

REVIEW OF TRAFFIC CONFLICTS TECHNIQUE STUDIES

Third edition

R-83-9

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FOREWORD

Interest in the development of conflict techniques for a variety of purposes in road safety research is greatly increasing at both national and municipal levels.

As this literature review shows, much has already been written on this subject. In practice, however, the use of traffic conflicts as a basis for a road safety method gives rise to a number of problems. They include, for instance, problems of defining a conflict, the reliability and validity of the conflict as an accident predictor. It may be added that there have already been carrying out many field studies in this framework.

From the current development of different conflicts techniques in a number of countries one may expect the conflict method to explain more of the variability in accidents than is possible with traffic volumes alone.

A first edition of this Review of traffic conflicts techniques studies (SWOV, R-79-9) was published in 1979. Since that time a number of new studies in this field was published as a result of the research development in the last few years. Therefore, it was desirable to produce a more up-to-date report.

This report has been compiled by J.H. Kraay, research sociologist.

E. Asmussen

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INTRODUCTION

Greatly increased attention has been given to the road-safety problem at the local level in recent years. This has faced road safety research with new problems, however. At the national level, traffic hazards - and changes therein as a result of countermeasures - can be measured by accident statistics.

Traffic hazards in (old and new) residential areas, in the vicinity of schools, on cycle routes in city centres, but also the redesigning of several streets or of entire residential areas, are attracting greater and greater interest. The typical feature of residential areas, for instance, is that traffic accidents are generally few in number and are usually spread throughout the research area concerned. The number of traffic accidents per annum is also small on traffic arteries inside built-up areas, even where there are black-spots.

A different criterion for expressing traffic hazards is that of near-misses and/or serious conflicts between road users. The expected numbers of near-misses or serious conflicts are in any case greater than the numbers of recorded accidents.

The road safety research method based on the study of (serious) conflicts is often briefly known as the conflicts method. It includes the observation of conflicting traffic behaviour and also its analysis, both by means of appropriate techniques.

In particular, the conflicts method can be used for establishing traffic hazards at separate locations, in specific traffic situations, or with respect to road usage in a variety of conditions, in the event of there being no (or only inadequate) information available on road accidents, or if such information is unreliable. Many people concerned with road safety research are of the opinion that research can be carried out in the near future with the aid of the conflicts method, as a substitute for road accident recording and analysis.

Various conflict techniques are at present being developed in a number of countries. In order to interrelate these developments as

effectively as possible, the First Workshop on Traffic Conflicts was held in Oslo at the end of 1977; those engaged in research work in this field discussed the progress of the various developments. In 1979 there was held a second Workshop in Paris; the outcome of the workshop was to set up an international calibration-study and to make a design for an international validation-study. The International Committee on Traffic Conflicts Techniques ICTCT organised the third Workshop in Leidschendam. The primary purpose of this Workshop was to discuss and finalise the research design for the mentioned international calibration-study that will be carried out in Malmö in June 1983.

Little is still known about the development and applications of the conflicts method by potential users of this method.

In this literature survey some different methods have been collected, giving a better idea of the possibilities of using them.

In compiling this survey the following steps were taken:

- Retrospective research was carried out in the International Road Research Documentation IRRD covering the period 1975 to June 1977
- An SDI service (Selective Dissemination of Information) was made on the IRRD file from June 1977 to December 1979
- SWOV documentation from 1975 to December 1979 was checked
- Checks were made of the literature lists in the collected publications (the so-called snowball system).

Subsequently the publications were traced in the SWOV library. If a publication was present the author's abstract was copied. When there was no author's abstract or if a publication was not present the IRRD abstract was used. If a publication was not in the IRRD file but only in the SWOV library without an author's abstract then the SWOV documentation abstract was used.

The type of abstract, viz. Author, IRRD or SWOV, is specified by means of an A, I or S.

The publications are given in alphabetic order on authors name.

AGENT, K.R.

Development of warrants for left-turn phasing

Research Report No. 456

Kentucky Department of Transportation, Lexington, Kentucky, 1976.

30 p.

IRRD 225542

(I)

Warrants for the installation of left-turn phasing were developed. A review of literature was conducted along with a survey of the policies of other states. Field data of delays and conflicts were taken before and after installation of exclusive left-turn signalization. Left-turn delay studies were conducted at intersections with varying volume conditions. Analysis of the effect on accidents of adding a left-turn phase were made. The relationship between left-turn accidents and conflicts was investigated. Other types of analysis concerning gap acceptance, computer simulation, capacity, and benefit-cost ratios were also performed. It was found that exclusive left-turn phasing significantly reduced left-turn accidents and conflicts. Left-turn delay was only reduced during periods of heavy traffic flow. Warrants were developed dealing with the following four general areas: 1. Accident experience; 2. Delay; 3. Volumes and 4. Traffic conflicts.

AGENT, K.R.

Development of warrants for left-turn lanes. Interim report

Research Report No. 526

Kentucky Bureau of Highways, Lexington, 1979. 33 p. + app.

IRRD 254737

(I)

Warrants for the installation of separate left-turn lanes were developed. Literature was reviewed, and policies and practices in other states were surveyed. Accident analyses of locations with and without separate left-turn lanes were conducted. Computer simulation was used to determine the relationship between and among traffic delay and load factor and traffic volume, percent left-turns, cycle length, and cycle split. The relationship between left turn accidents and conflicts was investigated. Warrants were developed involving the following three general areas: (1) accident experience, (2) volumes (based on delay), and (3) traffic conflicts.

AL-ASHARI, N.

Alternate methods of examining correlation of conflicts with accidents
Traffic Engineering 46 (1976) 10: 34-36

IRRD 226585 (I)

A conflict study was conducted at five signalized intersections on a two-way roadway in Grand Rapids, Michigan, with five lanes, one being a center lane for left turns. Because of the substantial number of accidents caused by these turns, a left turn phase was added to the signal operation. The Michigan Department of State Highways and Transportation did a before-and-after evaluation study of conflicts and accidents, finding no correlation between frequency variations. Two other statistical approaches for a correlation analysis are described here. Method A is a difference in percentage of vehicles not in conflict after going through the intersections. The difference in percentage in the before and after periods will be the increase or decrease in accidents. Method B is a cumulative function of safety improvement ratio. These methodologies show that the reduction in conflicts was between 10 and 14 percent, and the total accident reduction was 17 percent. Investigations with larger sample sizes will be necessary to prove that these correlation methodologies are applicable.

ALLEN, B.L.; SHIN, B.T. & COOPER, P.J.

Analysis of traffic conflicts and collisions

McMaster University, Hamilton, Ontario, 1977. 25 p.

In: Highway capacity, measures of effectiveness, and flow theory. Transportation Research Record 667, pp. 67-74. Transportation Research Board, Washington, D.C., 1978.

IRRD 241939 (A)

Parameters intrinsic to the sequence of events leading to vehicle collisions and traffic conflicts are investigated in an attempt to develop a more practical and reliable application of the traffic conflicts technique. Sequences of collisions and conflict events were video taped and are analyzed in detail. Preliminary investigations reveal that using the common method of brake application is not adequate for describing conflict. As a result, seven methods of defining a conflict situation are introduced and evaluated. It is concluded that at least two of the proposed methods will provide a practical investigative tool that explains accident occurrence better than brake application.

AMUNDSEN, F.H.

Nesten Ulykker (Near accidents: development of a registration method and an analysis of the correlation with traffic accidents)

Transport Økonomisk Institutt, Oslo, 1974. 3 p.

(SWOV PB6468 fo)

(S)

The purpose of this project has been to: find a practical method for registration of traffic conflicts which may have resulted in accidents; look for a correlation between accidents and number of conflicts; show that situations which result in conflicts are the same which may result in accidents; and evaluate how data about conflicts may supplement traffic accident data.

AMUNDSEN, F.H.

Registrering av trafikkonflikter (Recording traffic conflicts)

Temaserien - Trafikk No. 7

Transport Økonomisk Institutt, Oslo, 1977. 34 p.

IRRD 232467

(I)

The report describes a method of recording situations which could have developed into a near miss or an accident if one or both of the persons involved had not taken measures to prevent the conflict. The method is illustrated by examples.

AMUNDSEN, F.H. & HYDEN, C.

Proceedings: First workshop on traffic conflicts

Oslo, September 26-27, 1977.

Institute of Transport Economics Oslo, Lund Institute of Technology,
1977, 137 p. + app.

(SWOV PB12901)

(S)

This report is a collection of the papers given at the first traffic conflicts workshop in Oslo 1977 and gives a state-of-the-art. The report also consists of a short summary of the discussion.

AMUNDSEN, F.H. & LARSEN, H.O.E.

Traffic conflicts technique; Status in Norway

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 34-39.

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SWOV PB12905)

(S)

Conflicts are defined and separated into moderate conflict, dangerous conflict and critical conflict. On a junction conflict and accident situations were recorded before and after the installation of a priority traffic sign. In Norway the conflict observation technique is used if there is a doubt of what to do with an intersection.

ARNBERG, P.W.

The traffic environment of preschool children in Sweden

VTI Saertryck nr. 44.

Statens Vaeg- och Trafikinstitut, Linkoeeping, 1979. 18 p.

IRRD 243194

(I)

A survey of nearly 300 preschools in Sweden with 10.000 children was carried out. Responses to questionnaires sent out to preschool personnel (response rate of 95%) and the children's parents (response rate of 70%) have provided information concerning, among other areas, the traffic environment surrounding the preschools and the children's mode of transportation and route to/from school. Time of the year as well as the effect of where in Sweden the preschool was located were studied. Accidents and near accidents were also studied during the period January, 1977, to May 1978. In 15% of the preschools, the traffic environment and in 25% of the preschools, the route to school were considered dangerous. Factors characterizing a dangerous traffic environment included a lack of or poor quality of existing fences, lack of warning signs, obstructed vision, and too high a speed on roads surrounding the preschool. Safety hindrances for the large group of children walking and bicycling to preschool included, e.g. the lack of proper pedestrian and bicycle paths. In nearly all of the preschools (96%), at least some traffic education was stated as being given, although the form and extent of this education varied greatly. Parents, however, felt that most of the children's education in traffic was provided at home. Nearly half of the parents used material from 'the children's traffic club'.

ARNDT, C.

Pedestrian refuge islands as replacement for marked pedestrian crossings.

In: Joint ARRB/DOT Pedestrian Conference, Sydney, 1978, 3 p.

Australian Road Research Board, Vermont, 1978.

IRRD 236731 (SVOV PB 15134)

(I)

This paper describes procedures relating to the provision of marked pedestrian crossings in the Perth metropolitan area, including surveys to determine a particular site's rating against the pedestrian/vehicle conflict warrant. A relationship between sodium vapour floodlighting on pedestrian crossings and accident rate is also illustrated. Advantages in operational safety for both pedestrians and motorists is shown to be related to provision of at-grade pedestrian refuge islands in lieu of marked pedestrian crossings on multilane roadways where the conflict drops or is below generally accepted conflict guidelines.

BAGULEY, C.J.

The British traffic conflict technique: state of the art report

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 8-13

IRRD 265672 (SWOV PB21013)

(I)

Developments in the method of traffic conflicts data acquisition used by TRRL are outlined and research carried out since 1979 is described. A total of 17 sites is used in the present study in a mix of urban and rural locations. These comprise 8 T-junctions and 9 crossroads and include both single and dual-carriageway priority roads with a fairly wide range of traffic flows and injury accident histories. Signalised junctions without roundabouts were not included in this study. The equipment used for the study and the way data are collected are described.

BAKER, W.T.

An evaluation of the traffic conflicts technique

In: Traffic records, Highway Research Record No. 384, pp. 1-8
Highway Research Board, Washington, D.C., 1972

IRRD 203382 (SWOV PB1347)

(A)

The traffic conflicts technique, as developed by General Motors Research Laboratories, was evaluated by the Federal Highway Administration in co-operation with the state highway departments of Washington, Ohio, and Virginia. In addition to a field test of the technique, an attempt was made to find whether there is a statistical relation between traffic accidents and traffic conflicts. Conflicts were counted at 392 intersections before improvements were made and 173 intersections after construction of the improvements. It appears that those characteristics of intersections that contribute to accident causation can be more readily exposed by using conflicts than by using conventional accident analysis techniques. This may be especially true at low-volume rural intersections. Because of this ability to provide more precise information, lower cost remedial actions should result. Correlation coefficients were calculated for bivariate populations of number of conflicts and number of corresponding accidents. The compiled data tend to support a finding that conflicts and accidents are associated.

BAKER, W.T.

The traffic conflicts experience in the United States

In: Proceedings First Workshop on Traffic Conflicts, Oslo, 1977,

pp. 59-63

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SVOV PB12908)

(S)

Increased interest in application of traffic conflicts analysis at intersections is generated in the U.S.A. The objective of this research is to develop a standardized set of definitions and procedures that will provide a cost-effective method for measuring traffic conflicts. The major question is how well can traffic conflicts predict traffic conflicts.

BALASHA, D., HAKKERT, A.S. & LIVNEH, M.

A quantitative definition of the near-accident concept

In: Proceedings of the second international traffic conflicts technique

workshop, Paris, 1979, pp. 22-42

TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21271)

(S)

The study presents a quantitative definition of the near-accidents concepts, and the level of risk associated with various types of manoeuvres at an intersection. The definition is objective and is not influenced by observer variations. The definition is based on the development of two dimensional equations of motion for vehicles traveling through the intersection, the calibration of such equations, and the definition of critical values of resultant deceleration. The method needs relatively high speed continuous filming of the intersection area, and necessitates a detailed film analysis.

BERGER, W.C. & ROBERTSON, H.D.

Measures of pedestrian behaviour at intersections

In: Capacity and measurement of effectiveness, Transportation Research Record 615, pp. 54-59
Transportation Research Board, Washington, D.C., 1976

IRRD 230641 (SWOV PB8762)

(A)

This research was performed as part of a research project to identify and evaluate intersection improvements for pedestrian safety at urban intersections. Two field studies and a series of field observations were conducted to identify measures and methods that could reliably yield information concerning potentially hazardous pedestrian behaviour at intersections. Both operational measures and conflict measures were investigated. Of 16 behavioral measures that were tested at 120 intersections in the original field study, 7 were retained, refined, and tested in the following field study. These measures showed considerable promise in differentiating the high from the low accident intersection of a matched intersection pair (having similar traffic controls and geometrics). The measures that were developed in this task were to be used in the evaluation phase of the project.

BLUNDE, W.R. & MUNRO, R.D.

Study of traffic conflicts and accident exposure

Report 1977-06
Unisearch Limited, Kensington, N.S.W., 1977. 61 p.

IRRD 227959

(A)

The work includes research into the concepts of road accident exposure and accident liability and also a series of field studies in the Sydney area designed to investigate the potential of vehicle conflicts counts and classifications in the assessment of exposure. Data on traffic conflicts and flows and accident histories have been analysed for a variety of locations, broadly classified into intersection and "main street" situations. The results have revealed a number of areas in which connections between conflicts, exposure and accidents can be found and they indicate that further research into traffic conflict situations would be worth pursuing. Suggestions as to possible directions for this work are presented in the conclusion to the report.

BRYANT, J.F.M.

Intersection conflicts

Report No. 7

Australian Road Research Board, Canberra, 1973. 42 p.

IRRD 223002 (SWOV PB7984)

(A)

Commencing with the classical conflict diagrams for T-intersections, fourway intersections and multi-leg intersections, an exhaustive analysis of conflicts between two, three and four vehicles, with and without turning vehicles, is made. Conflict analysis is applied to the evaluation of priority rules, the effects of regulatory traffic control devices and accident analysis. For the latter risk rates are calculated for intersection flows in which turning vehicles are present. Conflict analysis is also applied to the dynamic situation, i.e. when other vehicles not in conflict may nevertheless influence the way in which conflicts are resolved. The study of conflicts in the field is commented on, including observations of intransitive conflicts or conflicts that cannot be resolved by the direct application of priority rules.

CAMENZIND, J.; HÜRLIMANN, F.W. & KÄGI, B.

Konfliktstelle Fussgängerstreifen (Conflict point pedestrian crossing)

Zeitschrift für Verkehrssicherheit 24 (1978) 1 + 2: 14-20 + 52-58

IRRD 308200

(A)

Our investigations have proved that considerable discrepancies exist, with motorists and pedestrians, between knowledge and behaviour, between intend and doing. Psychotherapeutically spoken, in making these circumstances evident, an initial important step has been done towards coping with an unsatisfactory state. The conflict point pedestrian crossing could be taken the edge off if motorists and pedestrians would exhaust better their feasibilities of communication. A great deal of those involved are aware of these feasibilities, however, little use is made thereof so far, in the concrete traffic situation.

Motorists are aware of:

- that they have to drive most cautiously while approaching pedestrian crossings,
- that they have to get into visual contact with the pedestrian in good time,
- that they have to regard handsignals of the pedestrians,
- that specific courtesy has to be exercised vis-à-vis children, disabled and aged persons.

Pedestrians are aware of:

- that existing pedestrian crossings have to be made use of,
- that they have to wait looking both ways before crossing the roadway,
- that they have to get into visual contact with the motorists in good time,
- that they have to give handsignals and wait for the effect of the latter,
- that they must not get into the pedestrian crossing suddenly.

This knowledge of the traffic participants is no doubt a good pre-condition for a safe and justifiable behaviour. An efficient traffic safety work should be based on this knowledge, and should assist in transferring it into a concrete traffic behaviour, for traffic knowledge is merely productively applied if it comes to fruition in the everyday traffic behaviour. Even if all problems about the pedestrian crossing have, by a long way, not yet been solved, the traffic safety work, in transferring traffic knowledge into traffic behaviour, is faced with a permanent task, for which proper strategies and a specifically methodical instrumentarium would have to be determined. In this regard, namely the step from the theory into practical application has not yet been fully performed neither.

CAMPBELL, R.E. & KING, L.E.

Rural intersection investigation for the purpose of evaluating the General Motors traffic-conflicts technique

In: Highway safety, Proc. Second Western Summer Meeting, Salt Lake City, 1969, HRB Special Report 107, pp. 60-69
Highway Research Board, Washington, D.C., 1970

IRRD 51417 (SWOV PA6834, see also PA5682 fo) (A)

A traffic conflict is any potential accident situation. The traffic-conflicts technique developed by General Motors Research Laboratories is a means for analyzing the accident potential of roadway intersections through observation and tabulation of 5 conflict categories: left-turn, weave, cross-traffic, rear-end, and violation. These conflicts occur when evasive action, such as braking or weaving, is necessary to avoid an accident. To date, this technique has been applied mainly to urban intersections. The purpose of this study was to investigate the application of the traffic-conflicts technique to rural roadway intersections.

The technique was found to be flexible enough to be applied to both rural and urban intersections, and it is the authors' opinion that the traffic-conflicts technique does detect accident potential and that it appears to be a good systematic method for studying and evaluating the accident potential of an intersection prior to development of an accident history. However, more research and experience with the technique will be necessary to establish this as a fact.

CAMPBELL, R.E. & KING, L.E.

The traffic conflicts technique applied to two rural intersections
Accident Analysis and Prevention 2 (1970) 3: 209-221

(SVOV PA8547 T, see also PB15342) (A)

A traffic conflict is any potential accident situation. The traffic conflicts technique is a means of analyzing roadway intersections through observation and tabulation of five basic categories of conflicts: left-turn, weave, cross-traffic, rear-end and traffic violation. These conflicts occur when evasive action, such as braking or weaving is necessary to avoid an accident, or when the traffic code at the intersection is violated.

To date, this technique has been applied mainly to urban fourway intersections. The purpose of this study was to investigate the application of the traffic conflicts technique to rural, Y-type roadway intersections with one approach faced by a stop sign. The traffic conflicts technique, by delineating initial causes of potential accident situations, provides an understanding of the basic causes of accidents at the studied intersection, and should prove to be an useful tool for traffic engineering changes, leading ultimately to a reduction of traffic accidents. The technique was found to be flexible enough to be applied to both rural and urban intersections, and it is the author's opinion that the traffic conflicts technique can be used to define accident potential. However, more research and experience with the technique will be necessary before it can become a quantitative tool.

CIMA, B.T.

Evaluation of freeway-merging safety as influenced by ramp-metering control

In: Evaluation of transportation operational improvements, Transportation Research Record 630, pp. 44-51
Transportation Research Board, Washington, D.C., 1977

IRRD 233595 (A)

The traffic-conflict technique was modified to evaluate the relative safety of freeway merging with and without the use of entrance ramp-metering control. Six types of traffic conflicts were defined for the entrance ramp and acceleration lane: braking on ramp, braking for lead vehicle, weaving around lead vehicle, entering second lane, entering side by side, and entering late. Five conflicts were specified for the freeway lane (merge lane) adjacent to the acceleration lane: weaving around entering vehicle, braking for entering vehicle, weaving around lead and entering vehicles, braking for lead entering vehicles, and avoiding encroaching vehicles. A three-level severity rating (routine, moderate, and serious) was also developed to assess the seriousness of each conflict. An existing ramp-metering control installation was investigated during freeway levels of service c and d. A two-way analysis of variance was performed on the traffic-conflict data by using, as the independent variables, ramp-control condition (on and off) and freeway level of serve (c and d). The study revealed a significant reduction of 11.6 percent in all traffic conflicts when ramp control was activated. Analysis results indicate that acceleration-lane conflicts significantly decreased when ramp-metering control was used. Merge-lane conflicts were found to be related more to freeway level of service than to ramp control. However, merge-lane, multiple-vehicle conflicts and their severity decreased when ramp control was in effect. An analysis of accident records supported these conclusions.

