Use of the Traffic Conflicts Technique in Finnish Road Conditions, by M J Merilinna, National Board of Public Roads and Waterways.

1. General

The traffic conflicts technique was introduced in Finland 1972 when the first study on it was carried out by the National Board of Public Roads and Waterways (NBR). After that NBR has developed it further by setting up a goal to make it usable for safety studies on intersections of public roads, mainly in rural areas. Three reports have been published as a result of this work /1,2,3/. Presently there is a vast study going on that comprises conflicts counts from 100 intersection approaches, which has required 2400 working hours during the field surveys. The results are being analysed now.

2. Definitions of Conflicts

The General Motors Research Laboratories in the United States had developed conflict definition which were used by NBR in their technique. Even the first field study proved the technique of GMR too complex for Finnish road and traffic conditions. It had to be simplified. At the present phase of studies a conflict at an intersection is defined as:

a) Evasive action, when a driver with the right-of-way, traveling straight through an intersection, brakes or weaves due to obvious interference by other traffic.

Braking is considered to have happened if the brake-lights are lit.

Weaving is considered to have happened if there is a clear change in travel course (e.i. crossing the solid yellow line in no-passing zone).

b) Traffic violation

In this connection traffic law is violated only if a driver traveling straight through an intersection
crosses the solid yellow line in no-passing zone without interference by other traffic. Usually this kind of traffic violation happens due to an error in choosing the proper lane or due to passing another vehicle at the intersection.

Conflicts in Group a) are further grouped as to their cause:

- right-of-way conflicts
- rear-end conflicts
- pedestrian conflicts

**Right-Of-Way Conflicts**

Right-of-way conflict is the situation where a driver, traveling straight through an intersection, is threatened as to his right-of-way by another vehicle and must therefore brake or weave. These conflicts are grouped according to the direction of the threat. They are named as:

- right-of-way conflict from right
- right-of-way conflict from opposing left turn
- right-of-way conflict from left

**Rear-End Conflicts**

Rear-end conflict is the situation where two vehicles following each other approach an intersection into the direction with the right-of-way, and the vehicle following behind is obliged to brake or weave because of the vehicle in front. These conflicts are grouped as to the movements of the first vehicle: making a left hand turn, driving straight through or making a right hand turn. They are named as:

- rear-end conflict to left
- rear-end conflict straight through
- rear-end conflict to right
Pedestrian Conflicts

Pedestrian conflict is the situation where a driver with the right-of-way, travelling straight through an intersection, is forced to break or weave because of a pedestrian on the road.

There are altogether eight separate types of conflicts. No division into "severe" and "other" conflicts is necessary as it turned out that in Finnish road condition (excluding city areas) a "severe conflict" (e.g. time for braking 1.5 seconds or less) is a very rare occasion.

3. Field Studies

Two observers record conflicts and traffic volumes at an intersection counting simultaneously the conflicts from the both main intersection approaches. The observations are made in periods of half an hour. A total of eight counting hours per day and two to three counting days are used. The practical arrangements of the observations are presented in Figure 1.

Figure 1 Arrangements for field studies of conflicts research
4. Some Results of Studies So Far

4.1 Correlation between Conflicts and Accidents

As the first conflicts study /2./ was carried out in Finland 1972 the traffic conflicts technique was tested by observing 25 intersection approaches. The conflicts observed during relatively short periods of time were converted into average daily conflicts (ADC). The correlation coefficient between ADS's and reported accidents within three years was found to be $R = .87$, which is significant at the one per cent level of significance. The definitions of conflicts slightly differed from those used at the moment.

4.2 Reliability of the Traffic Conflicts Technique

In 1974...75 a study on the reliability of the technique was carried out /1./. The following two separate conflict studies were conducted.

- Repeated conflict counts at three intersections during three weeks.

- Two one and a half hours' conflict counts at the same intersection approach with thirteen and sixteen observers.

Conformity of observations between individual observers was found insufficient if their training for observing conflicts was very short (only about half a day). In this case 95 per cent of all observations about the same conflicts are approximated to fall within the limits of the mean $\pm 42\%$, thus the range is fairly wide. However, it was also noticed that a longer training would improve conformity of observations.

It was suggested that experiments involving several observers simultaneously at different locations must absolutely be preceded by a test. All the observers count the same conflicts at the same location and the results are compared.
The length of a counting period may vary from 2 to 3 hours. If the standard deviation of all observations is:

\[ s \leq \frac{0.05\bar{x}}{t_{1-\alpha^2}(N-1)} \]

where
- \( \bar{x} \) = mean of the observations
- \( \alpha \) = level of significance (.05 suggested)
- \( N \) = number of observers
- \( t_{1-\alpha/2}(N-1) \) = corresponding upper percentage point of the t-distribution

the survey may begin. Otherwise the observers need more training. This test can be run, depending on the situation, either with the total number of conflicts or only with some specific types of conflicts. When this test is used a sample size of \( N \geq 5 \) observers is recommended.

Before a new observer is allowed to start actual counting it was also suggested to arrange a conflict counting test with another experienced observer. For instance the following test procedure can be applied. The observers are required to count the same conflicts during ten half hour periods on an intersection approach during one day so that a great variety in traffic volumes will occur. A sample correlation coefficient is to be calculated between their observations and if

\[ R_{\text{observed}} \geq 0.975 \]

the new observer may start working, otherwise more practising is needed.

The unsteadiness of conflict numbers between different observation days proved rather severe problem because 95% of all observations were approximated to fall within the limits of the mean ± 21% (the range relatively from .79 to 1.21), and the only means to improve the accuracy was to increase the number of counting days. The mean of
the observations obtained through two counting days will fall within the relative 95 per cent confidence interval .85 to 1.15, and about twenty counting days are required to reach the 95 per cent confidence interval of the mean from .95 to 1.05. One counting day in this estimation meant two to three hours' effective conflict counting.

The study showed that the best possible result can be obtained from conflict observations distributed evenly during a whole day at one location as conflict observations are being made from traffic conditions of all volumes.

5. **Practical Applications**

The Traffic Conflicts Technique is being further developed in Finland. A detailed traffic safety study was carried out on a road section (Main road 4, section Jämsä–Jyväskylä) and different methods were compared that suggest certain arrangements aiming at decrease in accident numbers. The comparison also included the Traffic Conflicts Technique.

The results show that the Traffic Conflicts Technique is rather a useful method, in some cases even better than an analysis of accident statistics, for determining suitable traffic safety arrangements. However, interviews of local authorities, professional bus, lorry and taxi drivers give very similar information at lower costs, although their recommendations can partially be misleading.

6. **Official Opinion and Future Research**

The results of the before mentioned project that is being analysed will show to what extend the usability of the Traffic Conflicts Technique is believed in and if it will be given any weight in decision making.

The final results of the project will also determine if the technique will be regarded useful for traffic conditions on public roads in rural areas of Finland. If the results are positive, further studies are very likely to be made.
REFERENCES

/1/ Merilinna, M.J: "A Study on the Reliability of the Traffic Conflicts Technique", The Ohio State University, USA. Columbus 1975.
