right - Left" before crossing the street.[37] The program included in-school training and mass media publicity. Children's knowledge of the "Left - Right - Left" procedure went from 2% to 75% and mid-block dart-out injuries for kids age 5-9 went down 57%!

The second program, the Seattle Children's Bicycle Helmet Campaign, was also highly successful.[38] The program included mass media publicity, bicycle rodeos, school program, and a helmet discount coupon. Helmet use among school age kids increased from 5.5% in 1987 to 40.2% in 1992. The community combined helmet-use education, bicycle handling, and proper traffic flow training into a unified safety strategy. Over the study period, researchers documented a 66.6% reduction in bicycle related head injuries among 5-9 year olds and a 67.6% reduction among 10-14 year olds!

Also, it must be noted that there exists a large variety of potential dangers facing bicyclists and pedestrians, such as drain grates, turning vehicles, darkness, etc... Along with these transportation-related dangers comes an equally complicated group of legal pitfalls. Case Study #4 examines the legal fall-out resulting from a tragic bicycling crash.

Following the strategies set forth in Table 15 and by working together to meet the training goals in table 16, our region can accomplish similar improvements in bicycle and pedestrian safety. The combined efforts of educators, parents, bicyclists, motorists, local governments, and law enforcement officials have made a difference in bicycle and pedestrian safety throughout the country. Reaching this region's potential for improvement relies solely on establishing the regional goal and local know-how to implement bicycle and pedestrian safety programs throughout North Central Texas..

[37]U.S. Department of Transportation, National Highway Traffic Safety Administration, *Safe Street Crossing for Kids*, (Washington D.C.: NHTSA, 1990).

[38]Rivara et al, "The Seattle Children's Bicycle Helmet Campaign: Changes in Helmet Use and Head Injury Admissions." Pediatrics 1994;93:567-569.

CASE STUDY #4

By P.M. Summer, Bicycle Coordinator, City of Dallas

Legal Entanglements

"An adult male recreational cyclist was riding with a small group of other cyclists. They were traveling west bound at approximately 18 mph on a six-lane, low traffic volume thoroughfare in Dallas. The weather was clear. The group came upon and proceeded to transverse a set of rough railroad tracks crossing perpendicular to the road. The bicyclist was violently ejected over the front of his bicycle handlebars immediately after crossing the rail-road track (at close to a 90 degree angle). The cyclist landed on his head, shattering his helmet and crushing his skull. The cyclist was unconscious, but remained breathing for several minutes until an EMS team arrived. He was pronounced dead shortly after arrival at a nearby hospital.

At first, speculation on the cause of the accident was that the cyclist's front wheel may have been caught in the railroad track grooves. Closer inspection seemed to indicate that the brake "safety lever" may have come loose while crossing the tracks and fallen into the bicycle's front wheel. Once caught in the wheel, it may have rotated up and become lodged behind the fork blades, causing the bike to flip forward resulting in the ejection of the bicyclist.

The cyclist was wearing a helmet.

This accident is currently in litigation against the bicycle manufacturer, railroads, the State Highway Department, the helmet manufacturer, the helmet retailer, and the pawn shop where the used bicycle was purchased. In bicycle injury cases, several factors may combine to work against a bicyclist. They include inexperience, poor road conditions, and bicycle mechanical problems."

CASE STUDY #4

BICYCLE AND PEDESTRIAN SAFETY PROGRAMS

The statistics developed in the previous sections of this report suggest a variety of safety programs. The following programs target children, teenagers, adults, motorists, and government officials. Each program contains elements addressing the key safety issues and primary training goals identified in Table 16.