CLAYTON, M.E.

Evaluation of urban intersections using traffic conflict measures.

Interim report

Research report 476

Kentucky Bureau of Highways, Department of Transportation, Lexington,
1977. 39 p.

IRRD 241611 (A)

The purpose of this report was to analyze two urban intersections using conflict data, erratic manoeuvre data, and near-miss accident data and to recommend site improvements, if necessary. The two intersections selected were Euclid Avenue at Woodland Avenue and New Circle Road at Woodhill Drive in Lexington. Data were taken using 11-hour observation periods. Proposed improvements for the site on Euclid Avenue included adding dual left-turn lanes and three-phase signals or an extended multi-turn lane. At the New Circle site, a longer, more gradual right-turn lane and repositioning some of the signing are recommended. The conflict data recorded were found to be very useful in identifying the specific causes of the problems.

COOPER, D.F. & FERGUSON, N.

Traffic studies at T-junctions (II); A conflict simulation model

Traffic Engineering & Control 7 (1976) 7: 306-309

IRRD 222064 (SWOV 12813 fo) (A)

This paper describes a simulation model for assessing accident risk at a T-junction and its use within a large continuing project. The model is based on the concept of traffic conflicts. It is implemented by an event-stepping simulation program in which the movements of individual vehicles are monitored. The events and vehicle interactions are defined, and it is shown how drivers' turning decisions lead to the occurrence of conflicts. Preliminary results from the model are presented, indicating that its general design is correct and that it identifies areas to which effort might be directed in future. It is noted that the level of risk which drivers take at T-junctions can be modified by police activity. Finally, some comments are made on the usefulness of this kind of study within a larger project.

COOPER, P.J.

A method of predicting high accident locations

In: Proceedings of the 1973 Annual Conference of the Roads and Transportation Association of Canada, pp. 270-278
Roads and Transportation Association of Canada, Ottawa, 1973

(SWOV PB5053)

(S)

A total of 59 non-signalized intersections in four major cities were examined. At each intersection, in addition to conflicts, measurements were taken of total volumes for each through and turning movement with the average time taken per vehicle to complete the manoeuvre, all violations occurring at the intersection whether accompanying a conflict or not and average through speeds of vehicles.

The concept of traffic conflicts as an accident predictor has much promise in theory but the results of this study did not indicate a very efficient or practical application for conflicts in their present form.

From the results of this study and also those of other previous investigations, it can be said that traffic conflicts are significantly related to accidents. The problem is that, while significant, the level of correlation is generally low and most of the relationship can probably be accounted for by the high dependence of conflicts on traffic volumes.

The fact that the use of conflicts does add something, however small, to the explanation of accident variance, however, is sufficient to warrant the further exploration of this concept. Emphasis should be placed upon a re-evaluation of the conflict definitions in the light of research on driver behaviour and safety and, perhaps even more important, on the improvement and standardization of observational procedures perhaps eventually to the point of ending the reliance on human recorders.

COOPER, P.J.

Predicting intersection accidents; The use of conflicts and other models based on traffic-flow parameters to predict accident experience at non-signalized intersections

Transport Canada, Road Safety, Ottawa, 1973. 96 p.

(SWOV PB6614)

(A)

This report describes a study undertaken by the Ministry of Transport in order to evaluate various models for the prediction of accident occurrence at intersections. Variables considered were: traffic volumes, vehicular manoeuvre times, traffic conflicts and violations. Significant correlations were found between accidents and conflicts, accidents and intersection approach volumes and accidents as a function of a time-volume exposure index.

While the data tended to support the hypothesis that accidents and conflicts are related, the correlations achieved were not of a high order and it was found that the concept of vehicular conflicts, in its present form, is not likely to result in a viable tool for the analysis of individual intersections. A possible exception to this general conclusion may be in the area of identifying hazard spots within an intersection.

It was found that the best accident predictor models were those based on vehicular volumes. The inclusion of a time exposure factor, while not improving the overall correlation, nevertheless gave indications of explaining some accident variance in situations where consideration of volume alone was insufficient.

COOPER, P.J.

State of the art: Report on traffic conflicts research in Canada

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 22-33

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SWOV PB12904)

(S)

Traffic conflicts technique is not yet being used in Canada in an operational role. The goal of the research on traffic conflicts technique in Canada is to develop a technique which will result in a consistent and reliable indication of hazard associated with certain vehicular manoeuvres, traffic control and geometric constraints. The technique must be based on definitions which are presented.

CROFT, P.G.

Driver behaviour and conflicts at pedestrian crossings

In: Joint ARRB/DOT Pedestrian Conference, Sydney, 1978, 22 p. Australian Road Research Board, Vermont, 1978.

IRRD 236736 (SWOV PB15141)

(A)

The extent and characteristics of collisions at uncontrolled marked pedestrian crossings in New South Wales are described. Factors contributing to driver behaviour on the approach to such crossings are discussed. Particular attention is paid to the perception of crossing facilities, the preparation for the presence of pedestrians and the reaction to conflict situations. The development of a technique for monitoring driver behaviour on the approach to crossings is described briefly, preliminary data indicate differences in driver behaviour when pedestrians are present. Implications of this finding are discussed.

CYNECKI, M.J.

Development of a conflicts analysis technique for pedestrian crossings

Transp. Res. Rec. 743 (1980): pp. 12-20

IRRD 253278

(I)

The purpose of the study described in this paper was to develop a pedestrian conflict technique that will be useful in identifying hazardous locations and specific operational deficiencies at pedestrian crossings. A major concern in the development of this conflict technique was flexibility, ease of use, and the ability to develop countermeasures from the collected data. The technique defines 13 principal pedestrian conflicts that may occur and uses different levels of conflict severity. A conflict data form was applicability and feasibility of this conflict technique was tested at five crossing locations in which a total of 25 h of data were collected. Although a significant amount of further testing is required to provide conclusive results on the usefulness of this conflict technique, preliminary investigation has indicated that this procedure can yield information that is valuable for the identification of potential safety hazards at pedestrian crossings. The technique may be used to develop countermeasures to reduce or eliminate pedestrian accidents.

DAMAS AND SMITH LIMITED

Post encroachment time conflict technique, a traffic safety tool?

Damas and Smith Limited. Planners, Engineers and Project Managers, Ottawa, 1982

(SWOV PB21331)

(S)

An analysis of the traffic conflicts data collected during 1980 for five unsignalized intersections using the Post Encroachment Time (PET) Technique is presented. The PET is an operational tool for engineers responsible for determining the need and consequences of changing roadway geometries and for traffic control systems.

With respect to testing the validity of the PET as an indicator of traffic safety problems at unsignalized intersections, the data analyzed provided mixed results due, in large parts, to the size of the data base.

DARZENTAS, J., HOLMES, V. & MCDOWELL, M.R.C.

A pilot study of conflicts at a T-junction on winter evening rush-hours

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 115-123
TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21279) (S)

The diurnal distribution of reported road accidents in the U.K. shows two major and one minor peak. The major peaks occur at the morning and the evening rush hour, the minor peak at late evening and is probably associated with alcohol usage. These peaks are still presented in the data when it is normalised for a given major road to unit traffic flow. Nevertheless all conflict studies have been carried out in daylight. A study is made in the differences, if any, in driver behaviour in daylight and in darkness. Results of the study are presented.

DARZENTAS, J., MCDOWELL, M.R.C. & COOPER, D.F.

Minimum acceptable gaps and conflict involvement in a simple crossing manoeuvre

Traffic Eng. & Control 21 (1980) 2: pp. 58-61

IRRD 246143 (I)

The authors analyse experimental data on minimum acceptable gaps and crossing times of subjects for a single-lane crossing manoeuvre. Data for four groups of subjects were used: young males, old males, young females and old females. A regression analysis was used to assess how judgements of minimum acceptable gap vary with speed of approaching vehicles. The results were used in a simulation model to estimate conflict involvement for each class of subject as a function of main-road flow and speed. Older drivers are more likely to cause conflicts in this manoeuvre than younger drivers and males are more likely to cause conflicts than females.

DARZENTAS, J., HOLM, V. & MCDOWELL, M.R.C.

Driver behaviour at a T-junction in daylight and darkness

Traffic. Eng. and Control 21 (1980) 4: pp. 186-189

IRRD 247269

(I)

Measurements are reported of driver gap acceptance behaviour in the left-turn merging manoeuvre at a T-junction, in England, in darkness and in daylight. No significant differences were found in the side-road flow, median delay, main-road flow distribution or main-road speed distribution. We find that drivers consistently accept shorter gaps in darkness. Almost 30 per cent of gaps accepted at night were in a class of less than four seconds, whereas a previous study (in the U.S.) found no accepted gaps in this class. Application of these data in a conflict simulation model predicts about 50 per cent higher conflict involvement in darkness, and that while severe conflicts in this manoeuvre are rare in daylight, many are to be expected at night.

DATTA, T.K.

Accidents surrogates for use in analyzing highway safety hazards

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 4-20

TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21269)

(S)

The basic goal of the study is to address a series of questions relative to the problems that it is essential that further research is directed toward identifying measures (highway and operational characteristics) other than accidents, which can be used in the overall highway safety improvement process. Specific questions are a.o. (1) What are the highway, operational and accident characteristics which describe the hazardousness of specific highway situations, (2) Do the surrogate measures selected on the basis of post research studies, exhibit sensitivity with accident history, and (3) Do safety improvements at a location change the accident characteristics as well as the surrogate measures.

DRAHOS, R.W.; TREAT, J.R.; HUME, R.D. & HUSSEY, S.A.

An analysis of emergency situations, maneuvers, and driver behaviors in accident avoidance

Indiana University, Institute for Research in Public Safety, Bloomington, Indiana, 1975. 300 p.

IRRD 228832

(I)

The specific objectives of this study were to: develop a taxonomy of emergency traffic conflict situations; develop a taxonomy of evasive manoeuvres available to a driver appropriate to each of the above identified situations; identify the critical driver behaviours which comprise each of the above evasive manoeuvres available to a driver; determine the probability of occurrence for each category of emergency situation identified above; determine for each category of evasive manoeuvre appropriate to each identified emergency situation that was identified above the probability that a driver would successfully avoid a traffic accident by instituting that manoeuvre in its given situation; determine for each critical driver behaviour comprising an evasive manoeuvre the probability or frequency of occurrence of each behaviour; and state the findings of the project in terms of the required behaviour responses necessary for accident avoidance in emergency situations.

ERKE, H. & ZIMOLONG, B.

Verkehrskonflikte im Innerortsbereich; Eine Untersuchung zur Verkehrskonflikt-technik (Traffic conflict inside built-up areas)

Unfall und Sicherheitsforschung Strassenverkehr Heft 15
Bundesanstalt für Strassenwesen, Bereich Unfallforschung, Köln, 1978.
177 p.

IRRD 307995 (SWOV PB13408)

(A)

The method of systematically observing traffic conflicts in order that accident black spots in the street network may be discovered (Traffic Conflicts Technique), which was developed in the U.S.A., was applied to German conditions and tested at three signal-controlled intersections each in two large cities of the Federal Republic of Germany.

For this purpose, the conflict types to be identified were defined for both the intersection area proper and the approach areas. In order to be able to analyze the relationship between accidents and conflicts, a systematic assignment system to link conflicts and their causes was developed for inclusion in the official records of accident causes. Before the field observations were actually started, the persons charged with the job of traffic observation were trained by means of a new training program especially developed for this purpose.

For some traffic situations, the investigation demonstrated relatively close relationships between the types of conflicts observed and the corresponding accidents recorded by the police at the intersections mentioned.

ERKE, H. & ZIMOLONG, B.

Zur Ökologie des Risikos (Ecology of risks)

University of Technology, Institute of Psychology, Brunswick, 1979

(SVOV PB21330)

(S)

Particular problems for an empirical and practical satisfying definition of spot locations and behavioural aspects are discussed. It is important in the calculation of risk to know the relationship of the person concerned with the risk; this defines mostly from the perception, an interrogation can change the situation totally. The tests for traffic restraint are positive evaluated.

FRANKLIN, M.

Traffic conflict analysis techniques

The National Institute for Physical Planning and Construction Research, Dublin, 1973. 32 p.

(SVOV PB6620)

(S)

This report is concerned with a method known as the "Traffic Conflicts Technique" which is being used to provide a measurement of the "accident potential" at an intersection. Conflicts have also been used in studies of driver assessment. Such studies aim to identify the unsafe driver and are relevant to the safety of junctions since drivers have been observed to have many of their conflicts in those locations. This report is not concerned with this type of study i.e. where individual drivers are observed but rather with the type of study where individual locations are observed.

GAARDER, P. & HYDEN, C.

Allgaafas i signalreglerade korsningar (Scramble system in signalized intersection)

Tekniska Hoegskola i Lund, Lund, 1978. 89 p.

IRRD 235958

(I)

The aim of this project has been to cover, as completely as possible, the consequences of scramble. Studies have been made at three sites; one intersection in the town of Eslov (approx 15000 inhabitants) and two in Stockholm (approx 1 mill. inhabitants). At all three intersections, studies were made both before and after the introduction of a scramble phase in earlier conventionally signalized intersections. In each study, measures of risk as well as measures of motor-vehicles and pedestrian delay and passage times were made. Studies of risk were carried out by the use of a conflict-technique, developed at the institution. Through direct observation at the traffic site, by especially trained observers, serious conflicts were registered (a conflict is a narrow-escape, according to a set definition). These conflicts are then, with the help of a developed model, used in an estimation of the risks of personal-injury accidents. Delay and passage times were registered with the use of a so called date-log - universal instrument which registers time-events with an accuracy of 1/1000 second. In the data-log, collected data are registered on a hole-punched tape which can be processed in a computer. To sum up, it can be stated that a very satisfactory accident reduction is achieved for pedestrians when introducing scramble if the percentage crossing while red is low. Simultaneously, however, the passing times for both vehicle and pedestrian traffic through the intersection are increased. Whether the total effect is considered positive or not, depends on how the two components are evaluated.

GALLOWAY, M.P.

The environmental effects of urban road traffic: pedestrian-vehicular conflicts

Dundee University, Dundee, 1979. 43 p. + app.

IRRD 248174

(I)

Three of the most serious problems associated with traffic flow in an urban road system are traffic noise, visual intrusion and pedestrian-vehicular conflict. This particular study deals with the problem of pedestrian/vehicular conflict and is presented as three essays which deal individually with major aspects of the problem. The first essay outlines the extent and nature of the problem of pedestrian/vehicular conflict while the second essay identifies and explains various methods of planning used to investigate pedestrian/vehicular conflict. The third essay defines and assesses techniques and models used to evaluate pedestrian/vehicular conflict.

GLAUZ, W.D. & MIGLETZ, D.J.

Traffic conflicts techniques for use at intersections

Transp. Res. Rec. 770 (1980): pp. 21-29

IRRD 260656

(I)

Field studies and analyses of observation of traffic conflicts at intersections are described. The field studies covered more than alternative operational definitions of traffic conflicts. The definitions that provide the best reliability, repeatability, and practicality are recommended. Initial estimates obtained of expected conflict rates as a function of type of intersection are also given.

GLAUZ, W.D. & MIGLETZ, D.J.

Application of traffic conflict analysis at intersections

Report 219

Transportation Research Board, Washington, 1980. 109 p. + app.

IRRD 249052

(I)

The objective of this project was to develop standard definitions in regard to what constitutes a traffic conflict and to design a data collection procedure that will minimize individual differences in the observation and recording of conflicts. Midwest research institute has fulfilled that objective through a state-of-the-art review; development of candidate definitions; comprehensive field studies (including the recruitment and training of conflicts observers); and, following an assessment of the collected data and the field procedures, documentation of the findings in a form for direct use both in other research projects and in practical applications. This report provides sufficient information for individuals having no prior experience in the use of the technique to initiate new applications. The procedures manual, instructor's guide, and sample data collection forms provided in the appendixes should be particularly useful.

GLENNON, J.C. & THORSON, B.A.

Evaluation of the traffic conflicts technique

Midwest Research Institute, Kansas City, 1975. 44 p.

IRRD 222531 (SWOV PB8778) (I)

Traffic accidents are the ideal measure of safety for a highway location. But attempts to estimate the relative safety of a highway location are usually fraught with the problems associated with the unreliability of accident records and the time required to wait for adequate sample sizes. For these reasons, the traffic conflicts technique (TCT) was developed as a surrogate measure in an attempt to objectively measure the accident potential of a highway location without having to wait for an accident history to evolve. The TCT was originally developed by the General Motors Research Laboratories (GMR) in 1967. It was conceived as a systematic method of observing and measuring accident potential. Conflicts were defined as the occurrence of evasive vehicular actions and characterized by braking and/or weaving manoeuvres. Based on the positive results of a large investigative study by the Federal Highway Administration (FHWA), reported by Baker in 1971, the TCT has gained popularity as an evaluative tool. The Washington State Department of Highways is using the TCT as a diagnostic tool to determine appropriate countermeasures at high-accident locations. Others have suggested the technique as a priority ranking criterion for programming the order for the implementation of spot improvements, and the FHWA has incorporated the TCT as a research tool into several recent problem statements in its contract research program. This report critically evaluates the state-of-the-art of the TCT and the results of recent attempts to develop a rigorous experimental design using traffic conflicts as the basic response variable to measure the effectiveness of access control techniques at commercial driveways.

GLENNON, J.C.; GLAUZ, W.D.; SHARP, M.C. & THORSON, B.A.

Critique of the traffic-conflict technique

In: Evaluation of transportation operational improvements, Transportation Research Record 630, pp. 32-38
Transportation Research Board, Washington, D.C., 1977

IRRD 233593 (SWOV PB15414) (I)

This examination of the utility of the traffic-conflict technique includes an evaluation of previous studies and a discussion of recent results of a Federal Highway Administration (FHWA) study. The FHWA study attempts to develop a rigorous experimental design by using traffic conflicts as the basic response variable to measure the effectiveness of implementing various access-control techniques. Although some of the studies conclude that the traffic-conflict technique is a reliable tool for predicting accident potential. These conclusions are not well supported. The concept of conflict analysis should not be abandoned, however, but a more rigorous data base should be acquired before the reliability and utility of conflict analysis can be assured.

GOELLER, B.F.

Modeling the traffic-safety system

Accident Analysis and Prevention 1 (1969) 2: 167-204

IRRD 049920 (SWOV PA6212)

(A)

A model is needed that can interrelate the full range of relevant traffic-safety activities and predict their consequences in terms of collisions, deaths, injuries, and property damage. This paper develops a conceptual framework for a traffic-safety model and identifies research needed to make this framework into an operational model.

A traffic accident may usefully be conceptualized as progressing through a series of phases, each a process of interaction among many factors associated with the driver, the vehicle, the environment in and outside the vehicle, and chance. Accordingly, the model is formulated as a chain of phases, where each phase has alternative possible outcomes-called situations - which are physically observable and operationally meaningful. (The evasion phase, for example, may result in either a near-miss, or a collision situation.) These situations have clear and apparent relations to accident likelihood or severity: reveal at what points and in what ways the accident chain may be frustrated: and can be measured and expressed as indices of performance. Situations are analogous to the states of Markov chain or the branches of a "fault tree".

The chain of phases comprising the model is separated into its three natural stages. The pre-accident stage consists of four phases: predisposition, initiation, juxtaposition (confrontation with danger), and evasion. The intra-accident stage consists of a first-collision phase (impact on the vehicle), and a second-collision phase (impact on the passengers). The post-accident stage, for those injured, consists of three phases: initial-treatment, emergency-transport, and primary-treatment.

This study emphasizes the pre-accident stage, the only one in which accidents can be prevented. Focus is on the driver and his vehicle, although he is not necessarily either the chief cause of accidents or the most cost-effective target of safety measures. Based on perception and estimate of and attitude toward risk (subjective danger), the driver continually makes decisions and takes actions that result in either safe or vulnerable driving. A driver experiences a vulnerability whenever he incurs a hazard and thereby becomes momentarily vulnerable to a potential collision. The vulnerability approach, which describes accident not in terms of their outcomes but in terms of the hazard which initiate them, helps quantify the cumulative effects of many variables that are difficult to appraise separately. Moreover, vulnerabilities occur about 20.000 times as often as involvements in an accident, thus yielding richer data for studying hypotheses about accident causes.

GOOS, J.G.

Slotboomproject; Een alternatief voor de verkeersveiligheid
(Slotboomproject; An alternative approach to road safety)
Verkeersdienst Rotterdam, Rotterdam, 1975

(SVOV PB8189)

(S)

The aim of this project in a residential area in Rotterdam is to bring about, by way of alterations in and of environmental factors, a change of mentality in the behaviour of road users in general and drivers in particular, in order to improve the living conditions in residential districts. The research is aimed at four aspects, viz.: number of motorized traffic, number of conflicts between various groups of road users, nature of these conflicts, and speed of motorized traffic. The collected data are presented and analysed.

GRAHAM, J.L. & SHARP, M.C.

Effects of taper length on traffic operations in construction zones.
Report No. 77162.
Midwest Research Institute, Kansas City, 1977. 43 p.

