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CYCLISTS' ROAD TRAFFIC ACCIDENTS AND CONFLICTS

1. Introduction

The purpose of my current research in this field is to establish relationship between traffic conflicts and accidents, valid in Hungary, and to determine statistically accident/conflict ratios, good within domestic circumstances, for each type of collisions, for each type of intersections and for all possible environments (traffic volumes, visibility conditions, etc.).

The data upon which the conclusions and recommendations can be based are collected just partly so far. Because of the lack of a comprehensive contract, consequently lack of money regarding the purpose mentioned above, the objectives are planned to be accomplished step by step.

This year it was possible to collect data and experiences within the framework of two tasks :

- the traffic engineering study of the road network elements connecting the city center and the airport of Budapest and
- accident investigation of black spots of the highway network of the country.

Analyzing the black spots it was found that the most hazardous types of transportation are walking and cycling in Hungary. In 1989 16% of the total personal injury accidents happened to pedestrians, 23% happened to cyclists and moped drivers and 18% were so called single accidents of motor vehicles.

2. Cycling in Hungary

In the sixties and seventies the cycling as a mode of transport was considerable just in very small settlements of Hungary, without or almost without transportation network. As an activity of sport or recreation, cycling was urged by few people.

In the eighties there was a significant change in the importance of cycling in the transportation and in the leisure time, as well. The cyclists on the roads are not considered any more as disturbing and moving side obstacles and an independent or at least separated infrastructure is under development for cycling.

The safety issue of cycling has to be involved in studies dealing with transportation development or safety counter measures.

The country has a population of more than 10 million and there are at most 5 million cycles, estimated from the 250 thousand purchases in a year. In 1980 the average number of cycles was 370 per 1000 citizens, recently the same characteristic is about 500 bikes per 1000 inhabitants.

Regarding the cycle fleet and cycling habits there are significant differences between regions and counties within the country and the capital affords dangerous and inconvenient circumstances to the cyclists. In Budapest there are less than 300,000 bikes, which mean 150 cycles per 1000 citizens, and only 1% of the total daily trips is performed by bike. According to the census data gathered on the national road network, in 1980 the share of cycles and mopeds in the total traffic flow was 13%, as average. Meanwhile the figures regarding the counties vary between 0.6% and 46.1%.

In 1990 the share of the cycle and moped flow is about 7%, while the traffic performance of the motor vehicles has increased with about 60%. Taking the local road network into consideration, too, there are several towns, where the cycling shows about 50% performance within the total traffic performance of at least 6000 vehicle per day in a cross-section.

There are restrictions of entry for bicycles on the 6.5% of the total national road network, including the prohibitions on the 70% of the main road network. The length and quality of cycle roads is undeveloped compared to most European countries, in spite of the pleasant geographical conditions of the country for cycling.

	1982	1988
Length of cycle roads (km)		
- along the national road network	38.5	259.3
- along the local road network	16.6	
- within Budapest	9.9	15.5
Length of cycle lanes (km)		
- along the national road network	51.6	67.5
- along the local road network	2.0	
- within Budapest	-	-

It is interesting to note, that recently 25% of the cycle roads can be found in one county, called Békés, as a result of the rapid development in the last years.

3. Accident characteristics

Together with the increasing importance of cycling, a deterioration was experienced in the safety situation of cyclists. In 1980 2556 accidents happened involving cyclists, it was 13.5% of the total number of accidents. In 1989 3501 accidents happened involving cyclists, which was 14.4% of the total number of accidents.

Although the share in the total number of accidents has increased slightly, the number of accidents involving cyclists has increased with 37%. In 1980 there were 1233 accidents involving mopeds, this meant 6.5% of the total accidents. In 1989 there were 2096 accidents involving mopeds, meaning 8.6% of the total number of accidents. This number shows a 69% increase.

The figures show, that the increasing number of cycle and moped accidents followed the disadvantageous trend of the total number of road traffic accidents. The share of the cyclists' accidents and moped drivers' accidents together has increased from 20% to 23% within the continuously increasing number of all personal injury accidents.

	1980	1989	Growth
- Total number of accidents involving personal injury	18,994 (100%)	24,371 (100%)	28%
- Number of accidents involving cyclists	2,556 (13.5%)	3,501 (14.4%)	37%
- Number of accidents involving moped drivers	1,233 (6.5%)	2,096 (8.6%)	69%
- Number of accidents involving cyclists and moped drivers	3,789 (20%)	5,597 (23%)	48%

Regarding the accidents of cyclists in 1989, 302 (9%) was fatal, 1459 (41%) caused serious personal injuries and 1740 (50%) resulted slight personal injuries. So the fatality rate (number of persons killed per 100 accidents) was 9, which shows very unfavorable conditions from the cyclists' point of view, considering that the fatality rate for the total number of road traffic accidents in the country was 8. The fact, that 50% of cyclists' accidents resulted death or serious injury shows the high risk of cycling within the existing circumstances. Considering the national road network (ignoring the local roads), 60% of the accidents involving cyclists were caused by the cyclists themselves in 1989. In 1980 65% of cyclists' accidents were caused by the cyclists themselves. On the national road network the risk is even higher for the cyclists, because in the last year 11% of the cyclists' accident were fatal and 42% resulted serious injuries.

