



SWOV
Institute for
Road Safety
Research

RESEARCH ACTIVITIES

3

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Moped: a type of motorcycle or a type of bicycle?

Since the introduction of the moped in the Netherlands, Dutch law has required that they - being regarded as a type of bicycle - use cycle tracks wherever they are available rather than the carriageway.

For a number of years discussion has been taken place in the Netherlands whether or not it would be safer for bicyclists when moped riders were to make use of the carriageway instead of the cycle tracks.

In practice, approximately 70% of the moped riders exceed the speed limits. Therefore particularly inside built-up areas, the speed differences between mopeds and bicycles are much larger than the speed differences between mopeds and other motorized vehicles. The idea is that it could be safer if moped were directed to the carriageway.

In order to investigate the effect on safety of 'removing' the moped from the cycle tracks, a field experiment was set up in (parts of) three Dutch cities. An experimental situation incorporating the new measure was set up in these three cities: from 1 November 1991, mopeds were directed from the cycle track onto the carriageway of a number of roads with a maximum speed limit of 50 km/hour. Behavioural observations and accident data

were used to assess this measure.

The accident study had a before-after design with experimental and control areas. The pre-introduction period involved three years, 1989-1991; the post-introduction period involved the year 1992. In all three cities the public was informed about the introduction of the measure through pamphlets, posters and the local newspapers. Obviously, road users were also notified by signs on the side of the road and at intersections.

Behavioural observations

The behavioural observations showed that the speed driven by moped riders increased after the

measure was introduced. Six months after its introduction, the average speed of mopeds on carriageways was registered at between 44 and 45 km/hour. The speed limit for moped riders is 30 km/hour inside built-up areas. Around two-third of the mopeds drove at the same speed as the faster moving traffic with which they were sharing the road. The average speed of this general traffic was between 49 and 50 km/hour. In mid-1992, it appeared that an average of 85% of the moped riders were complying with the new measure. At the beginning of September 1993, compliance with the new measure was reasonable: an average of 80% of the moped riders respected it.

Accident study

It was shown that the measure 'mopeds on the carriageway' has exerted a favourable effect on injury related moped accidents: their number has been halved in the experimental areas. The same result is found for the number of accident victims. In particular, accidents between moped riders and cyclists and between moped riders and vehicles have been considerably reduced.

Moped: a type of motorcycle or a type of bicycle?	1
International study on the effects of black boxes on traffic safety	2
New list of SWOV publications available	3
Study into 100 km/hour limit for buses	4
Evaluation of the Dutch Incentive Scheme Campaign -25%	5
Infrastructure design and road safety in Central and Eastern Europe	6
Road safety in Poland, the GAMBIT project	7
Pilot projects for a sustainably safe road network in The Netherlands	8
Cost-benefit study	9
Road safety policy seminar organised by World Bank	10
SWOV reports in brief	11



Conclusions

Although after a year, the overall effect of directing mopeds onto the carriageway has been a positive one, the evidence is still not conclusive enough to warrant introducing the measure on a large scale.



One of the moped riders who is not obeying the rule to drive on the carriageway.



Marjan

Hagenzieker is 33 years old and studied psychology at the Leiden University. She is working for SWOV since 1987 as a researcher.

She is mainly involved in research projects on visual perception, the influence of enforcement and rewarding on the behaviour of road users, and infrastructural aspects.

A follow-up period of (at least) three years is felt to be necessary before it is possible to make more conclusive recommendations. Therefore, the accident study is to be repeated in 1995. If this new study will show the same positive effects as the previous one, SWOV recommends a general measure 'mopeds on the carriageway' for situations inside built-up areas. Outside built-up areas mopeds should behave like bicyclists and use the cycle tracks, if available. The results of this study give reason for considering the position of the moped - as a type of motorcycle inside built-up areas and as a type of bicycle outside built-up areas.

Bromfietsers op de rijbaan

Ongevallenstudie ter evaluatie van de maatregel 'bromfiets op de rijbaan'

M.P. Hagenzieker
R-93-39, 50 pp.

Are mopeds a type of motorcycle or a type of bicycle?

Mopeds off the cycle tracks: safer for cyclists, moped riders and other road users. Paper presented at The Third International Conference on Safety and the Environment in the 21st Century: Lessons from the Past, shaping the Future, Tel Aviv, Israel, November 7-10, 1994.

M.P. Hagenzieker
D-94-26, 12 pp.