IRRD 236457

(I)

The study dealt with a proposed taper length formula that yields shorter tapers at design speeds below 60 mph. than the existing formula, $L=WS$. Speed, erratic manoeuvres, conflicts and encroachment data were collected at four sites, day and night, covering a variety of design speeds and taper lengths. The analyses of the collected data do not implicate the proposed taper lengths at being more hazardous. Erratic-manoeuve and slow-moving conflicts rates were never greater with the proposed taper than with the standard or existing taper. There was no indication that the proposed taper lengths resulted in a greater number of passenger vehicle or truck encroachments on adjacent lanes.

GRAHAM, J.L.; PAULSEN, R.J. & GLENNON, J.C.

Accident and speed studies in construction zones

FHWA-RD 77-80

Midwest Research Institute, Kansas City, 1977. 242 p.

IRRD 236463

(I)

The report includes results of two studies of construction zone traffic control. The first study involved analysis of traffic accidents occurring in 79 zones in seven states. Results indicate a before to during accident rate increase of 6.8%. Results also include breakdowns by accident types, severity, light conditions, roadway type, area type, work area roadway type, construction type and state. The second study was field testing of speed reduction methods. Speeds, erratic manoeuvres and conflicts were measured at three sites: an urban freeway, a rural freeway, and an urban street. The field studies examined the effect of the following construction zone parameters on vehicle speeds and safety: sequential flashing arrow boards; speed zoning (advisory and regulatory); enforcement; transverse striping; obliteration of nonappropriate pavement markings; taper length; lane width reduction; and active warning of speed zoning. Recommended guidelines for construction zone traffic controls are also included.

GSTALTER, H.

Pedestrian conflicts technique (PCT)

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, p. 129

TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21271)

(S)

An observation technique with special regard to pedestrian-vehicle conflicts is developed and validated. Only an abstract of the paper is presented.

GÜTTINGER, V.A.

Veiligheid van kinderen in woonwijken; Deel 1: Conflictmethode; operationalisatie en betrouwbaarheid. (Safety of children in residential areas. Part 1: Conflictmethod - operation and reliability) Nederlands Instituut voor Praeventieve Geneeskunde TNO, Leiden, 1975. 41 p. + app.

IRRD 220519 (SWOV PB7893)

(A)

The growing need for a rapid evaluation of measures directed to increase traffic safety has led to the development of so-called "conflict techniques". For these techniques the near-accident or the serious conflict are used as a predictor of real accidents. Several studies have confirmed the validity of this concept. The reliability of the methods used - which, incidentally, have a great deal in common - is not very great, thanks to the extremely vague operationalizations of the concept "conflict".

In the study discussed in part I of the report "The safety of children in residential areas" the conflict technique, as it is used in various countries, has been taken as a starting-point. Attempts have been made, however, to arrive at a more reliable method of investigation by means of a better, empirically determined, operationalization of the concept "conflict". A laboratory test revealed that the method thus improved led in many cases to externally and internally reliable results.

In as far as the results were less reliable, they could largely be ascribed to weak points in the instruction, the fact that the observers were not selected, and the lack of actual training. Proper instruction, selection and training of observers would ensure the workability of this method for field studies aiming at assessing and predicting the (traffic) safety of pedestrians.

GÜTTINGER, V.A.

Veiligheid van kinderen in woonwijken; Deel 2: Toepassing van de conflictmethode in een veldonderzoek. (Safety of children in residential areas. Part 2: Application of the conflict method in a field test) Nederlands Instituut voor Praeventieve Geneeskunde TNO, Leiden, 1976. 106 p. + app.

IRRD 220520 (SWOV PB9444)

(S)

The study had the purpose to check the suitability of a conflict observation technique for measuring traffic behaviour. The experiment - the so-called "residential yard" approach - aims at the integration of several sectors in the vicinity of the home which are normally segregated (such as the road, the pavement, green zones, play areas, and flat entrances) so that children may be offered more possibilities for using them. The experiment also involved the integration of the various categories of users - children, adult pedestrians and traffic - whereby the design of the area was used as a means to subordinate the last-mentioned group, vehicular traffic, to the other groups. The idea behind this was - an idea which is shared by others - that the set-up of a residential area should allow confrontations between children and traffic, but that these confrontations should never take the form of serious conflicts.

The results of the two methods of observation (observations of persons and sectors) are fairly consistent. Compared with the results for a more traditionally planned new residential area, the experimental residential area clearly witnessed more confrontations between children and traffic, a finding which was to be expected because of the integration of the two groups.

GÜTTINGER, V.A.

Conflict observation techniques in traffic situations

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 16-21
T.Ø.I., Oslo / L.T.H., Lund, 1977

(SVOV PB12903)

(S)

A serious conflict or near-accident is defined as: a sudden motor reaction by a party or both parties involved in a traffic situation, towards the other, with a distance of about 1 metre or less between those involved. With the help of a conflict observation technique it is possible to forecast the effects of measures taken to improve the safety of for instance residential areas.

GÜTTINGER, V.A.

The validation of a conflict observation technique for child pedestrians in residential areas. Some impressions of ongoing research

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 102-106

IRRD 248611 (SVOV PB21277)

(S)

It is tried to develop a reliable and valid conflict observation technique that could be used as a tool to predict accidents of child pedestrians in residential districts. Although the study is not yet finished an impression is given of the validity study. Some of the results are presented.

GÜTTINGER, V.A.

Veiligheid van kinderen in woonwijken; Deel 3: Een onderzoek naar de geldigheid van de konfliktmethode

Nederlands Instituut voor Praeventieve Gezondheidszorg TNO, Leiden, 1979. 56 p. + app.

IRRD 247036 (SWOV PB16206)

(I)

In an earlier report by the same author a method was being developed for the prediction of traffic safety for children in residential areas. The method used the conflict-technique. In this report the forecasting value of the conflict observation technique is studied. The main question was if there is a sufficient correlation between serious conflicts of children as pedestrians with driving traffic and collisions in which children as pedestrians are involved, that the conflict observation technique can be used to judge the relative traffic safety or traffic insecurity of residential areas for child pedestrians.

GÜTTINGER, V.A.

Met het oog op hun veiligheid. De ontwikkeling van een konfliktobservatietechniek ter beoordeling van de verkeersveiligheid van woongebieden voor kinderen. (In consideration of their safety. The development of a conflict observation technique for the judgement of traffic safety of residential areas for children)

Thesis
Nederlands Instituut voor praeventieve gezondheidszorg TNO, Leiden, 1980, 310 p. + app.

Thesis

Nederlands Instituut voor praeventieve gezondheidszorg TNO, Leiden, 1980, 310 p. + app.

IRRD 249894 (SWOV PB17108)

(I)

The lack of safety is determined by the occurrence of accidents. This thesis presents the results of a series of research projects with the central aim of finding an alternative indicator to describe this lack of safety in traffic. This research centres on so-called conflicts between traffic participants. The work, with the aim of developing a reliable and valid conflict observation technique that can be used for the prediction of children's safety as pedestrians, consisted of four steps (1) operationalisation of the concept conflict (2) a test of the reliability (3) a test of the practical applicability of the conflict observation technique in field situations and (4) a test of the validity of the conflict technique. The conflict observation technique is not yet suited to the estimation of expected accident rates. It can be used for comparing situations (areas, roads, intersections etc.) and for arriving at statements in terms of more or less safe.

GÜTTINGER, V.A.

From accidents to conflicts: alternative safety measurement

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 15-24

IRRD 265673 (SWOV PB21014)

(I)

The danger of traffic is commonly determined by the occurrence of accidents. This paper presents some of the history of alternative measures for describing traffic hazards (measurement of so-called conflicts). It also gives the results of a series of research projects aimed at the development of a conflicts observation technique for the estimation of the safety of child pedestrians in residential areas. The reliability, practical applicability and validity of the technique developed prove to be satisfactory. It is concluded that the use of this technique seems to be justified for those situations in which accident rates are relatively low, e.g., in residential areas. This is not only because of the strong relationship between serious conflicts and accidents but also because other potential alternative indicators for the estimation of traffic hazards often used in practice, such as traffic volumes and subjective estimation of risk by residents, have had little success in accident prediction.

GÜTTINGER, V.A. & KRAAY, J.H.

Development of a conflict observation technique; Operationalisation, methodological problems and the use of the technique in two field situations in Delft

Institute for Road Safety Research SWOV, Voorburg, 1976. 30 p. + Figs., Tabs. and App.

IRRD 225778 (SWOV PB11675)

(I)

Both for logical reasons and on the basis of research it has become clear that urban planning can have a great influence in reducing the number and nature of conflicts between pedestrians and wheeled traffic. Literature research has shown that measures aimed at influencing social behaviour do not have the desired effect on road safety. It is shown that urban planning and infrastructural measures affect residents' behaviour more than statutory codes and attempts to influence social attitudes and behaviour. The main objective of the research is to develop a conflict observation technique which can be used as a reliable measuring instrument in various urban planning designs to establish road users' behaviour. The research was concentrated on children, as they are the most intensive users of the residential area.

HAKKERT, A.S.; BALASHA, D.; LIVNEH, M. & PRASHKER, J.

Irregularities in traffic flow as an estimate of risk at intersections

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 71-86
T.Ø.I., Oslo / L.T.H., Lund, 1977

(SWOV PB12910)

(S)

A basic research effort to determine a methodology for objective analysis of traffic behaviour at an intersection is presented. A methodology is presented to describe the motion of each vehicle, and to determine its travel characteristics. Excessive values of reaction to driving stimuli have been defined and calculated.

HÄKKINEN, S.; NYSSÖMEN, R. & RAUHALA, V.

Use of traffic conflict technique for estimation of accident potential

In: Proceedings of the 1st International Conference on Driver Behaviour, Zürich, 1973. 8 p.

IRRD 215031 (SWOV PB9136, see also PB6687 fo)

(S)

The use of accident statistics as a starting point and criterion of traffic safety measures has many disadvantages and limiting factors. For future research, general standardized observation methods and statistical procedures are extremely important for an international co-operation. A general trend of traffic conflict studies is that accidents, as a criterion of this method, have given very inconsistent results. This may depend on the random nature of accidents and their recording system. Three pilot studies are made on traffic conflicts, traffic conflicts and psychological right-of-way and traffic conflicts and driver alertness. These methods seem to be more reliable and more sensitive for controlling of traffic safety activities.

HANSEN, L. & HYDEN, C.

Hastighetsbegränsning vid skolor (Speed limit outside schools)

Bulletin 18

Tekniska Högskolan i Lund, Lund, 1976. 36 p.

IRRD 233066

(I)

The purpose of this project was to study the effects of lowering the speed limits around schools with regard to the safety of the children, and of motorists' choice of speed. The method used, the conflict method, is based on the hypothesis that there is a connection between accidents and situations where accidents nearly happen. Several methods were used for measuring the speed and the intensity of the traffic, and both fixed and changeable road signs were used in the tests. Observations were made before and after the introduction of the lower speed limits. Later, complementary observations were made in order to establish the long term effects. Four areas were selected for the tests, and population density, geographical factors and street characteristics were taken into account. All four tests indicate clearly that the number of critical situations was reduced as a result of the implementation of the lower speed limits, and in regard to motorists' obedience to the lower speed regulations, differences were observed when the various types of road sign were used.

HANSSON, T. & SVENSSON, B.

Trafikbeteende och personlighet. Ett foerzoek att belysa personlighets-
maessiga faktorerers betydelse vid trafikkonflikter och trafikolyckor

(Traffic behaviour and personality. A study of the role of personality in traffic conflicts and road accidents)

Lunds Universitet, Beteendevetenskapliga institutionsgruppen, Lund, 1978. 107 p.

IRRD 243643

(I)

The study pursued two aims: first of investigating the importance of personality factors in causing traffic conflicts, and second of relating personality differences to previous road accidents. All of the 40 subjects in the study had been involved in traffic conflicts. Information was collected through two separate interviews and two personality tests, the Defence mechanism test (DMT) and the Spiral after-effect technique (SAE). Results revealed certain personality differences between a group of subjects judged and a group not judged to have caused the conflict on the basis of videorecordings of the events. Introaggression and mechanisms of projection were more common among the guilty subjects. Subjects who reported previous road accidents were found to possess more unusual defence mechanisms - isolation alone, denial, introjection, projection and regression - in a much higher proportion than subjects reporting no previous accidents. The findings were interpreted in terms of a model of personality described by Grunert.

HARRIS, J.I. & PERKINS, S.R.

Traffic conflict characteristics

In: Proceedings Automotive Safety Seminar, Milford, 1978, paper 26

IRRD 50688 (SWOV PA5216)

(A)

Traffic conflict characteristics are measures of traffic accident potentials. A traffic conflict is any potential accident situation. Over twenty objective criteria for traffic conflicts (or impending accident situations) have been defined for specific accident patterns at intersections; essentially these traffic conflicts are defined by the occurrence of evasive actions, such as braking or weaving, which are forced on a driver by an impending accident situation or a traffic violation. A method of systematically observing an intersection for traffic conflicts has been devised. In two 12-hr observation sessions, it is possible to evaluate completely an intersection; the information obtained is much more comprehensive than that normally available from accident histories. Further, the initial causes of the incidents, which accident records often fail to reveal, are uncovered. Traffic conflict studies use objective criteria to obtain significant quantities of data in short observation periods.

HAUER, E.

The traffic conflicts technique; Fundamental issues

University of Toronto, Toronto, 1975. 28 p

(SWOV PB6467 fo)

(A)

The question is posed which are the circumstances for the Traffic Conflicts Technique to generate more reliable accident rate estimates than those obtained from the history of accident occurrence. To provide an answer, expressions for the variance of the expected annual accident rate are derived for both methods. Based on several applications of the Traffic Conflicts Technique by various researchers, the variability of the "accident-to-conflict" ratio is examined. The analytical machinery so created allows provision of answers to the aforementioned question. It facilitates also derivation of guidelines with respect to the conduct of Traffic Conflicts studies. It appears that the Traffic Conflicts Technique can be used to advantage at locations with less than 4 accidents per year or when accident records are not usable. One day appears to be the best duration of a field count of conflicts. Adoption of a narrower operational definition of "conflict" is suggested.

HAUER, E.

Traffic conflict surveys; Some study design considerations

TRRL Supplementary Report 352

Transport and Road Research Laboratory, Crowthorne, 1978. 30 p.

IRRD 231922

(A)

The traffic conflicts technique is a device for indirect safety measurement. It requires at present the conduct of a field survey to count conflict occurrence. On this basis the rate at which conflicts occur is estimated. This report deals with the accuracy of such estimation and its dependence on the design of the field survey.

First, present practice in conflict count duration is reviewed.

Next, the relationship between count duration and estimation accuracy is examined. Using data obtained from several sources the daily variability of conflict counts is described. It is concluded that the expected conflict rate varies from day to day. Use of the negative binomial distribution is suggested as appropriate for the representation of the distribution of sample means obtained from conflict studies. On this basis, confidence limits and probabilities of Type I and Type II errors in hypothesis testing are obtained and tabulated. Their use in study design is illustrated by numerical examples.

The marginal increase in estimation accuracy diminishes rapidly as conflict counting time increases. Thus, there is little to be gained by counting longer than three days. This establishes a practical limit to the accuracy with which expected daily conflict rates can be estimated.

HAUER, E. & GLAUZ, W.D.

Design considerations of traffic conflict surveys

In: Highway capacity, measures of effectiveness, and flow theory.

Transportation Research Record 667, pp. 57-66.

Transportation Research Board, Washington, D.C., 1978.

IRRD 241940

(A)

The traffic conflicts technique is a device for measuring safety indirectly. It requires, at present, a field count of conflict occurrences, which gives the basis on which the rate at which conflicts occur is estimated. This report deals with the accuracy of such estimating and its dependence on the design of the field survey. Current practices in conflict-count duration are reviewed, and the relationship between count duration and estimation accuracy is examined. Using data from several sources, the daily variability of conflict counts is described. It is concluded that the expected conflict rate varies from day to day. Use of negative binomial distribution is suggested as appropriate for representing the distribution of sample means obtained from conflict studies. On this basis, confidence limits and probabilities of type I and type II errors in hypothesis testing are obtained and tabulated. Their use in study design is illustrated by numerical examples. The marginal increase in estimation accuracy diminishes rapidly as conflict-counting time increases. Thus, there is little to be gained by counting longer than 3 d. This establishes a practical limit to the accuracy with which expected daily conflict rates can be estimated.

HAYWARD, J.C.

Near misses as a measure of safety at urban intersections

Thesis 1971-06

Pennsylvania State University, University Park, Pennsylvania, 1971.
79 p.

IRRD 214268 (SWOV PB14087)

(I)

Films of dangerous traffic events were taken using the Bureau of Public Roads' Traffic sensing and surveillance system at the intersection of 14th and F streets in Washington, D.C. The dangerous events were observed on real time television monitors and captured on 16 mm film using a time lag device unique to the system. Forty-three sequences were analyzed using a Benson Lehner film reading system, and a computer program was devised to convert the coordinate output from the film reader into motion parameters for the two vehicles participating in the dangerous manoeuvres. Using the velocities and spacings, a measure of the time until collision for each frame was computed. These time to collision values were plotted against time to form a curve which represented the time available to the two drivers to avoid a collision. It was concluded that the minimum value of this curve could be used to separate near misses from other traffic events of some threshold value were adopted as a base for comparison. The value of one second is suggested as the near miss dividing line. The addition of near miss counts as a safety monitoring method to the present method which uses accident counts is discussed and a plan for implementation of the method is outlined. Long range research required to make near misses into a useful diagnostic tool for traffic engineers is discussed and certain approaches suggested.

HAYWARD, J.C.

Near miss determination through use of a scale of danger

In: Traffic records. Highway Research Record No. 384, pp. 24-34
Highway Research Board, Washington, D.C., 1972

IRRD 203372 (SWOV PB1349)

(A)

Near-miss traffic events have been considered but not adopted as a traffic safety tool because of the high degree of subjectivity involved with their identification. A scale of danger may be applied to a traffic event to facilitate objective measurement and subsequent detection of near-miss situations. The unit proposed here for this danger scale is the time measured until collision between two vehicles involved in the unsafe event. This measure, computed from films taken with the Traffic Sensing and Surveillance System of the Federal Highway Administration at an urban intersection, is an adequate unit to rate the danger of almost any traffic event. It may be used to standardize human observer judgment of dangerous manoeuvres and, therefore, make near-miss monitoring a viable alternative to traffic safety determination.

HEANY, J.J.

How to identify dangerous intersections

City Traffic Department, Philadelphia, 1969. 14 p.

(SVOV PB6635 fo)

(A)

The technique was developed because of a feeling of need, based on experience in the field of traffic planning, to define the term "dangerous intersection" and to establish an objective means of identification. The method is presently under consideration of the Spot Improvement Program and copies have been furnished, upon request, to the Special Congressional Subcommittee on the Federal Aid Highway Program of the Committee on Public Works which is inquiring into a number of subjects relating to highway safety, design and efficiency.

HÖFNER, K. & SCHÜTZENHÖFER, A.

Konfliktforschung im Strassenverkehr (Research on traffic conflict techniques)

Verkehrsjurist (1978) 39/40: pp. 18-24

IRRD 309058

(I)

Because each accident is a multi-factor and, from a statistical viewpoint, a rare event and moreover can only be inadequately considered in a non-standardized way by a survey team, it is better to use the critical situation (traffic conflict) as a criteria in accident research and accident prevention. By use of conflict techniques (methodical, precisely defined observation of interaction conduct, e.g. with video equipment) it is possible to investigate economically, in a relatively short time, the effectiveness of various safety measures (e.g. the reorganisation of accident sites), the degree of risk in a particular length of road, the parameters of traffic flow and traffic quality, before the number of accidents grows too great. The research carried out on this subject in the USA, England, Holland, Sweden and the Federal Republic of Germany is fully described. In Austria, conflict techniques have been tried in an inter-disciplinary pilot study of an urban junction at Graz. With the aid of conflict techniques the effectiveness of technical measures (in this case the introduction of prohibited areas, additional direction markings and parking restrictions) could be examined and continually modified until an optimum layout of the junction was achieved.

HÜFNER, K.J. & SCHÜTZENHÜFER, A.

Conflict research in traffic

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 124-126

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21280)

(S)

Summarizing the results of this study it can be stated that by means of the conflict technique the efficiency of measures of traffic regulation and traffic guidance at an intersection can be measured in a short time and therefore modifications can be carried out quickly and systematically and without high costs.

HORST, VAN DER, A.R.A.

De ontwikkeling van een konfliktobservatie- en analysemethode op kruispunten m.b.t. langzaam verkeer (The development of a conflict observation method and a conflict-analysis method at junctions as regard slow traffic)

In: Proceedings Symposium Gedragsobservatie en -beïnvloeding van kruisende verkeersstromen, Haren, 7 juni 1979. Verkeerskundig Studiecentrum, Rijksuniversiteit Groningen, Groningen, 1980, p. 25-38

IRRD 254231 (SWOV PB18520)

(A)

The Institute for Perception TNO is carrying out a study at non-signalized intersections of newly developed cycle tracks in two cities in The Netherlands, The Hague and Tilburg. The aims of this study are:

1. to evaluate newly developed design elements and aspects with regard to road-user behaviour.
2. the development of an objective method for assessing serious conflicts between road users.

Measurable behaviour characteristics of cycle traffic as related to road characteristics, and also as related to other road users, include course, course changes, speed, speed changes and interactions between road users. Observations were made by means of video. The recorded video-pictures are analyzed quantitatively using specially developed video-analysis equipment.