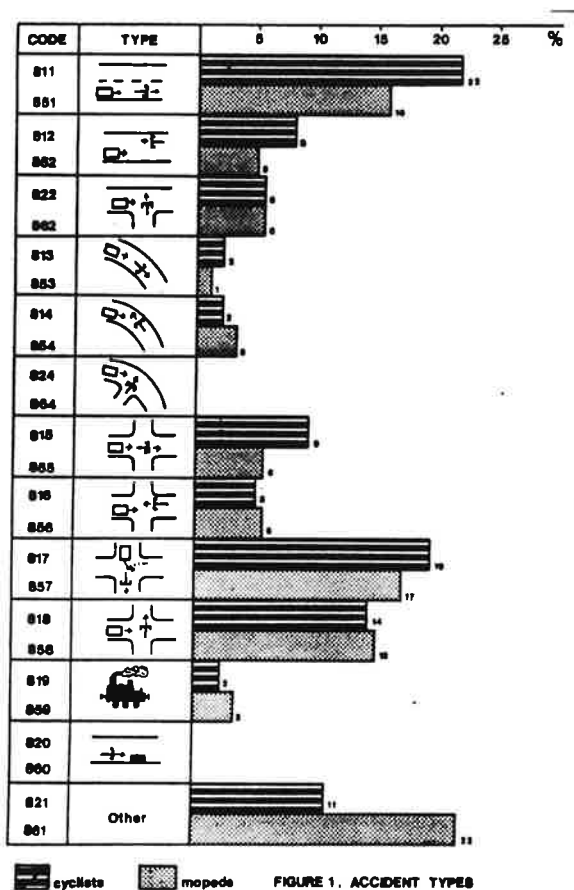
	Fatal	Serious injury	Slight injury	Total
Total number of accidents involving cyclists	302 (9%)	1459 (41%)	1740 (50%)	3501 (100%)
Number of accidents involving cyclists on the national road network	222 (11%)	864 (42%)	946 (47%)	2032 (100%)

On the main roads regarding the visibility conditions, the figures show that the fatal accidents happened to the cyclists mostly daytime, within good visibility conditions or at night at those sites, where there is no street lighting. Cycling along main roads is a very hazardous mode of transport, as the fatality rate in the last year was 14 there.

Visibility conditions	Accidents involving personal injuries on the main roads (%)			
	Fatal	Serious injury	Slight injury	Total
Daytime, good	7	28	36	71
Daytime, poor	1	1	2	4
Night-time, at sites without street lighting	4	6	4	14
Night-time, at sites with street lighting	2	4	4	10
Night-time, at sites where street lighting was out of work	-	1	-	1
Total	14	40	46	100

Regarding the types of cyclists' and moped drivers' accidents, we can say, that those two groups of road users have the same pattern. The frequent accident types are:

- collisions with other vehicles moving in the same direction (type codes are 811, 851) and
- collisions with other vehicles, coming from the crossing direction, even making turning movements (types 817, 857) or going straight forward (types 818, 858).



In the town of Nagykanizsa, in 6 years from 1980 until 1985 the cyclists' accidents were 28% of the total number of personal injury accidents, but the share of the cyclists accidents resulting serious injuries was 39% within the total number of serious personal injury accidents.

In the town of Békéscsaba a relatively developed bike fleet and bike road network can be found, 44% of the total personal injury accidents involved cyclists. The same share was experienced regarding the fatal and serious injury accidents, too.

In the town of Győr the black spots and black sections were investigated and it was discovered, that in the most dangerous intersection all of the personal injury accidents involved a pedestrian, a cyclist, a moped driver or a motorcycle driver in the 4 years of the study. The diagram shows the movements of the accidents in that site. We can see, that there are bike roads along the main street on both sides. There were 18 accidents, 2 of them was fatal, 8 resulted serious personal injuries. From the 7 cyclist accidents cyclists caused the accident in 5 cases. There was a fatal accident, the victim was a cyclist and a truck driver caused the accident not giving way in the intersection. According to latest information the intersection will be signalized in the near future.

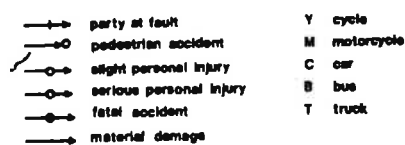
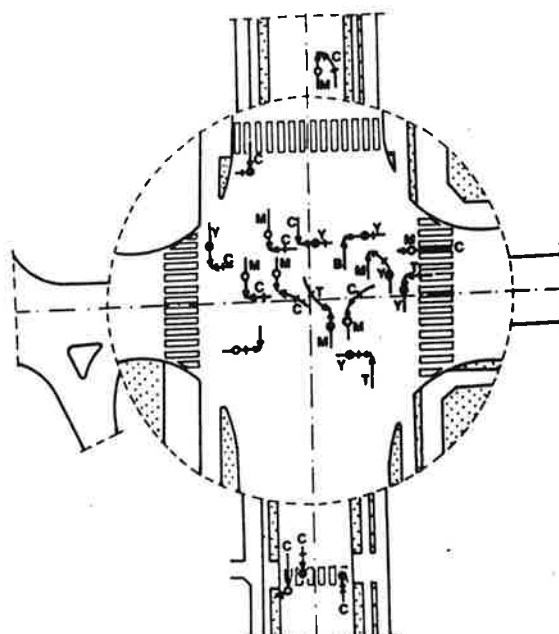