International study on the effects of black boxes on traffic safety

Human behaviour is an important factor in traffic safety. If drivers were able to behave according to the necessities of the actual traffic conditions, no doubt road safety would be a less serious problem. Therefore, driver attitudes and behaviour are a starting point for improving traffic safety. Drivers might be influenced, for instance by training, by publicity campaigns or by police enforcement. It is not easy to address drivers individually and to find instruments of feedback and support. Monitoring behaviour offers also a possibility for influencing it, in particular when the driver is confronted with his own behaviour. Making use of this feedback mechanism is in fact the basis of a project called SAMOVAR.

SAMOVAR stands for Safety Assessment Monitoring On vehicle with Automatic Recording. The project is part of the DRIVE 2 Research Programme of the Commission of

the European Union and it is partly financed by it. Other parts are being financed by the Dutch insurance companies. The project is being carried out by an international consortium in which the following organisations participate: Queen Mary and Westfield College of the University of London; the Motor Industry Research Association (MIRA); the Transport Research Laboratory (TRL) and Royal Mail, all from Great Britain; IMPETUS Consultants from Greece and SWOV from The Netherlands.

Objectives

Making use of the above mentioned feedback mechanism is especially worthwhile to fleet owners and insurance companies in developing and maintaining a safety policy. Information about vehicle movements and traffic incidents can be gathered by in-car recording devices, or 'black boxes'. To some extent, it might be applied for pointing out safety aspects to their drivers.

The final objective of the SAMOVAR project is to study the opportunities for improving traffic safety by confronting the driver with his monitored and recorded behaviour, making use of in-car electronic recording devices. The underlying assumption then is that drivers will act in a safer way, for instance by adapting driving speed to traffic circumstances, being aware of the fact that their behaviour is recorded - also just before and after an accident - and will be acted upon if necessary, by or on behalf of the employer.

Effects on road safety

There is some evidence in support of this assumption and substantial effects in terms of fewer accidents or less severe accidents have been claimed as well. In a specific case in Germany, installing so called 'accident reconstruction recorders' into a vehicle fleet was claimed to have resulted into 30% fewer accidents. In addition, it is reported that a British insurance company offers fleet owners a premium reduction up to 15%, on the condition that a certain make of 'trip recorder' is installed in their vehicles.

However, so far effects have not been stated formally. Furthermore, it is not yet known from what exactly they emanate, whether they could possibly be enhanced, or even if there will be positive effects in all circumstances. Nevertheless it is obvious that drivers can change their behaviour in such a way that they seem to be involved - on the average - less often, at least, in incidents.

Field trial

A quasi-experimental field trial in which such subjects are to be investigated, has been set up and has been carried out by now. Its objective is to determine the influence of the above described utilization of black boxes on traffic safety. Directly, and of prime interest, safety improvement will be assessed in terms of fewer accidents or less severe accidents. Indirectly, changes in driver behaviour related to traffic safety will be measured, in particular with respect to driving speed. The feasibility of such an experiment has already been established in the past. In a study topics were

addressed such as the suitability of different types of recorders, the cooperation with fleet owners and insurance companies, and the accessibility of the necessary accident and exposure data.

This report deals with the design of the trial, its methodology and the way behavioural and accident data can be analysed.

Mid-1995 the report for the Commission of the European Union will be finished. Several Dutch insurance companies are financing the costs of the installation of the black boxes in different kind of fleets. The results of that field trial will be reported in 1996.

Methodologies for evaluating usage of vehicle data recorders

D3-Report prepared for DRIVE Project V 2007 Safety Assessment Monitoring On-vehicle with Automatic Recording (SAMOVAR)

*J.M.J. Bos & P.I.J. Wouters
D-94-20 . 22 pp.*



New list of SWOV-publications available

SWOV has made a new list of publications which are written in English, German or French. The list contains reports, papers and articles published

in 1985-1994. If you want to receive a free copy of this list, please write or telefax us and ask for the publication with number R-95-2. If you want to

receive a list in which also Dutch contributions are mentioned, ask for publication R-95-3.

Study into 100 km/hour limit for buses

SWOV has performed a study into increasing the speed limit for buses from 80 to 100 km/hour. Apparently, under certain conditions such an increase would not have any adverse consequences for road safety when compared to the current situation. The SWOV bases this premise on the assumption that, in the near future, buses will be equipped with a speed limiter set at 100 km/hour.

The current maximum speed for buses is 80 km/hour. This limit is, however, transgressed on a large scale. Speed measurements on motorways demonstrate that the average speed of buses in the Netherlands lies above 90 km/hour. About 15% of buses drive faster than 100 km/hour. If buses were to be equipped with a speed limiter set at 100 km/hour, this would lead to a drop in both the maximum speed and in the average speed.

In combination with this speed limiter, the increase in the speed limit would have little or no effect on the speeding behaviour of bus drivers.