The method and equipment will be discussed. Some illustrations will be given of an interaction measure, which seems to offer good possibilities, TTC (time-to-collision).

HORST, VAN DER, A.R.A.

The analysis of traffic behaviour by video

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 26-41

IRRD 265674 (SWOV PB21015)

(I)

From the analysis of traffic behaviour by video the following conclusions can be drawn (1) recording and analysing the traffic behaviour in detail may give a lot of information about the functioning of several road design elements, (2) the method as described in this paper, based on video, enables a process oriented analysis of interacting behaviour between road users, not necessarily restricted only to the time-to-collision concept, and (3) however, in spite of a semi-automatic analysis procedure by the use of a mini computer, the quantitative analysis remains time consuming. Further automation of the procedure seems necessary.

HORST, VAN DER, A.R.A.

Verkeerskonflikten als indikator voor verkeersveiligheid (Traffic conflicts as an indicator for traffic safety)

Nationaal Verkeersveiligheidscongres Verkeersveiligheid in Woonwijken. Discussiebijdragen. Amsterdam, 1982, pp. 66-71

(SWOV PB21329 fo)

(S)

There is a need for an alternative criterium for accidents on which traffic safety can be evaluated. One of the methods is the conflict techniques. A useful measure to describe the severity of an interaction between road users is the time-to-collision (TCT). The TCT is a continuing function of time and can be shown in a grafical curve. In this paper a technique is described by which it is possible to determine TCT curves objectively by analyzing video recordings quantitatively.

HORST, VAN DER, A.R.A. & RIEMERSMA, J.B.J.

Registration of traffic conflicts: methodology and practical implications
Institute for Perception IZF-TNO. Report nr. 1981 C-22. Soesterberg,
1981, 35 p. + app.

IRRD 261173 (SWOV PB19447)

(A)

Accident frequencies have inherent limitations as indicators of traffic safety. These limitations are especially paramount in small-scale research. To overcome these difficulties, substitution of accident frequencies by conflict counts is often suggested.

Some methodological aspects of the use of conflicts counts as indicators of traffic safety are discussed. This provides a framework for the evaluation of available research results and/or the planning of new research. More detailed information is given in the appendices.

Most methods to collect traffic conflict data use individual observers to decide on conflict type etc. Since this introduces subjective elements in the method, also objective quantitative measures of traffic conflicts have been proposed. Some of these objective measures are compared, resulting in some preference of the authors for the time-to-collision concept (TTC). A description of the observation method of the Institute for Perception TNO is given, which allows for computing TTC values.

HORST, A.R.A. & SYMONSMA, R.M.M.

Behavioural study by the Institute for Perception IZF-TNO

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 140-150
TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21284)

(S)

A measuring instrument was developed for evaluation road-design elements as applied in the demonstration projects on Cycle routes in The Hague and Tilburg. Behavioural observations were carried out by means of film and video recording. Both techniques gave comparable results, but with respects to the costs the application of video is preferable.

HYDEN, C.

Samband mellan allvarliga konflikter ock trafikolyckor (Relations between conflicts and traffic accidents)

Techniska Hoegskolan i Lund, Lund, 1975. 26 p. + app.

IRRD 219727 (SWOV PB10757)

(I)

The aim of this project is to develop a method for accident-risk measuring by the use of conflict analysis. The basic hypothesis is that, if the degree of seriousness in conflicts might be measured in an objective way, there is a connection between conflicts and actual accidents. In order to study the relation between accidents and conflicts, accident- and conflict data for 50 intersections in the city of Malmö were collected. The preliminary analysis aimed at discriminating factors that influenced the relation between accidents and conflicts. Two factors were found with an absolutely dominating influence, the kind of road user involved and the speed-standard (the mean speed of vehicles passing the intersection). The main possible application area of the method so far is for before and after studies to evaluate the safety effects of different counter-measures.

HYDEN, C.

A traffic-conflicts technique and its practical use in pedestrian safety research

In: Proceedings of the International Conference on Pedestrian Safety, Haifa, 1976, pp. 1C1-1C8

Michlol-Publishing House, Haifa, 1977

IRRD 229742 (SWOV PB12303)

(I)

Pedestrian safety planning lacks basic knowledge of pedestrian risk, behaviour, attitudes, etc. This is partly due to a lack of a useful method for risk-measuring. Accident analysis has proved to be unsatisfactory for many purposes. A valid conflict technique might solve many of the problems. A traffic-conflicts technique has been developed in Sweden. The conflict criterion is based on the time to collision and covers all kinds of traffic conflicts. The recording of conflicts is carried out by human observers using ground-level observation. Reliability tests indicate very strongly that observers record conflicts in a reliable way after 3-4 days of training. The results from validation studies indicate that this technique, based on a criterion that the degree of seriousness should be taken into account, shows a strong correlation between conflicts and accidents. The three primary application areas of the technique are: (1) in-depth analysis of conflicts to evaluate possible countermeasures. (2) evaluation of safety effects through before and after studies. (3) studies of the relation between accident-risk and different explanatory factors. The conflict-technique here mentioned is used in some on-going projects at the department and has provided results used in both federal and local pedestrian safety planning.

HYDEN, C.

Trafiksaekerhetsplanering grundad paa studier av olyckstillbud
(Traffic safety planning based on near accident studies)

In: Vaeg- och Vattenbyggaren No. 11, pp. 37-39

Svenska Vaeg- och Vattenbyggares Riksfoerbund, Stockholm, 1976

IRRD 226813

(I)

45
A study of accidents, which often represent only those that have been reported to the police, does not provide sufficient information concerning contributory factors. Examination of potential accident situations, which it is estimated occur about 5000 times as often as accidents causing injury, is much more promising. It is well known that accidents to pedestrians on a non-regulated crossing at a four-way junction occur four times as often when a motorist is leaving the crossing as when he is approaching it. Since potential accidents, which according to definition occur when there would have been a collision between two road users within 1.5 seconds if one of them had not taken evasive action, take place about 40 times daily at a road junction, observations were made at 120 cross-roads in Stockholm and Malmö. As a result of these studies, risk curves relating to conflicts at cross-roads have been drawn. Observations were also made of the effect of speed restrictions outside schools. Studies of potential accident situations showed that there was an improvement of 40 percent in safety.

HYDEN, C.

A method for risk-measuring by the use of a conflict-technique and some practical applications

In: Proceedings of the symposium on methods for determining geometric road design standards, Elsinore, 1976, pp. 123-125

(SWOV PB13079)

(S)

The use of a uniform technique for risk measuring is of great importance in traffic safety planning both on national and international level of make relevant comparisons possible. A conflict technique should be advantageous to accident analysis.

HYDEN, C.

A traffic conflicts technique for determining risk

Techniska Hoegskolan i Lund, Lund, 1976. 93 p.

IRRD 228557 (SVOV PB12756 and PB15737)

(I)

The aim of this project is to develop a conflict technique for the determination of risk. The basic hypothesis is that there is a definite relationship between conflicts with a certain degree of seriousness and accidents. The following definition is used: a serious conflict occurs when two road users are involved in a conflict situation where a collision would have occurred within 1,5 seconds if both drivers involved had continued with unchanged speed and direction. The time is calculated from the moment one of the drivers starts braking or swerving to avoid the collision. The recording of conflicts is made by observers at the traffic site. Studies of traffic have been carried out at a total of 115 intersections in three stages. In each intersection conflict registration has taken place during 7 hours and has been compared with previous accidents causing injury during 7 to 8 years. The analysis shows that the kind of driver and the speed standard type of intersections have a definite influence. The resemblance between the results of the three stages shows that the developed conflict technique offers practical application within the following areas: description of present state of situations involving risk in urban traffic and before and after studies to establish the effect on traffic safety of countermeasures implemented.

HYDEN, C.

A traffic conflicts technique for examining urban intersection problems

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 87-98

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SVOV PB12911)

(S)

A three year project with the aim to develop a traffic conflicts technique which should be useful when studying all kinds of safety problems in urban intersections, is described.

HYDEN, C.

Effekten av fynvaegsstopp (The effect of stop signs on all four legs of an intersection)

Saekta, Bjaerred, 1981, 18 p. + app.

IRRD 264041

(I)

At two intersections in Malmoe, stop signs were erected at all four legs of the intersection. Traffic volume on each is about 2000 vehicles/day. Before the experiment traffic from the right had priority. The number of conflicts dropped from 11 to 4 and from 17 to 3, the number of reported accidents from 4,2 to 1 and from 6,1 to nil, and the number of injuries from 0,5 and 3 to nil in both cases. Some cars and 70 of cyclists do not now stop at the intersection. Prior to the change speeds were low because of poor sight conditions. Interviews show that drivers welcome the change, many wish to retain it and consider that similar schemes should be introduced elsewhere. The effect on traffic safety is evidently good. Conflicts which arise are due to uncertainty as to priority, but owing to low speeds do not constitute a safety problem. It is difficult to draw general conclusions, as (1) if sight conditions were better, drivers might be less inclined to stop, (2) increase in traffic causes more delays and different driver behaviour, (3) long-term effects have not been studied, and (4) the novelty of the scheme may have affected results.

HYDEN, C. & GAARDER, P.

Konfliktstudier i landsvaegskorsningar. Redovisning av tvaa pilotstudier (Conflict studies at rural intersections)

Lunds Tekniska Hoegskola, Institutionen foer Trafikteknik, Lund, 1977. 17 p.

IRRD 240709

(I)

Accident analyses, the conventional method for studying the effects of measures for improved road safety, is very time consuming, and has deficiencies when it comes to describing the chain of events leading to the accident. The method described in this report, the conflict method, is based on the hypothesis that there is a connection between accidents and situations when accidents almost happen; here called conflicts. Conflicts are registered by observers, and tests show that the observers are able to identify serious conflicts in a reliable way after only four days of training. The method has been tested at 115 road intersections in urban areas, and a distinct connection between conflicts and accidents was detected in regard to two parameters: road user category and intersection traffic speed profile. The primary purpose of this report is to determine whether the method can be used to study intersections in rural areas with higher traffic speed. Two intersections with mean traffic speeds of 65 and 85 km/h were studied. The report gives a detailed account of the projects, and concludes that although much remains to be done concerning the development of methods to register conflict situations and to clarify the connection between conflicts and accidents, the method can be used to evaluate traffic safety measures in rural areas as well.

HYDEN, C.; GAARDER, P. & LINDERHOLM, L.

Samband mellan olyckrisk och olika förklaringsvariabler (Relation between accident risk and different explained variables)

Lunds Tekniska Högskola, Lund, 1978. 91 p.

IRRD 237288 (SWOV PB13993)

(A)

The aim of this project was to develop a model for describing risks to pedestrians and cyclists under varying environmental conditions in urban traffic, at varying exposure to car traffic. The project is based on risk studies, using a conflict-technique developed at the Department. Parallel to these conflict-studies, traffic volume counts were undertaken.

The relationship between accident risk and exposure was tested by linear regression analysis.

Accident risk is defined as the number of serious conflicts per minute, multiplied by a conversion factor for the relation between serious conflicts and police-reported injury accidents.

The measure of exposure chosen was the square-root of the product between the number of pedestrians or cyclists per hour in a studied flow and the number of motor-vehicles per hour that might get involved in a conflict with the pedestrians or cyclists.

The selection of intersections was primarily chosen for studies where the aim was to calculate conversion factors between serious conflicts and accidents. Due to this, no consideration was paid to the fact that in this project a maximum cover of different geometrical designs was desirable.

The consequence of this is that there are just a few design alternatives for which relations between accident risk and exposure could be satisfactorily established.

The main findings in this project may be summarized as follows:

- Accident risk to pedestrians increases with increased speed standard and street width
- A median traffic-island decreases accident risk to pedestrians

- The zebra-crossing ought to be located less than 2 meters, or more than 10 meters away from the intersection in order to minimize pedestrian risk
- Accident-risk to cyclists increase with increased speed-standard and increased street width
- Cyclists are especially risk-exposed in high-speed intersections where they should give way to intersecting traffic
- A separate left-turning lane reduces accident risk to cyclists
- A traffic-island in the intersecting street reduces accident risk to cyclists in high-speed intersections

HYDEN, C., GAARDER, P. & LINDERHOLM, L.

An updating of the use and further development of the traffic conflicts techniques

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 42-48

IRRD 265675 (SWOV PB21016)

(I)

Many of the problems related to the analysis of accidents can be solved by estimating the risks indirectly by a conflict technique. Conflict technique studies were started in 1973 at the Department of Traffic Planning and Engineering of the Lund Institute of Technology in Sweden. The basic hypothesis, unchanged since 1974, says that there is a distinct relation between conflicts with a certain degree of seriousness and accidents. When those relationships have been determined the technique is practically useful. This means that after a conflict study has been undertaken actual accident risk can be calculated with a known degree of uncertainty. The different phases of the development of the swedish technique are described.

HYDEN, C. & STAAL, A.

Aatgaerder i trafikmiljoen foer att oeka oskyddade trafkanter (measures for the improvement of the safety of unprotected road users)

Lunds Tekniska Hoegskola, Lund, 1979, 85 p. + app.

IRRD 246639

(I)

The report presents a method for the following use: (1) identifying the safety problems of unprotected road users, (2) giving priority to the most important groups of problem, (3) finding the causal relations between unprotected road user accidents, (4) finding suitable countermeasures and (5) evaluation of the effects of the measures on road safety. The method was tested, in modified form, in order to find suitable measures for unprotected road users in urban intersections. In order to clarify the causal connections road users involved in serious conflicts were stopped immediately after the situation occurred and interviewed. The interview comprised the road user's awareness of the situation, conflict severity and cause, disturbing moments inside or outside the vehicle and the question of guilt. Certain marked relations between personality factors and traffic behaviour were established. The road users most guilty of the conflict showed a higher degree of specific defence mechanisms than others. Similar results were obtained regarding road users involved in accidents compared with road users not involved in accidents.

INDIANA UNIVERSITY

An analysis of emergency situations, maneuvers and driver behaviors in accident avoidance

National Highway Traffic Safety Administration, Washington, D.C., 1975.
285 p.

IRRD 234481 (SWOV PB16311)

(I)

The report presents the results of a study, the object of which was to perform an empirical analysis of in-depth accident case histories. Two aspects were studied: (1) to analyze events which immediately precede a crash, and (2) to derive driver behavioural requirements for accident avoidance imposed by a high-probability set of events. Particular attention was given to emergency traffic conflict situations which involve more than one road-user and require rapid and unplanned actions to avoid a collision. Subjective estimates of the probabilities of accident avoidance were developed for all feasible combinations of emergency situations and manoeuvres.

JURVILLIER, J.C.

Analyse des caracteristiques des incidents et accidents sur le Boulevard Peripherique de Paris (Analysis of characteristics of near misses and accidents on the Paris ring road)

Institut de Recherche des Transports, Arcueil, 1977. 70 p.

IRRD 105649

(I)

An exhaustive enquiry into stoppages (incidents and accidents) has been carried out over a 20 km length of the Paris ring road for five days between 7.00 and 22.00. The reasons for stoppage are essentially mechanical breakdown (35%); punctures, lack of fuel and accidents each representing 18% of stoppages. Detection of stoppages is effective only for 46% of cases with a mean time of 7.4 minutes.

KAMMANN, R. & THOMPSON, G.

Four-way intersection controls and road accidents (including a notation system for intersection conflicts)

New Zealand Engineering 33 (1978) 9: 203-206.

IRRD 237408

(A)

It is the conventional wisdom of the road safety movement that the behaviour of drivers can be changed through driver education, public information campaigns, and law enforcement. Unfortunately, there is growing evidence that intensified programmes on these three fronts produce little or no long-term gains in road safety.

Real (rather than ideal) people are difficult to reprogramme in a free society. At the same time, there is growing evidence that some road situations are much more accident-prone than others. For example, two-lane highways are much more dangerous than four-lane ones; curves and hills are much more dangerous than straights and levels; and intersections (at which nearly half of all accidents occur) are much more dangerous than non-intersections. These situations represent cases in which the road environment demands more vehicle control than real drivers can always produce. The ideal technological solution both for safety and for traffic flow is to eliminate these road hazards altogether, including intersections, but this is very expensive and wasteful of land. This paper outlines a general human factors approach to the design of intersections and their signs to reduce driver confusion and error, and thus the frequency of accidents. In the present paper the theory and the evidence on the choice of levels of intersection control at four-way intersections are considered. This question has been in danger of falling into neglect since the study by Kitto which concluded that, changes in the form of (four-way intersection) control frequently produced no significant results.

KATZ, A.; ZAIDEL, D. & ELGRISHI, A.

An experimental study of driver and pedestrian interaction during the crossing conflict

Human Factors 17 (1975) 5: 514-527.

IRRD 217012 (SWOV PB9588, see also PB5947)

(A)

A controlled experiment was conducted to determine the relative importance of pedestrian, vehicle, and situational factors in influencing drivers to give way to crossing pedestrians. The following variables were combined in a complete factorial design: (1) type of crossing; (2) distance between oncoming vehicle and pedestrian; (3) orientation of pedestrian; (4) number of pedestrians; and (5) approach velocity of vehicle.

Trained pedestrians performed the start of an ordinary street crossing attempt and interacted with regular drivers whose response was measured in terms of changes in vehicle velocity. The experiment was replicated at two sites for a total of 960 crossing trials. The results show that drivers slowed down, or stopped more, for crossing pedestrians when: (1) the approach speed of the vehicle was low; (2) the crossing took place on a marked crosswalk; (3) there was a relatively long distance between the vehicle and the pedestrian's point of entry into the road; (4) a group of pedestrians, rather than an individual, attempted to cross, and, (5) the pedestrian did not look at the approaching vehicle. Additionally, female drivers and older drivers slowed down more than other drivers. Implications of the results for pedestrian safety, road design, and further research are discussed.

KRAAY, J.H.

Een conflictobservatietechniek ten behoeve van de verkeersveiligheid in woonbuurten (A conflict observation technique for the sake of traffic safety in residential areas)
Verkeerskunde 26 (1975) 5: 252-254

IRRD 214040 (SWOV PB7060 T) (also available in English) (A)

Researchers suspect that infrastructural measures have a greater influence on traffic safety than the more conventional legal measures, traffic regulations, initiatives in the field of instruction, training and campaigns. The Institute of Road Safety Research SWOV has commissioned The Netherlands institute for Preventive Medicine TNO to develop a conflict observation technique in order to determine the effects of various lay-outs of residential environments on traffic safety. The proposed pilot study in the town of Delft is a very useful instrument to gain experience in handling techniques different from traffic accident analyses. The examination concerns the Buitenhof district of Delft, consisting of two areas. The Gillis area has been designed on the basis of the principle that the entire residential area, including the streets, should be used by playing children and that it should offer possibilities for various activities. On the other hand the Fledderus area has been planned along conventional lines, which implies that neat green beds (not to walk on), footpaths, streets and kerbs have been laid out. A few problems pertaining to the reliability of the conflict observation technique are dealt with in this article.

KRAAY, J.H.

Onderzoek van de verkeersveiligheid van de voetganger (Research on pedestrian safety)
In: SWOV congres Toekomst in veiligheid, Publikatie 1976-4N
Stichting Wetenschappelijk Onderzoek Verkeersveiligheid SWOV, Voorburg, 1976

IRRD 220552 (SWOV PB9606) (I)

Because there are not enough traffic accidents in residential areas to be used for statistical research, the accident cannot be used in a short range study as a measure of degree of hazard. Another measure is the near-miss or severe conflict between road users. The possible use of such conflict techniques is out-lined. It is known that measures in the field of town planning and infrastructure influence human behaviour in residential areas more than do legal or social measures. It is first necessary to develop conflict observation technique as a reliable measuring instrument; the technique has been used for the first time in a study to compare traffic safety in two residential areas in Delft which are different in layout.

KRAAY, J.H.

Urban planning, pedestrians and road safety

In: Proceedings of the International Conference on Pedestrian Safety, Haifa, 1976. pp. 3C1-3C9
Michlol-Publishing House, Haifa, 1976

IRRD 229755 (SVOV PB12316) (A)

Mixed traffic in residential neighbourhoods has led to the establishment of residential yards. Residential yards are areas where the space open to the public is designed primarily so that the functions of walking and playing are adequately provided for, and only local traffic is allowed. Since traffic accidents do not occur in sufficient numbers in a residential area for statistical research, it is impossible to use accidents as a criterion of traffic safety for short-term research. In this investigation an attempt was made to give a definition of a serious conflict which would be as close as possible to a traffic accident, would be measurable, and would provide enough serious conflicts to make the problem capable of investigation.

The first part of the research showed that it is quite possible in a test situation to make the developed conflict observation technique reliable. The field research carried out in two very differently planned parts of Delft was the second part of the investigation. The field observations have shown that mixed traffic in the residential yard solution leads to more encounters between children and wheeled traffic than in the conventional neighbourhood, and to more serious conflicts involving children. It is clear that much development work still has to be done before the object of the research has been achieved, i.e. to develop a reliable and practical conflict technique for predicting accidents.

KRAAY, J.