FIGURE 2. COLLISION DIAGRAM

4. Observation on a bike road

It is obvious, that on roads where separated bike roads are built, the accidents occur mostly in intersections and other sites where the cyclists meet other road users. So we have to pay a lot of attention to the typical hazardous situations, the cyclists' movement characteristics and habits in intersections, before explaining geometric design recommendations.

The development of a bike road network is under way in Hungary. There are cycle lanes and cycle roads already in considerable length, good for gathering data and observation, but in the coming years further development is expected regarding the cycle road network.

The cyclists' habits, attitudes in dangerous situation are not discovered yet and accident statistics do not involve the accidents happened on separated bike roads into the road traffic accident files.

Furthermore we have no information of conflicts between the different users of bike roads, e.g. cyclists and pedestrians, cyclists and cyclists, or cyclists and moped drivers.

Moreover there are several arrangements of cycle roads :

- together with pedestrian roads, without signing the share of the surface for cyclists and pedestrians
- together with pedestrians, but sharing the surface by pavement markings between pedestrians and cyclists
- on both sides of the road
- on one side of the road for both directions
- with entirely independent alignment and
- other variations of the above mentioned cases.

Finding that the traffic conflicts on bike roads must be a good field of investigation, I visited a cycle road, which connects a residential area of Budapest with a famous tourist place of the town of Szentendre, leading along a recreational area. Several observations emerged from the visit. The first, about 1 km long section of the cycle road can be found within the city of Budapest, and it serves as a cycle road, but it is not signed to be compulsory cycle track. Its connections with the surrounding large residential area are not solved, it begins and ends in a signalized intersection, offering the side walks or the carriageways for approaching and leaving the bike track. The cycle road itself offers a quiet, safe and attractive environment for the users. At the beginning of its second section there is a dangerous site from the cyclist's point of view. The bordering road of the housing estate approaches the main road leading to North, on the opposite side of the main road to the cycle track. There is no pedestrian crossing or any other safe approaching possibility for pedestrians and cyclists. Leaving the residential area the cyclists have to cross 6 traffic lanes, and can have traffic conflicts with 5 types of vehicle manoeuvres, before reaching the cycle road. Within an hour there were 86 cyclists, 27 of them crossed the main road leaving the residential area for the cycle road, 14 of them crossed the main road from the opposite direction leaving the cycle road for the housing estate. None of them could accomplish the intended movement in one step, and 10 of them had slight traffic conflicts with other road users.

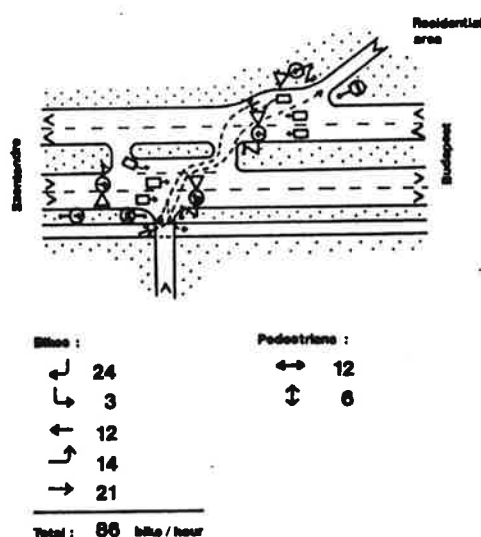


FIGURE 3. OBSERVATION ON A BIKE TRACK

The main road has a high traffic performance, the speed limit on this section is 80 km per hour and there are no danger warning signs drawing the drivers' attention to the presence of the non-motorized traffic. The other sections are comfortable and safe, apart from the conscious violences of car drivers, who use the bike road as if it were a road for their use. Effective protection is given against them by logs placed at the crossing points with other, all purpose roads. Reaching the beautiful town of Szentendre, the alignment of the bike road becomes confusing. At a bridge over a creek, following the sign of the cycle road, you can ride your bike upstairs and downstairs. The cyclists, of course, have found the way from the mousetrap, developing another interesting site for traffic conflicts, while crossing the main road again at grade.

The main conclusions of the observations along the 6 km long bike road are the following :

- A wide variety of vehicles and road users (cars, motorcycles, mopeds), several types, conditions and qualities of bikes, moreover pedestrians were experienced on the bike road, so the traffic composition and the age composition of the users were less homogeneous than it had been expected before.

- It was not obvious for the staff responsible for the bike road, that an attractive bike road has to have attractive and safe ending points as well as attractive and safe crossing points meeting the road network elements, because the signing and channelization of the end junctions must be good solved.

- Further observations and observations of other sites have to be made in order to cover most of the events occurring along bicycle tracks and to determine conclusions based on statistics.