Child Education Programs

1) Name: Bicycle Driver's License
   Summary: After completing a fifth grade training course, kids would be issued a driver's license authorizing them to operate their vehicle on the roadway. The training would include legal traffic flow and movements, as well as on-bicycle training.
   Benefits: By formalizing bicycle training at this age, the state would have the opportunity to reduce the high bicycle related fatality rate among 10-14 year olds and provide preliminary driver's education.
   Availability: Potential statewide program

2) Name: Bicycle Rodeo Instructor's Training
   Summary: Individuals interested in training young bicyclists would be given the opportunity to learn detailed information about sponsoring and teaching all the elements of a "Bicycle Rodeo."
   Benefits: Instructors would be taught the basics of traffic flow and traffic law, and they would have access to injury statistics and information to help prioritize various elements of their presentation.
   Availability: Potential regional program

3) Name: Bicycle Rodeo
   Summary: On-Bike training introduces kids to traffic situations and bicycle handling skills in a mock street environment.
   Benefits: Kids have the opportunity to learn safe bicycle handling skills and basic traffic rules
   Availability: Existing program available through Adventure Bicycle Association

4) Name: Safe Street Crossings
   Summary: This community wide program teaches kids to be aware of traffic as pedestrians, and to look "Left-Right-Left" before crossing the street.
   Benefits: This program has a proven track record in reducing child - motor vehicle collisions
   Availability: Existing program available from the Federal Highway Administration

5) Name: The Wily Walker
Summary: This in-school program introduces kids to a wide range of pedestrian safety issues.
Benefits: The easy-to-use adaptable curriculum lets teachers customize presentations to kids
Availability: Existing program available through the Harborview Injury Prevention and Research Center

Teenager Education Programs

1) Name: Bicycle Rodeo Instructor's Training
Summary: Teenagers interested in educating child bicyclists would be given the opportunity to learn detailed information about sponsoring and teaching all the elements of a Bicycle Rodeo.
Benefits: Teenagers could convey the basics of traffic flow and traffic law to kids and they would have access to injury statistics and information to help prioritize various elements of their presentation.
Availability: Potential program

2) Name: Driver's Education
Summary: The program is currently designed to teach potential motorists automobile handling skills and rules.
Benefits: With additional emphasis on bicycle transportation, young adult could be encouraged to obey traffic rules as bicyclists, and to search for and avoid bicyclists and pedestrians while driving automobiles.
Availability: Existing State program

3) Name: Effective Cycling
Summary: Driver's Education for bicyclists.
Benefits: Provided in junior and senior high school athletic programs, this program could encourage physical education and improved bicycle handling skills.
Availability: Existing program available from the League of American Bicyclists

Adult Education Programs

3) Name: Effective Cycling
Summary: Driver's Education for bicyclists.
Benefits: Reduction in overall injury rates for bicyclists results for individuals participating in this program.
Availability: Existing program available from the League of American Bicyclists

2) Name: Defensive Driving
Summary: The program is currently designed to reinforce motorist's automobile handling skills and respect for the rules of the road.
Benefits: With additional emphasis on bicycle transportation, adults could be encouraged to obey traffic rules as bicyclists and to search for and avoid bicyclists and pedestrians while driving automobiles.
Availability: Existing program available from the League of American Bicyclists

3) Name: Employee Transportation Coordinator Training
Summary: Employee Transportation Coordinators (ETCs) would have the opportunity to learn about the bicycle as alternate transportation and would receive materials to pass out to prospective bicycle commuters in their organization.
Benefits: Businesses would have the opportunity to reduce the number of single occupancy motor vehicle trips taken by employees, to increase employee health and fitness and to provide safety information to current or potential bicycle commuters.
Availability: Existing component of the Regional Travel Demand Management program

3) Name: Parents of Bicyclists Training
Summary: Program designed to teach parents how to teach their children bicycle safety.
Benefits: Provide both kids and adults with increased knowledge on bicycle safety while enhancing the parents ability to lead by example.
Availability: Potential program

Motorist Education

1) Name: Driver's Education
Summary: The program is currently designed to teach potential motorists automobile handling skills and rules.
Benefits: With additional emphasis on bicycle transportation, young adult could be encouraged to obey traffic rules as bicyclists and to search for and avoid bicyclists and pedestrians while driving automobiles.
Availability: Existing State program