Strategies in pedestrian road safety research

The voice of the pedestrian (1976) 6: 103-118

IRRD 229206 (SVOV PB12215) (I)

Mixed traffic in residential neighbourhoods has led to the establishment of shared spaces. Since traffic accidents do not occur in sufficient numbers in a residential area for statistical research it is impossible to use accidents as a criterion of traffic safety for short-term research. In this paper a definition is given of a serious conflict which would be as close as possible to a traffic accident, would be measurable, and would provide enough serious conflicts to make the problem capable of investigation. It is shown that it is quite possible in a situation to make the developed conflict observation technique reliable, but much development work still has to be done.

KRAAY, J.H.

Integration of mixed traffic in residential areas; General principles and strategies

Institute for Road Safety Research SWOV, Voorburg, 1976. 12 p.

IRRD 233897 (SWOV PB13395) (I)

Since validity in the various investigations is still not very great, it would seem advisable firstly to make a given technique reliable enough (because this is the primary requirement for a measuring instrument) so that it will ultimately improve validity. The foregoing implies that no opinions can yet be expressed regarding road safety if urban planning projects are to be evaluated by means of a conflict technique. By using a conflict technique, reliable information can, however, be obtained on certain kinds of encounter that occur, for instance, in a residential yard (shared space). Since the various conflict techniques have not so far proved reliable or valid in most cases, it is advisable to use them in situations where very few, if any, accident statistics are available or where an initial impression of the situation is required.

KRAAY, J.H.

Pedestrian road safety development and research in The Netherlands

Institute for Road Safety Research SWOV, Voorburg, 1976. 15 p.

IRRD 231131 (SWOV PB12597) (I)

Mixed traffic in residential neighbourhoods has led to the establishment of residential yards. Residential yards (shared spaces) are areas where the space open to the public is designed primarily so that the functions of walking and playing are adequately provided for, and only local traffic is allowed. Since traffic accidents do not occur in sufficient numbers in a residential area for statistical research it is impossible to use accidents as a criterion of traffic safety for short-term research. In this investigation an attempt is made to give a definition of a serious conflict which would be as close as possible to a traffic accident, would be measurable, and would provide enough serious conflicts to make the problem capable of investigation. Much development work has still to be done before the object of the research has been achieved, i.e. to develop a reliable and practical conflict technique for predicting accidents.

KRAAY, J.H.

De ontwikkeling en toepassing van de conflictmethode alsmede de internationale samenwerking in verkeersveiligheidsonderzoek (The development and application of the conflict theory as well as the international cooperation in traffic safety research)

Proceedings Symposium Gedragsobservatie en -beïnvloeding van kruisende verkeersstromen, Haren, 7 juni 1979. Verkeerskundig Studiecentrum, Rijksuniversiteit Groningen, Groningen, 1980. p. 1-25

IRRD 247058 (SWOV PB18519)

(I)

For a small scale study in residential areas accident studies can mostly not be carried out methodically. Therefore other methods are needed. One of these is the conflict method or near miss method. This method can be used for recording traffic hazards at separate locations and in specific traffic situations, or regarding participating with traffic under different conditions if no information or insufficient or unreliable information on traffic accidents is available. The applicability and the reliability of the conflict method are discussed. Secondly, international cooperation in traffic safety research, especially with this technique, is mentioned.

KRAAY, J.H.

Proceedings of the third international workshop on traffic conflicts techniques, organised by the international committee on traffic conflicts techniques ICTCT, Leidschendam, 1982

Institute for Road Safety Research SWOV, Report R-82-27, 91 p. + app.

IRRD 265671 (SWOV PB21012)

(I)

The primary purpose of the third international workshop was to discuss and finalise a research plan for the joint international study for the calibration of traffic conflicts techniques that is going to take place in Malmoe, Sweden, 1983. A secondary aim of the workshop was to present the state of the art of different conflict techniques.

KRAAY, J.H. & OPPE, S.

Verkeersconflicten als uitgangspunt voor een methode van verkeers-
veiligheid (Traffic conflicts as a diagnostic tool for road safety
research)

Verkeerskunde 30 (1975) 5: 226-229.

IRRD 241420 (SWOV PB15014 and PB14856)

(A)

The application of traffic conflicts as a diagnostic tool for road safety research still provides some problems in practice. The first requirement is a general definition of the concept "traffic conflict". As well as a summing up of the advantages and disadvantages of the use of the conflicts method in road safety research, the use of different operational definitions of the concept of conflict is treated. Some remarks on the reliability and validity of the conflicts method follow.

From the current development in a number of countries of different conflicts techniques one may expect that the conflicts method can explain more of the variability in accidents than is possible with traffic intensities.

KULMALA, R.

Liittymien liikenneturvallisuuden mittaaminen (Measuring safety at
junctions)

Tiedonanto 45.

Tie-ja liikennelaboratoria, Espoo, 1979. 40 p.

IRRD 244545 (SWOV PB15261)

(I)

Traffic accident risk can be used as a measure of traffic safety. Accident risk means the risk of an accident happening, the risk of being involved in an accident or the risk of injuries and damage to property in traffic accidents. Accident risk can be expressed as the ratio of the number of accidents to risk exposure. Risk exposure is a measure of exposure to risk in the accident studied and can be evaluated by observing the traffic conditions at junctions. The number of conflict situations at junctions can be used as a measure of risk exposure. Very often studies of traffic conflicts have shown a significant correlation between the number of traffic accidents and conflicts. Thus accident risk can be expressed as the product of the ratio of the number of accidents to the number of traffic conflicts and the ratio of the number of traffic conflicts to risk exposure. The study deals with the usefulness of accident risks as measures of traffic safety at junctions by an analysis of the available literature on the subject. Different methods to measuring traffic safety based on accident risks are studied and compared according to the reliability and the validity and the characteristics of the data used in the method.

KULMALA, R.

Lükenteen konfliktitutkimukset 1979 (Traffic conflict studies in 1979)

Report 57

Technical Research Centre of Finland, Espoo, 1980. 34 p. + app.

IRRD 248151 (SVOV PB19583)

(A)

The traffic conflict method is a traffic safety research method, which gives faster and more information about traffic environment than accident statistics. In the traffic conflict method traffic safety is studied by observing traffic flow and by registering the number of hazardous traffic situations, i.e. traffic conflicts.

In addition to four trained observers video equipment and a traffic radar were used at the field measurements. The video equipment was used in collecting background data for traffic conflicts - traffic flows, the number of potential conflicts and vehicle speeds.

The method was used in Helsinki to study the effects of pedestrian refuges on traffic safety. In a before-after-study the number of conflicts observed on a street before the building of refuges were compared with the observations made after the building of refuges. On another street conflict observations at pedestrian crossings without refuges and a pedestrian crossing with a refuge were compared.

In Lahti the method was used in evaluating traffic safety at five junctions. The problem areas and spots of the junctions were located using the method. A number of measures to improve the traffic safety of the junctions were proposed based on traffic conflict observations.

KULMALA, R.

Ryömiskaistojen korvaaminen ohituskaistoilla

(The replacement of crawling lanes by overtaking lanes)

Technical Research Centre of Finland, Espoo, 1981. 29 p. + app.

IRRD 258480

(I)

In May 1980 crawling lanes were replaced by overtaking lanes. This study deals with the effects of the change on the operation and safety of the lanes. The study was carried out as a before-after study. The field studies were carried out at three locations on highway. Traffic observations were made at each location just before the change and three months after it. At one location after-observations were made also only two weeks after the change. Field studies especially under observation were the lane behaviour and speed (traffic radar) of the vehicles. Traffic safety was studied by the traffic conflict method using video equipment. The study showed that under the new regulation, where the left lane is an overtaking lane and the right lane a driving lane, traffic runs smoothly and safely. There was hardly any confusion in lane behaviour three months after the change. Overtaking lanes were used almost solely for overtaking. Overtaking from the right were distinctly rarer events than before the change. The change didn't seem to have any significant effect on the speeds of the vehicles.

KULMALA, R.

Mannerheimintien suojateiden turvallisuus

(Traffic safety at pedestrian crossings on Mannerheimintie)

Technical Research Centre of Finland, Espoo, 1981. 38 p. + app.

IRRD 258479

(I)

The study dealt with the effects of different pedestrian crossing arrangements on pedestrian safety. The objects of this research were 16 pedestrian crossings in Helsinki. According to the applied arrangements the crossings were classified by the existence of refuges, signal control and their location (at or between junctions). The crossings with refuge coincided, with one exception, with tramcar stops in the middle of the street. The research material consisted of police reported traffic accidents in 1974-1979 and the average pedestrian flows from the traffic counts performed by the city of Helsinki. In addition, conflict studies were made at 13 crossings. At these studies pedestrian behaviour and their conflicts and potential conflict situations while crossing the street were observed and recorded on video tape. Vehicle flows and speeds were obtained in samples. The highest accident and conflict risks were found at crossing without refuges. Accidents and conflicts at the crossings were mainly caused by pedestrians crossing the street against red and vehicle passing other vehicles stopped before pedestrian crossings. The implementation of signal control at all the studied crossings and more distinct marking of the crossings between junctions were proposed as measures for improving pedestrian safety. The removal of tramlines should also improve pedestrian safety. The safety effects of building a new pedestrian crossing with a refuge were studied separately.

KULMALA, R.

Traffic conflict studies in Finland

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 50-59

IRRD 265676 (SWOV PB21017)

(I)

The development of a model for simulating traffic conflicts started at the Technical Research Centre of Finland in 1973. The model was first completed in 1974, but it has been improved continuously. The input information needed by the model consists of the geometry of the road environment, the amount of traffic, the speed distribution of different vehicle flows and the phasing scheme of the possible signal control. The output of the model consists of the number of conflicts in the time given classified by the severity and the type of the conflict in different parts of the road environment studied. The advantages and disadvantages of the method are listed.

LAWSON, J.

Recent work in Canada on the development of traffic conflicts techniques

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 60-61

IRRD 265677 (SWOV PB21018)

(I)

Based on earlier work and previous studies of Post Encroachment Time (PET) as a measurement of traffic conflict the Road Safety Branch of Transport Canada does not have much confidence that PET would prove to be a useful tool, either for diagnosis of accident problems or evaluation of counter-measures. Further application of the PET measurement techniques to larger samples of locations would be required to verify this; but the Department of Transport has not found there to be any concrete interest in developing and using the techniques. It appears that formal measurement and analysis of conflicts is still not used in Canada.

LIGHTBURN, A. & HOWARTH, C.I.

Study of observer reliability and variability in detection of traffic conflicts; Part II

University of Nottingham, Nottingham, 1978. 84 p.

(SWOV PB14118)

(S)

The overall aim of the work is to produce a training manual and associated visual aids for use by Local Authority Traffic and Road Safety Departments for the study of traffic conflicts. The second phase of this study has been to estimate reliability within and variability between observers.

LIGHTBURN, A. & HOWARTH, C.I.

A study of observer variability and reliability in the detection and grading of traffic conflicts

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 89-98

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21275)

(S)

The objective of the study was to see whether the identification, classification and recording of traffic conflicts could be adequately carried out by the type of personnel typically employed by local authorities as temporary traffic examiners. There was no significant differences between male and female observers, or between drivers and non-drivers. The theory of signal detection was applied to the data obtained and the benefit of selectively eliminating various percentages of observers was examined.

LIGHTBURN, A. & HOWARTH, C.I.

Training conflict observers

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 179-182

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21286)

(S)

The manner in which observers are trained for conflict study work, and the effects of different methods of training on their assessments of traffic conflict situations are discussed shortly. The main problem is that of subjectivity. No matter how mutually exclusive and well-defined the severity classifications are, the traffic conflicts technique is based on people using their subjective judgement to quantify what is often a complex traffic situation, and one which is over within a very few seconds.

LINDEROTH, V. & RINGHAGEN, L.

Traffic study technique at rural intersections

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 40-46

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SWOV PB12906)

(S)

The National Swedish Road and Traffic Research Institute (VTI) has been working with the development of a traffic study technique adapted to rural intersections. The primary aim is to receive knowledge of accident: producing mechanisms working at intersections. It is not measured what is meant by traffic conflicts. In this study traffic conflicts are meant in an ordinary sense as well as situations with low potential for accident risk.

LÖVEMARK, O. & HYDEN, C.

Traffic safety in the center of Uppsala

In: Pedestrian safety project, NATO-CCMS Report No. 27, pp. 80-100 National Highway Traffic Safety Administration, Washington, D.C., 1974

IRRD 218077 (SWOV PB8306)

(A)

In this report is presented a practical application of a method to decide travellers' risks of personal injuries through behaviour registration. This method has been developed by the PLANFOR group.

Earlier it was necessary to analyze occurred accidents to be able to describe the risks run by travellers.

The great advantage with the behaviour registration method is the immediate and precise description of travellers' risk which it can give. This is of great importance for the summing up of, for example, the safety effects of a traffic regulation. For a comparable summing up through accident data, there is a need for at last 2 years' accidents.

The fundamental thing about the method is that the risk for personal injuries that travellers are exposed to is directly proportional to the share of serious conflict situations which travellers in a flow are involved in.

Serious conflict situations result from, either an uncontrollable conflict-averting behaviour, or a traffic dangerous behaviour which provokes an uncontrollable situation. In both cases the involved travellers should pass each other at a distance less than one meter partly depending on means of conveyance and traffic environment type.

The risk for personal injury varies with traffic environment type-traffic situation-means of conveyance (conflict class) and size of the conflict-arousing vehicle flows.

The risk quantity which is a measure of the probability that an accident with personal injuries would occur, can be estimated only on the basis of knowledge about the size of traveller-flows and risk for personal injuries in existing conflict classes. The registration of travellers' behaviour and serious conflict situations is executed through direct observation. The observations must be preceded by a training period for the observers and control studies must be executed before and during the observations in order to get a uniform interpretation of the definitions chosen. Registration of travellers' behaviour is executed with an electronic gauge. The summing up is computer-based. Results from an application of the method are presented in the report. These results sum up the safety effects of the traffic regulation performed in the center of the town of Uppsala, October, 1972, as well as they provide material for the first stage of the up-building of a general behaviour data bank, which will constitute the basis for municipal programs against traffic accidents. Through this method the planning can be based on a precise description of the risks and risk quantities of today, their probable change and precisely defined goals regarding traffic safety. The summing up of the effectiveness of the regulation in Uppsala showed that traffic safety had been somewhat improved for all means of conveyance, an effect which in the first place is dependent on the measures taken in those routes which got an increased traffic flow through the regulation.

The total reduction of risk quantity in the regulation in Uppsala was: pedestrians 5%, cycles 2%, cars 11%, all means of conveyance 5%.

LÖVEMARK, O. & HYDEN, C.

Trafiksäkerhet i Landskrona. Tillämpad risk- och riskmängdsbeskrivning av befintligt trafiksystem. Beskrivning av pågående utveckling avseende riskbeskrivningssystemets tillförlitlighet och tillämpbarhet.
Planfor Arbetsgrupp för trafik- och stadsplaneringsforskning, Lunds Universitet, Lund, 1974. 41 p.

(SWOV PB14711)

(S)

With derived relations of accidents with serious conflicts as a starting point an extensive recording of serious conflicts is carried out. These conflicts are then going to be related to different explaining factors such as traffic intensity, traffic situation, travellers speed and individual characteristics. The general system for risk calculation enables operative methods for planning and also technical development is the subject of a growing international interest which is rendered for in this report.

LUDVIGSEN, H.S.

Traffic conflicts experience in Denmark

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 107-114

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21278)

(S)

The aim of a project carried out by the Technical University of Denmark was to make a survey and evaluation of the conflicts technique as a means of judging the risk of accidents in unsignalized intersections. The Swedish traffic conflicts technique was applied. The observers were especially trained in this technique. The conflicts technique is expected to be able to reflect the level of risk in an intersection. The advantage of the application of the technique as a supplement to accident data is demonstrated.

MALATERRE, G. & MUHLRAD, N.

Les conflits de trafic: une technique au service des Etudes de sécurité

ONSER, Arcueil, 1976

(SWOV PB12815)

(S)

Conflict observation for 8 junctions in urban area's and 4 in rural areas were performed. The seriousness of the conflicts were classified into 5 categories and also noted were: the type of conflict, the type of road users involved, estimation of speed, angle of collision if the conflict would have resulted in a accident. From the results of this study it is concluded there exist a correlation between conflict- and accident rates; suggestions for improvement of the conflict-observation are given.

MALATERRE, G. & MUHLRAD, N.

Interet et limité du concept de conflit de trafic et quasi-accident dans les Etudes de securité

ONSER, Arcueil, 1976

(SVOV PB12816)

(S)

Conflict-observations for 8 junctions in urban areas were performed. The seriousness of the conflicts were classified in 5 categories and also noted were: the type of conflict, the type of road users involved, estimation of speed, angle of collision if the conflict would have resulted in an accident.

Comparing the accidents happened at these junctions with the results of this conflict-observation study it is concluded there exist a correlation between conflict- and accident rates and also between conflict- and accident types. Suggestions for improving the conflict-observation are given.

MALATERRE, G. & MUHLRAD, N.

Mise au point d'une methodologie des conflits de trafic ou quasi-accidents dans les Etudes de securité. (Development of a methodology for the study of traffic conflicts or near accidents in safety studies).

ONSER, Arcueil, 1976. 37 p.

IRRD 105555

(I)

This two-year study (1975-1976) investigated (1) the cohesion and reliability of data collected by investigators trained in the use of the method; (2) the accuracy and sensitivity of conflicts as measures of risk by comparing the successive recordings taken by investigators (insofar as the data they have collected are reliable); (3) the relation between flow and conflicts. The data also gave information on the respective behaviour of various types of road user.

MALATERRE, G. & MUHLRAD, N.

A conflict technique

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 47-58

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SVOV PB12907)

(S)

Work on traffic conflicts technique carried out at ONSER since 1973 is taken as the basis for this study which takes also into account other factors which determine the severity of individual conflicts, such as speed, manoeuvres and type of road users involved. Although this conflict technique is primarily designed for evaluation studies and for comparison between various locations in terms of risk, it can also be used in safety diagnoses on hazardous locations.

MALATERRE, G. & MUHLRAD, N.

Conflicts and accidents as tools for a safety diagnosis

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 43-63

TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21272)

(S)

The conflict technique developed of ONSER, and the first validation studies that were performed in 1976-1977, were described in the first Traffic Conflict Workshop. Since then data-collection was identified, including conflict observations and analysis of accident reports on a number of urban intersections. The conflict technique underwent some modifications. But the main features were kept the same. An example of data acquisition on two groups of intersections on rural trunk roads near Bordeaux and urban trunk roads near Rouen is presented.

MALATERRE, G. & MUHLRAD, N.

International comparative study on traffic conflict techniques

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 185-231

TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21287)

(S)

Four international teams have participated in a conflict observation study at two intersections in the urban area of Rouen. Rouen was chosen because it is of medium size, it has easy access, has a good representativity of usual urban traffic problems, and had accident data available. The methods used for measuring and recording traffic conflicts are presented in detail and the first fundamental results are discussed.

MAMLOUK, M.S.

Right turn on red; Utilization and impact

Purdue University, Lafayette, 1976. 101 p.

IRRD 231330

(I)

The purpose of this research effort was to investigate the quality of use of right turn on red in Indiana after one year of allowing the manoeuvre as a basic rule. Attention was given to the study of all factors that might affect the manoeuvre as well as the consequences that might occur as a result of applying it. Data were obtained from 150 signalized intersection approaches scattered over 18 cities. Each approach was observed for four hours during peak and off-peak periods. The study examined the performance of the RTOR manoeuvre and the effect of the manoeuvre on traffic conflicts as well as pedestrians. A part of the study examined left turn on red from a one-way street to another one-way street. The number of vehicles that turned on red at locations where RTOR or LTOR was prohibited was also observed.

MCDOWELL, M.R.C.

The second international traffic conflict technique workshop: a personal overview

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 234-238

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21288)

(S)

The use of variants of the traffic conflict techniques as an operational tool in assessing deficiencies of existing road traffic layouts was the main theme of the workshop. Little attention has been paid to validation in terms of conflict measurement as a predictor of expected number of accidents. A plan is made for wider publication of the results in general literature; many traffic engineers and scientists do not know of this work, and will not unless it is carefully described in the literature.

MERILINNA, M.J.

Use of the traffic conflicts technique in Finnish road conditions

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 64-70

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SWOV PB12909)

(S)

Results of the described project are analysed to show to what extent the usability of the traffic conflicts technique is believed in and if it will be given any weight in decision making. Final results will also determine if the technique will be regarded useful for traffic conditions on roads in rural areas of Finland.

MILLAR, L. & GENEROWICZ, B.

A study to assess the effectiveness of varying levels and types of enforcement on driver behaviour at urban signalised intersections

Research and Statistics Division Report No. 14.

Road Traffic Authority Western Australia, Perth, 1979. 94 p.

IRRD 239333

(I)

This report describes the results of a study to investigate the effect of varying the levels of traffic law enforcement on driver behaviour and safety at urban intersections controlled by traffic signals. An assessment of the potential of a traffic violation photo-recorder as a means of improving driver behaviour at signalised intersections was also undertaken. Use was made of the traffic conflicts technique and observation of violation incidence to assess any significant changes. The results of the study indicate that the presence of surveillance, whether continuous by mechanical means or sporadic but frequent by patrols, reduces the incidence of unsafe behaviour of drivers. Frequency of visits, not the strenght of the patrol, appears to be the main factor. There is no evidence that the duration of stay of a patrol, longer than thirty minutes in one location, is of any additional benefit but as long as surveillance remains evident, its effect on the drivers' behaviour continues. A more intensive study, of much longer duration, would be needed to investigate the influence of increased enforcemment on accidents, since a conflict which results in an accident need not necessarily be caused by a violation.