European aspects

On the basis of the current situation, where the 80 km/hour speed limit for buses is not complied with and not



B o b

Roszbach studied experimental psychology at the University of Amsterdam. He is 51 years old and is working at SWOV since 1970. He worked on a variety of subjects.

Nowadays his main concerns are the quality control of research proposals and research reports and intermediate and long term research programming.

enforced, there are few objections to increasing the limit. The effects on road safety if the current limit of 80 km/hour were to be maintained in conjunction with the 100 km/hour speed regulator have not been investigated in this report.

The government and interest groups have consulted at length about the speed limits to be imposed on buses, where the following factors play a role.

In the first place, European harmonisation of traffic regulations has become increasingly important, particularly where it concerns international traffic. In most countries of the European Union, the maximum speed for buses (or for a proportion of the buses) is set at over 80 km/hour. In Germany and France, for example, a limit of 100 km/hour applies.

In the second place, agreement was reached within the European Union very recently about the installation of speed regulators (set at 100 km/hour) on buses with a total weight of over 10 ton.

Practical trial in Germany

A large scale practical trial in Germany, where permission for a maximum speed of 100 km/hour on the autobahn was linked to quality specifications, has had no demonstrable negative effects on road safety. This has led to official adoption of the trial limit. As a consequence, certain buses on the German autobahn are now permitted to travel at speeds up to 100 km/hour.



Extra vehicle requirements

If the Netherlands were to decide to increase the speed limit, it is recommended that a similar regulation be introduced, whereby the 100 km/hour limit is linked to specific quality standards to which buses must comply. For example, requirements concerning the braking performance of the bus, reduction of skid sensitivity, the rigidity of the bodywork, passenger protection and access to emergency exits. The SWOV recommends that these vehicle requirements be further defined before introducing the rise in the speed limit.



Snelheidslimieten voor bussen

Veiligheidseffecten van een limietverhoging op autosnelwegen van 80 naar 100 km/hour.

(Speed limits for buses. Safety effects caused by a limit raise on motorways from 80 to 100 km/h)

R. Roszbach
R 94 32 - 25 pp.
(only available in Dutch)

Evaluation of the Dutch Incentive Scheme Campaign -25%



The Dutch Government has formulated road safety targets in the Long Term Plan for Road Safety. This plan formulated a concrete task for policy: 25% fewer road accident casualties in the year 2000 with respect to the number in 1985. Part of this plan is the so called Incentive Scheme Campaign -25%. This Campaign commenced in 1987 with the objective of involving municipalities in counteracting road hazard and encouraging them to develop more activities in this area.

An initial evaluation of the plan by SWOV led to its continuation in 1990 in a somewhat modified form. This amended plan was also evaluated.

Again, the principle of the updated campaign was that, in response, municipalities would formulate more and better policy in the field of road safety and realise better implementation of such policy. On the basis of this principle, a general study question was posed: did the updated incentive scheme and in particular the associated project subsidies lead to more and better road safety policy?

Eight points

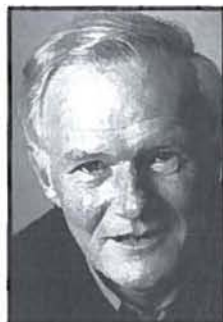
The study showed that policymakers assumed that Campaign -25% envisaged an enhancement and improvement of municipal road safety policy with respect to eight points: the amount of administrative and political attention devoted to road safety, the level of knowledge related to the field of road safety, the level and thoroughness of road hazard analysis performed, the concrete application of locally specified objectives in the field of road safety, the quantity and quality of plans, the policy performance delivered in the field of information campaigns and education, the level of financial support and finally, the degree of cooperation with external influencing factors.

Limited results

Administrative concern still proves to be a limited resource. This does not apply to the knowledge relating to road safety as utilised in the

process of policy preparation, which has certainly improved with respect to general knowledge on the subject. The campaign has offered favourable results for the quantity and thoroughness of local road hazard analyses, where in general an improvement can be noted. The study also showed that the municipal objectives in the field of road safety and the budget for road safety have hardly undergone any change. Furthermore the objectives have not been formulated in a concrete way in most cases.

Also with respect to an increase in the number of road safety plans, only a limited number of objectives have been achieved. Insofar plans were made, an improvement in their



J a n

Mulder is 55 years old and is originally an aeronautical engineer. After his study he worked at a research and development department in the (aircraft) industry.

As from 1969 he is researcher at SWOV, commissioned with drink driving, breath analyzing, speed behaviour, relations between road safety and policy.

quality was noted. In addition, a growth was noted in the number of policy achievements in the field of education and information supplied.