2) Name: Defensive Driving
Summary: The program is currently designed to reinforce motorist's automobile handling skills and respect for the rules of the road.
Benefits: With additional emphasis on bicycle transportation, adults could be encouraged to obey traffic rules as bicyclists and to search for bicyclists and pedestrians while driving automobiles.
Availability: Existing program available from the League of American Bicyclists

3) Name: Employee Transportation Coordinator Training
Summary: Employee Transportation Coordinators (ETCs) would have the opportunity to learn about the bicycle as alternate transportation and would receive materials to pass out to prospective bicycle commuters in their organization.
Benefits: Businesses would have the opportunity to reduce the number of single occupancy motor vehicle trips taken by employees, to increase employee health and fitness, and to provide safety information to current or potential bicycle commuters.
Availability: Potential regional program

4) Name: Mass Media Campaigns
Summary: Public promotion of safe driving practices
Benefits: Encourages motorist to watch out for bicyclists and pedestrians while driving and to obey traffic rules when walking or bicycling.
Availability: Some existing televisions ads are available from the League of American Bicyclists and the Texas Bicycle Coalition. The NCTCOG publication, *Go Friendly* represents a small scale effort of the same nature.

Government Officials Education

1) Name: Bicycle Traffic Law Enforcement Training
Summary: Instruction for law enforcement personnel on various elements bicycle traffic violations.
Benefits: On-street enforcement by police encourages bicyclists to routinely follow all applicable traffic laws and discourages unsafe behavior.
Availability: New regional program.

2) Name: 1991 *Intermodal Surface Transportation Efficiency Act*
Summary: Law requiring the consideration of bicycles in transportation facilities and providing funding for bicycle transportation.
Benefits: Improvements in street system quality create a safer bicycling environment.
Availability: Existing federal program.

3) Name: NCTCOG's Bicycle and Pedestrian Facilities Planning and Design Manual
Summary: Provides technical guidance on planning and designing bicycle and pedestrian facilities.
Benefits: Improvements in street system quality create a safer bicycling environment.
Availability: New regional program.

4) Name: Injury/ Fatality Tracking
Summary: Data collection at bicycle crash scenes by law enforcement personnel with subsequent data storage and analysis on a Regional Geographic Information System.
Benefits: Identification of problem areas in the region's transportation system.
Availability: Potential program.

Ap had passed September 1994, Plano Texas -- On my commute to work today, I encountered a down bicyclist while riding my regular morning bicycle commute. Apparently, I had been less than a minute behind the incident. I did not actually see the crash, but I did see the cars suddenly swerve around him. As I came on the scene, I saw a man crumpled on the road with a half dozen people standing around. His face was a dark red/blue. His helmet was broken, the part remaining was tight on his neck. I managed to pop the helmet off without moving him. He was not breathing nor did he have a pulse. Another person on the scene said she knew CPR and I completed CPR training early in this year. We straightened him out, she did the breathing, I did the heart massage. He got his pulse back, then started to breathe. In moments, several emergency vehicles arrived and took over. A Care Flight chopper soon landed and took him to a local Hospital. As he was taken from the scene, I knew little of the man or his condition. He was older, seemed in excellent physical shape but carried no identification and, apparently, he was unconscious and had broken his neck in the fall.

Over the next few days, I tried to piece together what had happened. Apparently, he crashed after a motor vehicle passed him, pulled in front of him and sharply turned into a driveway. No witness has clearly said whether the bicyclist was actually cut off, though they are certain no contact was made. One witness said it looked like the bicyclist became unstable and crashed some 30 yards behind the motor vehicle. Another said it looked like his wheel hit a man-hole cover and slid to the right while the bicyclist fell to the left. The end result was that he flipped over his handle bars, hit head first, tumbled a few times, then came to rest in the middle of the outside lane. The bike remained in good condition.

As an Effective Cycling Instructor, my worry has been that the bicyclist may have hit the left brake lever (controlling the front brake) too hard causing the bike to loose stability. I don't know if we'll ever know for sure. I'm reasonably confident that either if the bicyclist had known an emergency Effective Cycling maneuver called a 'panic stop' or, if the motorist had respected the bicyclist's right-of-way, that he may not have fallen."