MINNEN, J. van

Een methode voor de kwalificatie van het voorrangsgedrag op kruisingen (A method for the qualification of the right-of-way behaviour at intersections)

Verkeerstechniek 21 (1970) 9: 469-474

IRRD 61548 (SWOV PA7850 T)

(A)

The determination of the amount of hazard at intersections is one of the problems one meets while studying the right of way. Within the scheme of the investigation it is not always possible to gauge this danger by means of accident recording. This led to the searching for alternative methods such as observation of the behaviour of road-users at intersections. Observation of the behaviour of road-users at intersections were done by some investigators, p.e. British and West-German researchworkers. A new method was developed by the Institute for Road Safety Research SWOV, mainly since the existing and common methods were considered to be too concise or too comprehensive. The SWOV-method is based on the grading of the right-of-way behaviour into four categories:

1. "good": the right-of-way is given correctly;
2. "interchanged": the road user, entitled to the right-of-way, gives way;
3. "precarious": the road user, obliged to give way, only does so at the latest moment; a slightly critical situations arised;
4. "wrong": the road user, obliged to give way, omits such.

The reviewed method was applied to some investigations of limited size. The results were such, that a further development of the method concerned seems to be desirable.

The perfection ought to be directed in the first place to an improvement of the directions to the observers: well-reproducible results should be possible in all hypothetical circumstances.

Secondly, one should search for the relationship between the grading

of the give-way behaviour and the road traffic hazard.

For the time being, especially the categories "wrong" and "precarious" are assumed to be determining for the road accident risk.

The category "interchanged" can give, among others, indications for the discrepancy between de jure and de facto give-way behaviour.

From the results of the first researches, some remarkable facts come to the fore:

In Antwerp (Belgium), the give-way behaviour of drivers with regard to vehicles, coming from the right, is compared with the behaviour of the drivers with regard to the cyclists and moped-riders coming from the right. In that investigation, explicit differences are noted in the percentage "interchanged", that in the second case appeared to be considerable higher. From the observations could also be deduced that the influence of a tramway still occurs, although the statutory law which equated a tramway with a major road, has already been abolished some years ago.

In Den Helder (The Netherlands) the right-of-way behaviour was observed as a before- and after study, at several intersections without give-way regulations (identical road traffic of the right has the right-of-way) which were altered into major intersections. The more or less favourable trend in which the behaviour altered, turned out to be slightly dependent on the fact whether the new give-way regulation met the dominating character of one of both roads or functioned contradictory.

MUHLRAD, N.

The French traffic conflict technique: a state of the art report

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 62-69

IRRD 265678 (SWOV PB21019)

(I)

Work on a conflict technique was undertaken at ONSER in 1973, with the primary aim of providing an instrument for measuring danger suitable for evaluation studies in urban areas. Possible use of conflict data in safety diagnosis on hazardous locations was also tested. The technique and summary of the work done before 1979 are described briefly. New developments in the French technique after 1979 are presented. Results of the validation and calibrations led to modification of the technique in the following aspects (1) the observers (2) the length of the data collection period and (3) the risk-matrix. Further use of the conflict technique is given.

NMMINEN, R. & SUMMALA, H.

A simple method for simulating danger-related aspects of behaviour in hazardous activities

Accid. Anal. & Prev. 7 (1975) 1: 63-70

IRRD 214423 (SVOV PB11420 T)

(A)

An attempt to simulate the closed-loop nature of many kinds of hazardous activities, e.g. driving, was made by means of a dart-throwing game in which the score progressively increased towards the right-hand portion of the target. Just to the right of the area yielding the highest score there were a "near-accident" area and, still more to the right, an "accident" area. The former yielded no score and was assumed to warn the thrower; a hit in the latter was followed by a punishment session, an extra session to be performed immediately after the session in which the accident occurred. The subject knew in advance that upon reaching a pre-scribed total score the session would be over.

The main result was that the hits had a tendency to move to the right, to the area with higher scores and smaller margins of safety, and that this shift was, every now and then, reset by a hit in the "near-accident" area. These changes apparently reflect corresponding phenomena in the thrower's decision-making, and similar changes presumably take place in decision-making in many kinds of hazardous situations.

NILSSON, G.

Risk exposure. Structuring of the need for risk exposures for road accident analysis

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, p. 21

TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21270)

(S)

In the continuous research carried out by VTI different measurements for road accident are tested in order to find measurements to be used in different decision procedures, intended to result in measures. When developing accident measurements it is essential to define and to deduce traffic measurements, that show strong relations with the number of accidents. These traffic measurements are called risk exposures. For the full report see VTI report 144 A, IRRD 240704.

NORCONSULT A/S, SAMFERDSELAVDELINGEN

Vurdering av to typer toplanskryss ved konfliktregistrering. Slutt-rapport (Evaluation of two kinds of road intersections in relation to conflict registration. Final report).

Norconsult A/S, Samferdselavdelingen, Hoevik, 1976.

IRRD 240928

(I)

This is a safety and performance evaluation of two main kinds of road intersection designs in connection with a two lane motorway crossing another road at different levels. In this work the near miss method was used, based on the connection between conflicts (near misses) and actual accidents.

OLDER, S.J. & SPICER, B.R.

Traffic conflicts; A development in accident research
Human Factors 18 (1976) 4: 335-350

IRRD 222282 (SVOV PB11985 T)

(A)

Accident reports have been the main source of information in road safety research, and they provide the usual base for criteria used in countermeasure evaluation. Certain difficulties in using accident data arise from the time periods required for the collection of sufficient numbers of incidents and from the restricted details available for specific incidents. To overcome these difficulties studies have been made to test the feasibility of directly observing situations where road users are in conflict and evasive actions, successful or unsuccessful, become necessary. These conflict studies show that for a range of rural and urban intersections, conflicts occur frequently, are readily observable, and correlate well with the known longterm accident data. The recurring situations leading to conflicts have been detailed and give information on multiple vehicle involvement, queue position, vehicle paths, and blocking maneuvers. The use of this conflict study technique by traffic and highway engineers and road safety research workers is discussed.

OLDER, S.J. & SPICER, B.R.

Using traffic conflicts to assess the safety of road design elements

In: Symposium on Geometric Road Design Standards, LO-skolen Gammel, Denmark, Part II, Session III, pp. 341-353

Organisation for Economic Co-operation and Development, Paris, 1976

IRRD 219986 (SVOV PB13078)

(A)

It is possible to augment information from reported accident records by using records of observed near accidents or traffic conflicts. The development of a technique of study involved defining conflicts in terms of evasive action by one or more of the road users involved and classifying each incident by the severity of such action. Records can be made by observers on site or by analysis of a time lapse cine film of vehicle movements at the site.

Conflicts are many times more frequent than accidents and such a technique can provide more precise and detailed information than accident analyses on hazardous locations and manoeuvres. This allows easier identification of layout related problems and rapid evaluation of the effect of any change in design on safety.

The results from five site studies show the identification of hazards at certain "at grade" junctions on dual carriageway roads and the effect of traffic signal installation at these intersections; the short term effects of introducing a mini roundabout at a simple priority intersection; an evaluation of the effect of a traffic signal installation at an urban intersection; and the effect of increasing the entry lanes at an intersection possessing a small island roundabout.

OLDER, S.J. & SHIPPEY, J.

Traffic conflict studies in the United Kingdom

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 1-15

T.Ø.I., Oslo / L.T.H., Lund, 1977

IRRD 233337 (SVOV PB12902)

(I)

Studies in the United Kingdom are mainly concerned with the development of the traffic conflict technique as a viable research and operational tool: (1) to obtain objective records of road user behaviour in accident situations for further analysis; (2) to provide a measure of safety to be used in before and after studies to evaluate accident countermeasures; (3) to evaluate the present state of a given location with respect to safety.

Five grades of conflict severity are defined. The two methods of measurement: (1) observation of evasive action and (2) automatic detection of vehicle proximities from computer analysis of continuously recorded data from vehicle sensors, are discussed, particularly from the point of view of validity, reliability of observers, day to day variability and conflict types and differences in accident/conflict ratios. Some examples of before and after studies in the United Kingdom are given and possible future research is discussed.

OLDER, S.J. & SHIPPEY, J.

Proceedings of the second international traffic conflicts technique workshop, Paris, 1979

TRRL Supplementary Report 557

Transport and Road Research Laboratory, Crowthorne, 1980. 245 p. + app.

IRRD 248611 (SWOV PB21268)

(I)

These proceedings contain the following papers: accident surrogates for use in analyzing highway safety hazards (Datta, T.K.); risk exposure - structuring the need for risk exposure data for traffic accident analysis (Nilsson, G.); a quantitative definition of the near accident concept (Balatha, D., Hakkert, A.S. and Livneh, M.); conflicts and accidents as tools for a safety diagnosis (Malaterre, G. and Muhlrad, N.); a microprocessor based system for traffic data collection (Storr, P., Wennell, J., McDowell, M.R.C. and Copper, D.); empirical studies of driver-behaviour at T-junctions and use of a simulation model to study conflicts (Wennell, J., Storr, P.A., Darzentas, J. and McDowell, M.R.C.); a study of observer variability and reliability in the detection and grading of traffic conflicts (Lightburn, A. and Howarth, C.I.); variations in vehicle conflicts at a T-junction and comparison with recorded collisions (Spicer, B., Wheeler, A. and Older, S.J.); the validation of a conflict observation technique for child pedestrians in residential areas (Güttinger, V.A.); traffic conflicts experience in Denmark (Ludvigsen, H.S.); a pilot study of conflicts at a T-junction on winter evening rush-hours (Darzentas, J., Holmes, V. and McDowell, M.R.C.); conflict research in traffic (Hogner, K.J. and Schutzenhofer, A.); evaluation of a new design of pedestrian crossing with TCT (Schutzenhofer, A.); pedestrian conflict technique (Gstalter, H.); traffic conflicts at urban junctions (Zimolong, B.); behavioural study by the institute for perception (Van den Horst, A.R.A. and Symonsma, R.M.M.); observations and recording methods used in the traffic conflicts technique (Shippey, J.); methodological assessment of the techniques (Hauer, E.); training conflict observers (Lightburn, A. and Howarth, C.I.); international comparative study on traffic

conflict techniques (Malaterre, G. and Muhlrad, N.); 2nd international workshop on traffic conflict techniques - a personal overview (McDowell, M.R.C.).

OPPE, S.

Traffic conflict analysis: A road safety research technique
Institute for Road Safety Research SWOV, Voorburg, 1977. 23 p.

IRRD 231127 (SWOV PB12593) (Also SWOV PB7059 T in Dutch) (A)

Based on research results, it is ascertained to what extent traffic conflict analysis can be applied as a method of traffic safety research. It appears from the literature that there is no substantial relation between conflicts and accidents. Traffic volumes probably play an important role with regard to this relation. Better results are gained if only serious conflicts are considered. However, research in this field has been made only on a limited scale. In this connection the problem of the reliability and validity of the measurements is of importance. It is concluded that a great deal of evaluating research still has to be done before conflict analysis can be applied on a large scale. In specific cases, particularly those in which only very few accidents have been recorded or no accident history is available, the application of the technique may be useful. A strategy is proposed to decide between both techniques. It is suggested applying traffic encounters instead of traffic volumes to measure exposure and using that the results of conflicts should be used in combination with other data such as those derived from observations of road-users' behaviour.

OPPE, S.

Some notes on: "What tasks is a traffic conflicts technique intended for?"

Revised version of Contribution to Proceedings First Workshop on traffic conflicts, Oslo, 1977, pp. 111-116
Institute for Road Safety Research SWOV, Voorburg, 1977. 6 p.

IRRD 231128 (SWOV PB12594) (I)

Road safety can be measured by means of accident analysis. Another measuring method is the conflicts technique. The validity of the conflicts technique is related to the reliability of the two measuring methods. A decision procedure is given for deciding between the two methods when the accident history is incomplete. The alternative of combining both methods is described. An example is given of a decision procedure between the criterion variables traffic volume and accident counts.

OPPE, S.

Statistical tools for the calibration of traffic conflicts techniques

In: Proceedings of the third international workshop on traffic conflicts techniques, Leidschendam, 1982, pp. 70-76

IRRD 265679 (SWOV PB21020)

(I)

To compare the results of various conflict techniques from different countries, an international experiment took place in Rouen in 1979. The experiment showed that, in general, with each technique the same conclusions were reached with regard to the problems of safety at two intersections in Rouen. However, it was not always clear how the observations led to these conclusions. An international calibration study would be very informative. This should be concerned with a detailed comparison of conflict scores. Efforts have been made to carry out such a calibration study. This note describes a data-analysis technique that is an efficient tool for the analysis of the data that will be collected in such an experiment. An example is given from which it is clear that the analysis, which is in fact much more general and not restricted to the narrow context of the calibration experiment will give all the relevant information in this case.

PADDOCK, R.D.

The traffic conflict technique: An accident prediction method

Second edition

Ohio Department of Transportation, Columbus, 1974

Also in: Traffic accident analysis, Transportation Research Record 486, pp. 1-10

IRRD 213894 (SWOV PB4739)

(A)

The Traffic Conflicts Technique was developed by General Motors Research Labs as a method of measuring accident potential during the early 1960's. The Technique is based upon tabulation of evasive maneuvers at intersections as evidenced by brake light indications or lane changes. For the purpose of measuring accident potential at intersections, some twenty-odd specific conflict classifications are defined and coded on computer keypunch forms. As a result of a FHWS financed research program, the State of Ohio became involved in the evaluation of the Conflicts Technique during 1969. At the time that the Federal Program ended in 1971, Ohio decided to pursue its own evaluation of the technique. This decision was prompted by a conviction that the theory behind the Conflicts Technique was sound and a belief that it could be used to find an accident projection technique for use in Ohio. In order to be useful, an accident projection technique must reflect the accident trends of the subject area. Early tests indicated that the projection algorithm published by FHWA could not be easily calibrated for Ohio data trends. Although Ohio data was utilized in generation of the FHWA method of accident prediction, it was felt that the data from the other states that submitted data, namely Virginia and Washington, was of such volume and different nature as to bias the resulting algorithm away from the accident trends found in Ohio. During 1972 and the first half of 1973, the Ohio data base was enlarged from 196 projects collected under the FHWA Program to 410

75

projects, thus providing 992 approaches of data, of which, 611 were usable for analysis purposes. A series of regression models were applied to this enlarged data base in an attempt to find a reliable accident prediction model. As a result of the regression analysis, accident prediction algorithms were developed which provide a mean accuracy of + 1.1 accidents per year and a 75 percentile accuracy of + 1.8 accidents per year. In addition, substantial insight was gained into the workings of the Conflicts Technique and its underlying theories. With this understanding of the Conflicts Technique and appreciation of the theory of conflicts came new questions and areas for future study. As a result, Ohio intends to continue its use and evaluation of the Traffic Conflicts Technique and hopes to eventually provide the Traffic Engineer with a versatile tool for the evaluation of traffic flow efficiency and accident potential.

PAHL, J.

A comparison of direct and indirect methods for determining accident potential

Accid. Anal. & Prev. 2 (1970) 3: 201-209

IRRD 060657 (SWOV PA8546 T)

(A)

The methods of determining the accident potential of a highway site can be categorized into direct and indirect approaches. Principal advantages and shortcomings of each of these two categories are discussed. A comparison of the two categories leads to the conclusion that there appears to be no advantage in the use of the indirect approaches as long as the relationship between traffic safety and the multitude of factors affecting traffic safety cannot be quantified.

PARKER, M.R., JR.

Use of traffic conflicts technique to assess hazards of transporting
oversize loads

Transp. Res. Rec. 709 (1979): pp. 30-38

IRRD 245884

(I)

The traffic conflicts technique was used to assess the hazards associated with transporting oversize loads over highways. The approach was based on the assumption that a driver applied brakes in response to a perceived danger when following, passing, or meeting other vehicles. Field tests were conducted to determine whether there are any differences in the hazards involved in moving 3.7-M (12-FT) wide housing units as compared with those of moving 4.3-M (14-FT) wide units. An analysis of the conflicts indicated that there were no major differences; however, the sample size was too small for the results to be accepted with a high degree of confidence. Although the conflicts data indicated that the large sample sizes needed to establish statistically reliable results may not be practical, the technique was useful in determining the types and relative frequencies of hazards associated with the movement of wide loads over a variety of highway systems. As a measure for assessing the hazards of moving wide loads, the conflicts technique provided more detailed information in a short period of time than could have been obtained from a conventional accident analysis.

PARSONS, H.M.

Caution behaviour and its conditioning in driving

Human Factors 18 (1976) 4: 397-408

IRRD 222288 (SWOV PB11991 T)

(A)

If people drove more cautiously, there might be fewer accidents. Caution behaviour includes pausing and looking. It is suggested that the "precautionary pause" based on a longer response latency and reduced force can be conditioned into drivers as avoidance behaviour. In laboratory research that can be constructed as simulation of driving, latencies were lengthened and forces diminished because of the contingencies of an aversive consequences that generate driver avoidance behaviour, including the precautionary pause. How might the driving environment, including motivational signs, be designed to exploit this process and thereby contribute to highway safety?

PAYMANS, P.J.

Is een bijna-ongeval bijna een ongeval? Een exploratieve analyse van de bijna-ongevallen op overwegen (Is a near-accident nearly an accident? An explorative analysis of near-accidents on railway-crossings)

Universiteit van Amsterdam, Amsterdam, 1972. 84 p.

IRRD 216263 (SWOV PB7687)

(I)

1915 so-called near miss accidents on level crossings were counted by railway drivers in 1971. A near miss was defined as the traversing of a level crossing when the safety installation was working or - in absence of this - the traversing when the train according to the judgement of the driver was already very close. With the aid of prediction formula, by which the number of expected accidents on level crossings can be forecasted, it is possible to pursue a policy based on objective safety norms for example regarding the kind of level crossing safety measures.

PERKINS, S.R.

GMR traffic conflicts technique procedures manual

Publication 895

General Motor Research Laboratories, Warren, Mich., 1969. 20 p. + app.

(SWOV PB4309)

(A)

The Traffic Conflicts Technique was developed by Research Laboratories, General Motors Corporation, to be a measure of traffic accident potential. A Traffic Conflict occurs when a driver takes evasive action, brakes or weaves, to avoid a collision. The evasive action is evidenced by a brake-light indication or a lane change by the offended driver. Objective criteria for Traffic Conflicts have been defined for over twenty specific accident patterns at intersections. This Procedures Manual defines the methodology to be used in making formal surveys in accordance with the technique.

This Procedures Manual was prepared by Research Laboratories, GMC for the Bureau of Public Roads, Federal Highway Administration, U.S. Department of Transportation.

PERKINS, S.R. & HARRIS, J.L.

Traffic conflict characteristics; Accident potential at intersections
General Motors Corporation, Warren, Mich., 1967

(SWOV PA1953)

(A)

Traffic conflict characteristics are measures of traffic accident potentials. A traffic conflict is any potential accident situation. Over twenty objective criteria for traffic conflicts (or impending accident situations) have been defined to specific accident patterns at intersections: essentially these traffic conflicts are defined by the occurrence of evasive actions, such as braking or weaving, which are forced on a driver by an impending accident situation or a traffic violation. A method of systematically observing an intersection for traffic conflicts has been devised. In three 12-hr observation sessions, it is possible to evaluate completely an intersection; the information obtained is much more comprehensive than that normally available from accident histories. Further, the initial causes of the incidents, which accident records often fail to reveal are uncovered. Traffic conflict studies use objective criteria to obtain significant quantities of data in short observation periods.

PUGH, D.E. & HALPIN, T.J.

Traffic conflicts in Washington State
Washington State Department of Highways, Washington, 1974. 12 p.

(SWOV PB6469 fo)

(S)

The Traffic conflict theory is tested in Washington State and some of the preliminary results are presented. Conflict studies are counted generally at hazardous intersections and an attempt is made to obtain a measure on just how many conflicts per hour should be responsive to a given intersection. The conflict technique is a highly valuable tool for use in the assessment of accident potential.

PYYMÄKI, M.

Tutkimus Liikennekonflikteista; Simulointimallin vertailu ja sovellutus (Traffic conflict simulation model)

Tie- ja Liikennelaboratorio, tiedonauto 29
Valtion Teknillinen Tutkimuskeskus, Espoo, 1975

(SWOV PB13551)

(A)

A simulation program developed at the Technical Research Center of Finland, is an attempt to combine two new traffic study methods, simulation and conflict technique. The conflicts are simulated in order to be able to estimate the traffic safety of even those projects still at the planning stage.

A simulation model can at a time be applied to only one crossing or other similar limited place. The structure and the geometry of the traffic network is of free choice. Traffic control may be based on traffic lights or it may not. The traffic flows, inbound traffic's type distribution and the distribution of the vehicular gaps are also a matter of choice. The model function is such, that vehicles try to proceed according to the traffic rules, but observations between them are stochastic. The vehicles may then proceed into situations, where a collision becomes a threat. These are explained as conflicts, which still can be classified on the basis of the necessary retardation to save the situation.

The simulating model was in 1976 applied to eight crossings in Helsinki, each also being a place for field observations about conflicts. In comparison with the accident statistics the simulated conflicts correlate just slightly poorer than the observed conflicts. The simulation model will be further developed and it may be possible, after some improvements, to apply it for comparison of traffic plans and prediction of accident figures at crossings.

The model puts out the conflicts divided into four groups.

- a vehicle ahead in driving direction or rear-end conflict.
- a pedestrian ahead or pedestrian conflict.
- a vehicle under obligation to yield drivers in the way from the left or right-of-way conflict from left.
- a vehicle under obligation to yield drivers in the way from the right or right-of-way conflict from right.

RADWAN, A.E., SINHA, K.C. & MICHAEL, H.L.

Development and use of a computer simulation model for the evaluation of design and control alternatives for intersections of minor roads with multi-lane rural highways: selection of the simulation model

FHWA-ISHC-IHRP-79/8

Purdue University, Indiana, 1979. 29 p. + app.

IRRD 254653

(I)

The main objective of the simulation phase of this project was to analyze the safety aspects of intersections at multi-lane rural divided highways using a simulation approach, and to evaluate possible design and control alternatives in terms of accident reduction. The alternatives tested included some of the countermeasures suggested by the first two phases. This phase of the project involved three parts. The first activity was to conduct a literature review involving driver gap acceptance at intersections on multi-lane highways, accident analysis and safety measurement techniques at such intersections, and a review of the available computer simulation models. The second activity was composed of three steps: (1) a field study at rural indiana intersections to investigate driver behavior, (2) traffic conflict studies at signalized as well as at unsignalized intersections, to select the appropriate safety measurements, and (3) selection and subsequent modification of a computer simulation model for the purpose of simulating traffic at intersections under study. The last part of this phase of the project was to apply the validated computer model in evaluating operation and safety of traffic under different design and control alternatives. The present report summarizes the results of a comprehensive litersture survey conducted in the first part of the simulation phase of the project to select the computer model to be used in the study.

RADWAN, A.E., SINHA, K.C. & MICHAEL, H.L.

Development and use of a computer simulation model for the evaluation of design and control alternatives for intersections of minor roads with multi-lane rural highways: field studies and model validation

FHWA-ISHC-IHRP-79/9

Purdue University, Indiana, 1979. 106 p. + app.

IRRD 254652

(I)

This report presents the details of the field studies conducted at a group of intersections in Indiana to obtain the necessary data for the modification and subsequent validation of the computer simulation model. Appropriate field studies were conducted to estimate gap acceptance distribution of minor road drivers to cross or merge with major road traffic at stop controlled intersections. Additional field studies were performed at signalized and unsignalized intersections to investigate the correlation between traffic volume, traffic conflicts and accidents, and to determine the effectiveness of the traffic conflict technique as a measure of safety at intersections. The simulation package, developed under the auspices of the federal highway administration, called UTCS-1 (known now as NETSIM) has been selected for use in this study. Several modifications, however, were made to the computer model to incorporate the estimation of average delay per vehicle, fuel consumption per vehicle, and number of traffic conflicts. The results of the field studies were further used to substantiate the model's validity.

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RADWAN, A.E., SINHA, K.C. & MICHAEL, H.L.

Development and use of a computer simulation model for the evaluation of design and control alternatives for intersections of minor roads with multi-lane rural highways: model application

FHWA-ISHC-IHRP-79/10

Purdue University, Indiana, 1979. 81 p. + app.

IRRD 254657

(I)

This part of the simulation phase of the study dealt with the use of the validated model in evaluating design and control alternatives to improve traffic safety and operation at intersections of minor roads with multi-lane rural highways. Different design and operational countermeasures for stop controlled as well as for signalized intersections were evaluated by a group of simulation experiments. For stop controlled intersections, the evaluated countermeasures were: intersection median width, median opening, median control, intersection width, approach grades, advance warning systems, and speed enforcement. As for signalized intersections, the evaluated countermeasures were: signal control type, signal timings, number of signal phases, advance warning systems, speed enforcement, amber and all-red phase durations, and detector setback from the intersection. Left-turn accidents caused by a shadow factor effect were also investigated.

RADWAN, A.E. & SINHA, K.C.

Countermeasures to improve safety at multilane rural intersections

Transportation Research Record 773 (1980): pp. 14-17

IRRD 260678

(A)

The objective of this study was to apply a computer model to evaluate, design, and control alternatives to improve safety at intersections of multi-lane major highways with two-lane minor roads. The NETSIM network-flow simulation model was used in this research. Measures of effectiveness considered in evaluating alternatives included average delay per vehicle and number of traffic conflicts. Several modifications were made to the NETSIM model to incorporate the calculations of the measures of effectiveness. Field studies were conducted for gap acceptance, traffic delay, and traffic conflicts, and the results were used to substantiate the model's validity. Different design and operational countermeasures for stop-controlled and for signalized intersections were evaluated by a group of simulation experiments.

RISSER, R.

Erhebungen von Konflikten im Rahmen der Entwicklung einer mitfahrenden Beobachtungsmethode (The collection of conflicts within the framework of the development of a method by which an observer is driving with)
In: Proceedings of the third international workshop on traffic conflict techniques, Leidschendam, 1982, pp. 77-78

IRRD 265680 (SWOV PB21021)

(I)

In the framework of a driving test with 250 test persons conflict observations in real driving situations were studied. An observer travelled as a vehicle occupant counting the conflicts. On account of a semantic difference it can not yet be concluded whether a valid segregation between light and severe conflicts can be found with this method. Results indicate that severe conflicts are rather rare. Future research will be done.

RUSSAM, K. & SABEY, B.E.

Accidents and traffic conflicts at junctions

TRRL Report LR 514

Transport and Road Research Laboratory, Crowthorne, 1972. 16 p.

IRRD 204874 (SWOV PB1810)

(A)

The problem of accidents at junctions, which feature largely in road accidents in Great Britain, is reviewed. An analysis of the national statistics of injury accidents indicates the extent to which accidents feature at different types of junction and the relative risks for different classes and ages of road user. Two techniques developed for studying junction accidents are described: one method assesses the safety of an individual junction by studying the vehicle movements which result in near accident or conflict situations: the other combines accident data for junctions of similar lay-out by location sampling. Examples of the application of these techniques to rural junctions are given and possible remedial measures are considered. The need to extend this work to urban junctions is stressed.

SANDERSON, R.W.

Procedures manual for traffic conflicts observers

Technical Memorandum Road Systems 8101

Transport Canada, Road Safety, Ottawa, 1982

(SWOV PB20849)

(S)

The publication describes two different procedures for the observation of traffic conflicts. Some chapters: Observer positioning, PET definitious for traffic conflict (OLT), measurement of traffic conflicts. Also described are the objectives and the preparational work.

SCHÜTZENHÖFER, L.

Evaluation of a new design of pedestrian crossing with TCT

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 127-128

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21281)

(S)

A modification in the design of pedestrian crossings is suggested. The modification refers only to crossings without traffic lights. The modification consists of two transverse stripes which join the ends of the longitudinal stripes combining a good inhibitory effect and an easy visibility. In order to test the effects and functioning the traffic conflict technique is used.

SCHWERDTFEGER, W. & ZIMOLONG, B.

Technische und psychologische Bedingungen der Unfallverhütung in Strassenverkehr

Zeitschrift für Verkehrssicherheit 19 (1973) 3: 143-162

IRRD 301775 (SVOV PB5508 T)

(A)

Reflections are defined on a new conception of accident prevention. Related experimental starts are referred to. Proceeding from a critical discussion on the human causing concept a reorientation is proposed considering stronger the situative factors with the occurrence of accidents. It is shown that for methodic reasons the diagnosis of qualification for traffic is not able to effectively contribute to reduction of accidents by the elimination of persons tending to cause accidents. On the other hand the road traffic engineer, in collaboration with representatives of anthroposcien-tific disciplines, may contribute effectively to prevent accidents, by a stronger regard of the effect of the driving space upon the man's way of acting.

SHIMADA, J.K.

Measures of site hazard - hazardous maneuvers

Accid. Anal. & Prev. 6 (1974) 3/4: 309-315

IRRD 214298 (SVOV PB9181)

(A)

This paper describes hazardous manoeuvres and their possible utilization to evaluate hazard of roadway sites. Some established hazardous manoeuvres are erratic manoeuvres, traffic conflicts, near-miss and hazardous regions of vehicle pairs. Hazard is defined as an occurrence function. The possible output consists of a continuous range of manifest severity event-accidents, hazardous and borderline maneuvers. An interval of that range is described by a subfunction of the occurrence function. The input consists of driver, environment and vehicle (DEV) variables. A random variable is interrelated with the DEV variables in the occurrence function forming complex interactions. In a comprehensive hazard reduction program, the concept of hazardous maneuvers is only a subset of the total hazard. Remedial techniques would be applied to the DEV variables as suggested by models of occurrence subfunctions and conventional traffic engineering studies.

SHIPPEY, J.

Observation and recording methods used in the traffic conflicts technique

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 152-157

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21285)

(S)

The purpose of this paper is to give a brief survey of the similarities and differences in the ways in which traffic conflict studies are made in different countries for use as a background for discussion at the 2nd International Workshop on Traffic Conflicts Technique. The paper summarises the main elements of each organisation's operational definition of a traffic conflict and categorises the observation techniques employed.

SPICER, B.R.

A pilot study of traffic conflicts at a rural dual carriageway intersection

TRRL Report LR 410

(Transport and) Road Research Laboratory, Crowthorne, 1971. 26 p.

IRRD 200129 (SWOV PB324)

(A)

A study of traffic conflicts at a rural dual carriageway intersection has been made and the relation of conflicts with injury accidents investigated. Simple conflicts, defined as situations involving one or more vehicles taking evasive action, do not correlate closely with reported injury accidents, but serious conflicts, defined as situations involving a vehicle in at least a sudden rapid deceleration or lane change to avoid collision, correlate well with reported injury accidents both in location and time of day. It is shown that more than two vehicles were present in three quarters of the conflict cases studied. Three of the most common situations observed leading to multi vehicle conflicts are described. Speed measurements were made but no evidence was found which indicated that vehicles travelling faster than average were an important factor in the generation of accident situations.

SPICER, B.R.

A traffic conflict study at an intersection on the Andoversford
by-pass

TRRL Report LR 520

Transport and Road Research Laboratory, Crowthorne, 1972. 19 p.

IRRD 205504 (SVOV PB3292)

(A)

Further data to validate the use of traffic conflict techniques in assessing junction safety have been collected from a study at rural dual carriageway intersection in Gloucestershire.

As in the earlier study it was found that accident data and data for serious conflicts is correlated well both by time of day and place of occurrence in the intersection. The relative frequencies of various types of conflict (e.g. blocking manoeuvres, overtaking and "follow out" cases) in most cases substantiate those found in the earlier study. Observation of vehicle manoeuvres prior to and during serious conflicts again revealed that vehicles other than the two immediately involved were present in over 60 percent of the cases. Unlike the earlier site the conflict and accident rates at this intersection increased with increasing vehicle flow. The study of vehicle conflicts at this intersection has led further to an assessment of driver behaviour and other associated factors. These include driver age, crossing time, path taken and vehicle speed.

The investigation provides further justification for the use of the traffic conflict technique and indicates ways in which it can be developed.

SPICER, B.R.

A study of traffic conflicts at six intersections

TRRL Report LR 551

Transport and Road Research Laboratory, Crowthorne, 1973. 15 p.

IRRD 206302 (SVOV PB2566)

(A)

Traffic conflict data have been obtained for six intersections using the technique of observation and definition of conflicts established in a previous study at one of the sites. Serious conflict and injury accident frequencies are shown to be positively related between different junctions and between different locations within a given junction. These data validate the use of the traffic conflict technique as a relatively rapid method of study of junction safety. At each intersection studies of vehicle speed and flow have been made and the important influence on conflicts of vehicles other than those primarily involved has again been shown.

SPICER, B.R., WHEELER, A.H. & OLDER, S.J.

Variation in vehicle conflicts at a T-junction and comparison with recorded collisions

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 99-101

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21276)

(S)

A study has been made of the numbers of vehicle conflicts occurring over a period of six months at a T-junction where two main roads meet. Daily and hour of day conflict count numbers were obtained for week days during the period of study. A marked pattern of variations in conflict numbers with hour of day was found. It was found that prediction, usually within about 10% of the true value, of the long terms daily average of conflict numbers could be made from two or three days' counts. For the full report see TRRL report SR 545.

SPICER, B.R., WHEELER, A.H. & OLDER, S.J.

Variation in vehicle conflicts at a T-junction and comparison with recorded collisions

TRRL Supplementary Report 545

Transport and Road Research Laboratory, Crowthorne, 1980. 28 p. + app.

IRRD 248519

(A)

A study has been made of the numbers of vehicle conflicts occurring over a period of six months at a T-junction where two main roads meet. Daily and hour of day conflict count numbers were obtained for week-days during the period of study. There was no evidence of either a day of week or a seasonal effect on these counts. However, although there was no regular pattern, definite day to day variation did exist. A marked pattern of variation in conflict numbers with hour of day was found. In both cases relations were demonstrated between conflict numbers and vehicle flow. The closest relation appeared to be that by hour of day. It was found that prediction, usually within about 10 per cent of the true value, of the long term daily average of conflict numbers could be made from two or three days' counts at this site. Collision data, recorded by times lapse cine film over the full 6 months of study, were not sufficient to make a meaningful comparison with recorded conflicts.

STORR, P., WENNEL, J. & MCDOWELL, M.R.C.

A microprocessor based system for traffic data collection

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 64-78
TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21273)

(S)

For some time the driver behaviour at non-urban T-junctions has been studied by video recording. This paper describes the design and construction of an alternative system to collect traffic data and transfer it to a control computer for processing. The use of this new system in recent observation of traffic behaviour at T-junctions is discussed and compared with the video techniques used before.

STATENS VAEGVERK

Faeltmaetningar avseende fordons- och gaangtrafikens framkomlighet i signalreglerade korsningar (Traffic surveys concerned with the passage of pedestrians and vehicles at signalized intersections)
TV 127

Statens Vaegverk, Stockholm, 1977. 104 p.

IRRD 228522

(I)

This report describes three investigations concerning traffic flow at signalized intersections. The studies consider: (1) the conflicts between left-turning and opposed vehicle traffic, (2) the conflicts between pedestrians and turning vehicles, and (3) the effects of approach width and lane markings on the saturation flow of non-turning vehicles. In the first study the conflict is characterized by the time interval. The results show a time interval of 4.8 seconds for minor intersections. The time interval increases with the size of the intersection and was found to be less in Stockholm (population 1 million) than in Malmö (population 250.000). The parameter measured in the second study was the difference in expected arrival time at a point of conflict between the pedestrian and the vehicle. The results show that a vehicle driver usually rejects a time advantage relative to a pedestrian unless the advantage exceeds 3 seconds. The results of the third study show that the effect of number of lanes was less than expected, due to parallel queues in wide lanes, and that the optimum lane width was between 3 and 4 meters.

STATENS VAEGVERK

Manual foer konfliktstudien paa landsbygd (Manual for conflict studies in rural areas)

Statens Vaegverk, Borlaange, 1979, 23 p.

IRRD 246652

(I)

This report concerns conflicts. A conflict is a situation where two traffic elements are approaching and would collide if no one of the road users had manoeuvred to avoid a collision. Conflict studies is a method for studying road safety problems at demarcated places, especially intersections. This report presents the four stages in conflict studies: planning, realization, evaluation and following-up. In the planning stage decisions have to be made upon time of the observations, necessary number of observations, the definition of observation beats and the number of observers and their position. In the realization stage, every conflict is registered by estimation of distance to collision spot and speed. The evaluation stage consists of completion of registration form, selection of measure, and following-up of effect of measure. In the following-up stage, the results have to be analysed concerning description and information of place, observation plans, registration form and realized measure.

STEINE, S.

Gang- og sykkelveggar i Trondheim (Foot- and cyclepaths in Trondheim, Norway)

Institutt for by- og regionplanlegging, Norges Tekniske Hoegskole, Trondheim, 1974. 65 p.

IRRD 237100

(I)

The thesis reviews the foot- and cyclepath system within the city of Trondheim, Norway. The first part discusses generally different problems concerning foot- and cyclepaths, such as: traffic volume (number of cars, cycles, pedestrians), the advantages and disadvantages of walking or using a bicycle in relation to cartraffic, the conflicts between the two forms of traffic, accident risk, geometric design, standards and specifications and the problem of safe crossings. Proposals are made for developing a network of foot- and cyclepaths in the city of Trondheim, and possible solutions are outlined. A more detailed plan is presented for a smaller area, Moholt, in Trondheim. Finally the way in which the responsibility for the planning and building of safe foot- and cyclepaths should be organized is discussed.

STOCKON, W.R.; MOUNCE, J.M. & WALTON, N.E.

Guidelines for application of selected signs and markings on low-volume rural roads

In: Traffic control; Signals and other devices, Transportation Research Record 597, pp. 26-32
Transportation Research Board, Washington, D.C., 1976

IRRD 227078

(A)

Existing standards and guidelines for the application of signs and markings are unsuited and inefficient for use on low-volume rural roads (roads with less than an average of 400 vehicles/day). To alleviate this inadequacy, several potentially hazardous situations were evaluated to ascertain actual needs for signs and markings as they relate to economy and safety. These evaluations were based on recent research and on probability of conflict analyses with regard to the needs for signing and marking of intersections, horizontal curves, and sections of inadequate passing sight distance. The research revealed that more efficient intersection control can be attained from the careful application of stop signs and cross-road warning signs based on approach speed, sight distance, and combined intersections volumes. Treatment of horizontal curves can be made more efficient through the application of more stringent guidelines without adversely affecting safety. Striping of no-passing zones was found to be very inefficient in most instances because the probability of conflict in these situations is virtually nil; guidelines for alternative treatments are presented. Overall, the authors felt that application of guidelines suited to the rural context would result in savings in time, money, and frustration on the part of responsible agencies.

TAYLOR, J.I. & THOMPSON, H.T.

Identification of hazardous location

Final report. Report No. FHWA-RD-76-44
Department of Transportation, Federal Highway Administration, Washington, D.C. 1976. V + 142 p.

IRRD 229296 (SVOV PB13967)

(I)

The principal objectives of the research project were to develop and verify procedures for identifying hazardous locations on all highway facilities except freeways and those systems within the Central business district (CBD). A hazardousness rating formula (HRF) was developed which incorporates both accident and non-accident measures or predictors. The intent of such a formula is to supplement, rather than replace, accident record systems in establishing the relative hazardousness at spot locations within the highway system. The formula provides a means for establishing a hazardousness index for any suspect site. The HRF incorporates data inputs regarding the number of accidents per year, accident rate (accidents per million entering vehicles), accident severity, sight distance, volume/capacity ratio, traffic conflicts, erratic manoeuvre counts, and two subjective indicators: driver expectancy and information system deficiencies. The form, control values for establishing three levels of hazardousness (normal, hazardous, and very hazardous), and scaling charts necessary to convert raw data values into a hazardousness indicator value are presented for each indicator. The concept of the hazardousness rating formula to assess relative hazardousness at spot locations appears to be valid, based on the results of workshops conducted as part of the research project, and limited statistical analysis of data from 12 study sites.

TAYLOR, J.I. & THOMPSON, H.T.

Determining hazardousness of spot locations

In: Evaluation of transportation operational improvements, Transportation Research Record 630, pp. 38-43
Transportation Research Board, Washington, D.C., 1977

IRRD 233594

(A)

This paper presents a procedure to assess hazardousness at spot locations on all highway facilities except freeways and in central business districts. Indications of hazardousness included in the rating procedure are number of accidents per year, accident rate in terms of annual traffic volumes, accident severity, volume/capacity ratio, sight distance, traffic conflicts, erratic maneuvers, driver expectancy, and information-system deficiencies. A raw-data format was selected for each of these indicators, and a scaling technique was developed that permits the combination of inputs from the several indicators to produce a hazardousness rating on a scale from 0 to 100. The procedure may be used even if data on all indicators are not available for a given site (level of confidence in the results diminishes). Sixteen traffic engineers and safety experts, representing 14 states, were invited to two workshops to review the procedures formulated and to assist in establishing the weights to be assigned to each of the indicators. The general concept underlying the convergence-of-evidence procedure is highly acceptable to the safety personnel who participated in the workshops. Of special note is the development of a workable form for obtaining subjective evaluations of hazardousness in various highway situations.

TAYLOR, J.I. & THOMPSON, H.T.

Identification of hazardous locations: a users manual.

Pennsylvania Transportation Institute, Pennsylvania State University, Pennsylvania, 1977. 89 p.

IRRD 236532 (SVOV PB 13966)

(I)

The objective of the research project within which this users manual was prepared was to develop procedures for indentifying hazardous locations on all highway facilities except freeways and in the Central business district (CBD). Both accident and non-accident measures, or indicators, are included in the formula proposed for establishing degree of hazardousness at spot locations within the highway system. The users manual describes and illustrates the procedure developed. A hazardousness rating formula is presented which provides a means for arriving at a hazardousness index for any suspect site. The formula incorporates data inputs for three accident indicators (number of accidents per year, accident rate, accidents per million entering vehicles), and accident severity; four objective non-accident indicators (sight distance, volume/capacity ratio, traffic conflicts, and erratic manoeuvre counts); and two subjective non-accident indicators (driver expectancy and information system dificiencies). Data requirements and collection procedures are defined, the necessary charts and computation forms are presented, and an illustrative example is provided.

TEPLY, S.

Comparative traffic behaviour

Traffic Eng. Control 19 (1978) 12: 569-71.

IRRD 238121

(A)

This article discusses a traffic behavioural framework for evaluating applicability of foreign experience in traffic management. Safety and capacity are used as the basic criteria for the model of traffic behaviour. Evaluation methods using 'critical incidents' and 'traffic conflicts' are examined, and a systematic table of elements of traffic behaviour is presented.

TRANSPORTFORSKNINGSDELEGATIONEN

Tillbudsrapportering och tillbudsanalys inom vaegtrafiken

(Near accident reporting and analysis)

TFD 1979:3.

Transportforskningsdelegationen, Stockholm, 1979. 73 p.

IRRD 241010

(I)

The purpose of the project was to develop a method for collecting and analysing information about near accidents in road traffic. Two pilot studies were performed. In these a total of 75 subjects reported all near accidents over a two week period. Before each experimental period meetings were organized in order to inform the subjects about the project and its aim. Using several examples a clear precise definition of a near accident was presented. The definition reads as follows: A near accident is an event which could become an actual accident. During the course of driving something may happen suddenly, which could result in a collision with a third party or vice versa. This situation may necessitate sudden evasive action by persons involved such as braking, swerving or accelerating in order to avoid a collision. During the test periods the subjects completed structured notes on a daily basis and a questionnaire for each near accident. A photographic record of the location of the near accident was made and, in most cases, the subject concerned was interviewed. The success of the pilot study was judged by the following points: (A) the number of reported near accidents, (B) the quality of details in the reported information, and (C) the relation between reported near accidents and accident statistics. The results show that although the subjects had diligently filled in the forms, important information about the traffic environment was missing. The photographic records seemed to provide this information.

VAN DER LINDEN, H.R.

Conflictobservatie: De ontwikkeling van een meetinstrument (Conflict observation: The development of a measuring instrument)

Verkeersdienst Rotterdam, Rotterdam, 1975. 35 p.

IRRD 231876 (SWOV PB12753)

(I)

The conflict observation method was developed in 1967 by General Motors Research Laboratory. The method is based on survey research used in the behavioural sciences. The validity and reliability of the conflict observation method is studied, and it is shown that further research is needed in particular on how the method can be improved for the recording of accidents.

VERHOEVEN, A.J.

Analyse bij bijna-ongevallen op overwegen (Analysis of near-miss accidents on level roadway crossings)

Rijksuniversiteit Utrecht, Utrecht, 1970. 25 p.

(SWOV PB4778)

(S)

The study is done to get a deeper understanding to the factors which play a role in near-miss accidents. An overview of level crossings which had a high near-miss accident rate was made and some conclusions were drawn, a.o. the most interesting common characteristics of level crossings.

VERKEERSBUREAU AMSTERDAM

Vergelijking van kruispuntontwerpen met betrekking tot de te verwachten ongevalsvatbaarheid door toepassing van de conflictpotentieelmethode (Junction lay-outs related to their accident potential by using the conflict method)

Verkeersbureau Amsterdam, Amsterdam, 1974

(SVOV PB12809 fo)

(S)

A comparison is made to different lay-outs of junctions at regarding their accident proneness. From the point of view of safety an interchange is, of course, more safe than an intersection. Much more research is wanted, o.a. to develop a method for a conflict-analysis on junctions.

WENNELL, J., STORR, P., DARZENTAS, J. & MCDOWELL, M.R.C.

Emperical studies of driver behaviour at T-junctions and use of a simulation model to study conflicts

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 79-88

TRRL Supplementary Report 557

IRRD 248611 (SVOV PB21274)

(S)

A simulation model to predict conflicts at a non urban T-junction has been developed. A general description of the model, and some preliminary results relating conflicts to flow and speed are presented. If the model is to be used to assess accident risk at junctions, one must be able to relate the conflicts predicted by the model with the injury accident record at such junctions. Emperical data from an appreciable number of junctions must be collected to provide details of the parameters needed as input to the model. An investigation of the relationship between model conflicts and accidents may then be conducted.

WILLIAMS, M.J.

Validity of the traffic conflicts technique

ARRD Internal report AIR 239-1.

Australian Road Research Board, Vermont South, 1980. 18 p.

IRRD 239637 (SVOV PB16301)

(A)

The traffic conflicts method was developed as a tool for estimating accident potential at intersections and for indicating methods of reducing hazardous conditions. A review of evaluation studies fails to confirm that the method can perform these tasks.

This results partly form methodological problems in the studies. Differences in the definitions of both accidents and conflicts have produced results which often are incomparable simply because different pairs of variables have been used in the analysis. Other theoretical inconsistencies appear to limit the likelihood of predicting accidents from conflicts. It is suggested that a hierarchy of traffic events ranging in severity from slight conflicts to fatal accidents exists. Certain fundamental characteristics of these events (including time of occurrence, type of manoeuvre, location and probable cause) differ so markedly that the prediction of one from the other may not be possible. Evidence is presented which indicates that neither accident nor conflict data, recorded using present methods, is of much value in predicting future accidents or conflicts, respectively.

It is suggested that a new method of recording conflicts which overcomes the conceptual problems of previous definitions may be useful in evaluating countermeasures. This would require a change in the criterion used for assessing the benefit of a particular countermeasure from one of reduction in accidents to one of eliminating predetermined improper driving behaviour or operational problems.

WILLIAMS, M.J.

Validity of the traffic conflicts technique

Accident Analysis and Prevention, vol. 13, 1981: pp. 133-145

IRRD 257076

(A)

The traffic conflicts technique was developed as a tool for estimating accident potential at intersections and for indicating methods of reducing hazardous conditions. A review of evaluation studies fails to confirm that the method can perform these tasks. This results partly from methodological problems in the studies. Differences in the definitions of both accidents and conflicts have produced results which often are incomparable simply because different pairs of variables have been used in the analyses. Other theoretical inconsistencies appear to limit the likelihood of predicting accidents from conflicts. It is suggested that a hierarchy of traffic events ranging in severity from slight conflicts to fatal accidents exists. Certain fundamental characteristics of these events (including time of occurrence, type of manoeuvre, location and probable cause) differ so markedly that the prediction of one from the other may not be possible. Evidence is presented which indicates that neither accident nor conflict data, recorded using present methods, is of much value in predicting future accidents or conflicts, respectively. It is suggested that a new method of recording conflicts which overcomes the conceptual problems of previous definitions may be useful in evaluating countermeasures at least as an experimental tool. This would require a change in the criterion used for assessing the benefits of countermeasures from one of the reduction in accidents to one of eliminating predetermined improper driving behaviour or operational problems.

ZAIDEL, D.; KATZ, A. & ALGARISHI, A.

A case study of pedestrian-vehicle conflict

Publication No. 77-7

Technion - Israel Institute of Technology, Haifa, 1977. 10 p.

(SVOV PBI2810)

(S)

The pedestrian crossing behaviour was studied on a divided four lane street. The street was divided naturally into two parts by a signalized intersection, one part having a pedestrian safety fence the entire length of the raised median, the other part (with the same street geometry) having no safety fence in the median. The following aspects were studied: pedestrian pathways across the street; pedestrian risk taking; micro traffic conditions and pedestrian-vehicle conflict.

ZEGEER, C.V.

Development of a traffic conflicts procedure for Kentucky

Research report 490

Kentucky Department of Transportation, Lexington, 1978. 26 p.

IRRD 236220

(A)

The objective of this report was to develop a procedure for the collection and use of traffic conflict data. Data were collected at five intersections to determine characteristics of conflicts. Observer reliability was found to be excellent. Traffic volumes accounted for only about 30 percent of the variation in numbers of conflicts. At one intersection, repeatability of conflict numbers, rates, and types was found to be very good. A total of 6,535 conflicts and 2,957 benign weaves were observed at the test sites based on the data, recommendations were made for collecting data during three peak hours at each site. Revised conflict data sheets were developed for signalized and nonsignalized intersections. The conflict diagram is illustrated and recommended for use. Collection of conflict data is recommended during inspection of suspected hazardous locations.

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ZEGEER, C.V.

Traffic conflicts, erratic manoeuvres, and near-miss accidents:
state-of-the-art

Research report 484.

Kentucky Bureau of Highways, Department of Transportation, Lexington,
1977. 30 p.

IRRD 241621

(A)

Definitions are given for the various types of traffic conflicts, erratic manoeuvres, and near-miss accidents. The General Motors technique for observation of traffic conflicts is summarized. Procedures used by several highway agencies for collecting conflict data are also detailed. Criteria which have been used to identify hazardous intersections using traffic conflict data are summarized. Methods and examples of evaluating safety improvements are detailed. Relationships between conflicts and accidents found by others are given. The procedure for observing traffic conflicts on freeway ramps is described. Definitions are given for erratic manoeuvres at lane drops, gore areas, and intersections. Results from studies which utilized counts of erratic vehicle manoeuvres are mentioned. The concept of near-miss accidents and the time-to-accident concept, as currently used, are explained. Advantages and limitations are given for the use of conflicts, erratic manoeuvres, and near-miss accidents in identifying hazardous sites and evaluating safety improvements.

ZEGEER, C.V. & DEEN, R.C.

Traffic conflicts as a diagnostic tool in highway safety

Research report 482

Kentucky Department of Transportation, Lexington, 1977. 12 p. + app.

(SVOV PB15437)

(A)

Because of the shortcomings in accident data, such as incomplete reporting and inaccurate information on accident reports, a need was found for indicators of accident potential. Nearly half of the 209 locations identified in Kentucky as hazardous by accident criteria were found to be falsely identified due to random accident occurrences. Accident repeatability from one year to the next was found to be poor at 60 intersections ($r = 0.64$) and 170 spot locations ($r = 0.59$). Up to two years of accident data were found to be necessary to obtain a reliable base of accident data.

Conflict counts were conducted at five intersections in Central Kentucky to determine characteristics of conflict data. Good reliability was found between observers in simultaneous counts of conflicts and weaves with r-values as high as 0.93. Traffic volumes accounted for only about 30 percent of the variation in numbers of conflicts. Conflict numbers, types, and rates were found to be very repeatable at one intersection. A revised procedure for collecting data in Kentucky, which increased the sample size and reduced the required manpower, was described. Modified data sheets were also developed for signalized and unsignalized intersections.

Results from evaluations of safety improvements in Kentucky using conflicts, erratic maneuvers, and accidents were summarized. Reductions in accidents (85 percent) and conflicts (81 percent) were found at intersections where left-turn signal phasing was added. Installation of green-phase extension resulted in conflict and accident reductions of 62 and 54 percent, respectively, at several high-speed intersections. Erratic maneuvers were reduced by 27 percent after installing raised pavement markers at five freeway lane-drop locations. Procedures for intersection analysis using conflict diagrams were described. Conflict

counts were recommended during routine inspections of suspected hazardous locations.

ZEGEER, C.V.; DEEN, R.C.; YAUCH, P.J. & PARSONSON, P.S.

Traffic conflicts as a diagnostic tool in highway safety.

In: Highway Capacity, measures of effectiveness, and flow theory, Transportation Research Record No. 667, pp. 48-57
Transportation Research Board, Washington, D.C., 1978.

IRRD 241938

(A)

Accident repeatability from one year to the next was found to be high at 60 intersections ($r=0,64$) and 170 spot locations ($r=0,59$). Nearly half of the 209 Kentucky locations designated as hazardous by accident criteria were found to have been so identified falsely because of random accident occurrences. Conflict counts were conducted at 5 intersections in central Kentucky to determine characteristics of conflict data. Good reliability was found between observers in simultaneous counts of conflicts and weaves with r values as high as 0,93. Traffic volumes accounted for only about 30 percent of the variation in numbers of conflicts. Reductions in conflicts and accidents that resulted from such safety improvements as installing left-turn signal phasing, raised pavement markers, and green-extension systems at numerous locations were determined. A revised procedure for collecting and utilizing conflict data is described.

ZEGEER, C.V., RANDOLPH, D.A., FLAK, M.A. & BHATACHARYA, R.K.

Use of pedestrian conflict analysis for hazard assessment in school zones

Transp. Res. Rec. 743 (1980): pp. 4-11

IRRD 253277

(I)

The purpose of this study was to develop and test a traffic conflicts procedure to assist in the early identification of hazardous school-zone locations. Various pedestrian conflict types and severities were used to collect data and analyze 10 school-zone sites in the Rochester school district. Multivariate linear regression techniques resulted in high correlations between pedestrian conflict levels and site-related traffic and highway variables. A subjective danger index was developed based on various pedestrian conflicts and events. The 10 school-zone locations were priority ranked based on danger index and other conflict measures. A systematic flowchart procedure was used to help select site improvements based on conflict types, safety deficiencies, and corresponding safety improvements. Although pedestrian conflicts were found to be related to know hazardous conditions at the test sites, the relationship between pedestrian conflicts and pedestrian accidents has not been quantified. Further testing of accident-conflict relationships is recommended.

ZIMMERMAN, G.; ZIMOLONG, B. & ERKE, H.

The development of the traffic conflicts technique in the Federal Republic of Germany

In: Proceedings of the First Workshop on Traffic Conflicts, Oslo, 1977, pp. 99-110

T.Ø.I., Oslo / L.T.H., Lund, 1977

(SVOV PB12912)

(S)

The traffic conflicts technique is intended for application in a large number of problems, especially as a diagnostic instrument; as an experimental evaluation of traffic facilities and as an instrument for traffic observation and control. A definition of conflicts, methods of conflict measurement, study design and measurement technique and future research are discussed.

ZIMOLONG, B.

Traffic conflicts at urban junctions

In: Proceedings of the second international traffic conflicts technique workshop, Paris, 1979, pp. 130-139

TRRL Supplementary Report 557

IRRD 248611 (SWOV PB21283)

(S)

The Traffic Conflict Technique (TCT) is a device for indirect safety measurement. The basis for the definition of conflicts is a sequence of events which has a finite probability of developing into an accident. The investigation of TCT in Germany was performed in three stages (1) Development of a standardized observation technique (2) Validity studies of conflicts, and (3) Practical applications.

ZIMOLONG, B.

Traffic conflicts a measure of road safety

Road Safety, research and practise. Foot, H.C. et al. (eds.), Cartbourne, 1981, pp. 35-41

IRRD 258855 (SWOV PB21333)

(I)

Traffic accidents are the best-known measure for gauging road safety in both rural and residential areas. However, attempts to estimate the relative safety of locations are usually problematic because of the unreliability of accident records and the time required to accumulate adequate sample sizes. Hence the Traffic Conflicts Technique (TCT) was developed to measure traffic hazards at particular sites. In practice, however, the use of traffic conflicts as a measure of safety gives rise to a number of problems. Results of reliability and validity studies are presented.

ZIMOLONG, B.

Verkehrskonflikttechnik; Grundlagen und Anwendungsbeispiele (Traffic conflicts technique, principles and examples of application)
University of Technology, Institute of Psychology, Brunswick. Unfall- und Sicherheitsforschung Strassenverkehr, Heft 35. Bundesanstalt für Strassenwesen, BAST, Köln, 1982

(SVOV PB21332)

(A)

The traffic conflicts technique is based on the consideration that observable road user interactions are the result of decisions made in situations involving elements of risk or danger. These decisions can lead to safe encounters or confrontations, conflicts, or else to accidents. The number of confrontations and conflicts, just like the number of accidents, can be used to determine the degree of safety or danger associated with traffic facilities. By means of identifying conflicts, the exposure of road users in specific situations can be analyzed employing a standardized observation procedure. The relationship between conflicts and accidents is checked on the basis of statistical correlations.

In the first part of this compilation of all research projects, which are carried out for the BAST under contract, the research approach to the traffic conflicts technique is described in detail.

In the second part of this compilation, two case studies are presented. At first, the effects of the installation of traffic lights on road safety are determined by means of a "before and after" study and the comparison of the number of conflicts and accidents and, second, the results of a traffic conflicts technique study conducted in Rouen, France, are presented within the frame of a cross-national comparison.

ZIMOLONG, B. & ERKE, H.

Experimental validation of traffic conflict technique
University of Technology, Institute of Psychology, Brunswick, 1977

(SVOV PB12811)

(S)

In an effort to proof the valid connection between conflicts and accidents observations of conflicts were done at 6 approaches to road intersections.

Starting out from an American recording manual the types of conflict were changed in a way that an assignment to the accident categories of the official list of the causes of accidents was possible. Further, a new breakdown of the seriousness of conflicts had to be developed. The recorded conflicts were set off against the accidents of the past 3 years. A multiple regression rate featuring the criteria of the quantity of traffic and degrees of the seriousness of conflicts lead to a satisfactory forecast of accidents.

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ZIMOLONG, B.; ERKE, H. & GSTALTER, H. (eds.)

Feststellung und Bewertung von gefährlichen Konfliktsituationen im Innerortsverkehr. Die Verkehrskonflikttechnik als Instrument zur qualitativen Kennzeichnung von Verkehrsanlagen: (1) Validierungsstudie im Knoteninnenbereich.

Technische Universität Braunschweig, Braunschweig, 1978. 81 p.

(SWOV PB14728)

(S)

The Traffic Conflict Technique as developed in the U.S.A. was only valid for forecasting accidents for roads without junctions. For junctions only partly evaluations could be obtained. Therefore the conflicts at junctions have been observed. From these observations the conflicts between left turn drivers with the oncoming drivers or through going traffic give a basis for a better measurement and forecasting.

ZIMOLONG, B.; ERKE, H. & GSTALTER, H.

Feststellung und Bewertung von gefährlichen Konfliktsituationen im Innerortsverkehr. Die Verkehrskonflikttechnik als Instrument zur qualitativen Kennzeichnung von Verkehrsanlagen: (2) Fahrzeug-Fuszgänger-Konflikte

Technische Universität Braunschweig, Braunschweig, 1979. 92 p.

(SWOV PB15955)

(S)

After in earlier research by the same authors the evidence of a close correlation between conflicts and accidents on junction access roads and in the neighbourhood of junctions could be shown, this conflict technique is used for the interaction between the vehicle and the pedestrian. The purpose of the study is the development of a method for the observation of vehicle-pedestrian.

ZIMOLONG, B., GSTALTER, H. & ERKE, H.

Traffic conflicts at urban junctions, reliability and validity studies
University of Technology, Institute of Psychology, Brunswick, 1980

(SVOV PB17945)

(A)

The Traffic Conflicts Technique serves as an observation method for indirect safety measurement, especially as a diagnostic instrument to localize hazards and to predict accident frequencies. Encounters, conflicts and accidents are observable traffic events which can be ordered on a risk continuum. Empirical relationships between them can be computed.

In this report, study design and results of our reliability and validity studies since 1976 at signalized and nonsignalized junctions are summarized. Conflict reliabilities for complete weekdays at both types of junctions prove to be high, within weekday conflict variations are reproducible. Conflict validity is estimated as correlation between conflicts and accidents. Regression functions of accidents on conflicts were found to depend on type of site and type of conflict. Generally the relationships between accidents and conflicts prove to be valid.

ZIMOLONG, B.; SCHWERDTFEGER, W. & ERKE, H.

Erhebung von Verkehrskonflikten an Knotenzufahrten (Census of conflicts at junction access roads)
Zeitschrift für Verkehrssicherheit 23 (1977) 2: 51-58

IRRD 306925 (SVOV PB12812 fo)

(A)

The registration of critical traffic situations with the aid of the traffic conflict technique permits the determination of danger points in road traffic. The method requires the proof of a valid connection between conflicts and accidents.

Starting out from an American recording manual the types of conflict were changes in a way that an assignment to the accident categories of the official list of the causes of accidents is possible. Further, a new breakdown of the seriousness of conflicts had to be developed. The conflicts were recorded at 6 approaches to road intersections and set off against the accidents of the past 3 years. A multiple regression rate featuring the criteria of the quantity of traffic and degree of the seriousness of conflicts lead to a satisfactory forecast of accidents.

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ZUERCHER, R.

Der Beinahe-unfall am Fussgängerstreifen (The near miss at pedestrian crossings)

The Voice of the Pedestrian (1978) 9: 53-63

IRRD 236296 (SVOV PB13469)

(I)

For a traffic safety campaign on communication at pedestrian crossings it is necessary to study the objective data on the behaviour of the pedestrian and the drivers in near miss situations. From these data it is shown that pedestrian crossings are conflict points, at which accidents are likely to occur. Critical situations arise at these crossings because of the fact that pedestrians and drivers do not pay attention to each other. The solution does not lie alone in the change of their attitudes but also in the improvement of the information given relating to such places.

ZUERCHER, J.D.; SASS, E.J. & WEISS, J.M.

Analysis of near-accidents and accidents on the highway
Behavioural Research in Highway Safety 2 (1971) 2: 98-106

IRRD 204882 (SVOV PB4433 T)

(A)

The cause of accidents on the highway can be attributed to three main factors: (1) the highway itself, (2) vehicle(s), and (3) driver(s). Using the Critical Incident Technique, observers were asked to clearly recall an accident or near-accident and to judge the elements leading up to the incident. Two samples were polled: college students and taxicab drivers. The driver himself was blamed for the accident or near-accident much more than either the highway condition or the vehicle(s). Inattention and excessive speed were the most commonly mentioned factors, and driver skill was most frequently listed as the element responsible for either avoidance of an accident or reduction of its seriousness. The driver himself, including his attention, judgment, and skill, was seen as the important ingredient for safety on the highways.