The anticipation that the campaign would lead to municipal budgets setting aside more funding for road safety was not realised fully. While at times there was question of an increase, in virtually as many cases the budgets remained unaltered or were in fact cut back.

Variable successes

The level of cooperation with external influencing factors led to variable successes. While in particular, cooperation with regional organs increased significantly, there was question of a serious deterioration in participation as regards interaction with the police authorities.

The financial instruments applied in Campaign -25% - start-up funding, achievement premiums and project subsidies - did not all prove equally successful. Nevertheless, they have to a greater or lesser degree managed to give more definition to the intention underlying the campaigns. A change in application of the instruments may have greater effect.

The supply of information can be considered successful and can even gain in value by also focusing it on specific target groups.

Het stimuleringsplan Actie -25% geëvalueerd

Een totaaloverzicht van de resultaten van de verschillende deelonderzoeken

(Evaluation of the Incentive Scheme Campaign -25%. A comprehensive overview of the results of the various monographs)

J. A. G. Mulder
R 94-28. 31 pp.
(only available in Dutch)

Infrastructure design and road safety in Central and Eastern Europe

OECD decided to propose joint initiatives towards Central and East European Countries (CEEC's) and New Independent States from the Soviet Union concerning technology transfer and exchange of scientific and technological information in the field of road and road transport. In this framework a series of fourteen workshops has been organised.



The concrete aims of these initiatives are to provide state-of-the-art knowledge and practices applicable to prevailing national contexts and conditions. Another aim is to identify tools, means and strategies for improvements; to recommend plans, organisational frameworks and implementation procedures and to promote feedback and evaluation of actions taken.

Some workshops have already taken place. Some are planned. Countries, participating in the Road Transport Research Programme of OECD as well as international organisations and the European Union are financing these workshops.

Workshop in Prague

In November last year a four day workshop on infrastructure design and road safety was held in Prague in the Czech Republic. This workshop was organised by the Czech Ministry of Transport and the SWOV Institute for Road Safety Research. The workshop was organised around two axes:

- presentations by CEEC experts from the Netherlands, Denmark,

Germany and the United Kingdom of overall and specific road safety problems;

- presentations by selected OECD/EU experts and consultants of the present state-of-the-art practice and technology.

It was stated that there is an intimate relationship between road safety design and management on the one hand and traffic safety on the other in terms of accident frequency and severity. The experts were highlighting and identifying these connections and were pointing to priority areas where immediate benefits will accrue through low-cost engineering measures. Introductions were held by Fred Wegman and

Pim Slop from SWOV on the following subjects: the road safety phenomenon, road design and design standards, road classification, road side safety, black spot approach, low cost engineering measures and vulnerable road users. Kenneth Kjemtrup from the Road Directorate from the Danish Ministry of Transport, Geoff Maycock from TRL in the UK and Prof. Ruediger Lamm from the University of Karlsruhe in Germany delivered papers on different topics: design of motorways, rural roads and urban streets, road signs and marking, speed and road safety, curve design etc.

In the paper mentioned below, the road safety phenomenon is described. Developments of fatalities are given for the Netherlands, Poland, Hungary and the Czech Republic and predictions are made for the future. Recommendations are given on how to increase road safety in the Central and Eastern European Countries.

The road safety phenomenon

Paper presented at OECD Workshop B3 'Infrastructure design and road safety', 15-18 November 1994, Prague (Czech Republic)

F. C. M. Wegman
D-94-29. 20 pp.



Road safety in Poland, the GAMBIT project

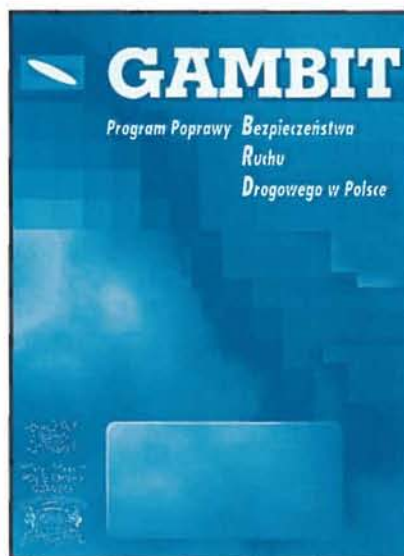
Road safety is a quality aspect of road traffic which should represent an equally important consideration in decision making. The fact that the situation in Central Europe has changed, caused a change in the situation in Poland as a transit country between East and West. It was concluded in Poland that road traffic and traffic safety cannot be considered only on a national level.

Experiences and knowledge of other countries should help to improve road safety.

Responding to two of the main recommendations of the World Bank Report on Road Safety in Poland, the Polish Government ordered a comprehensive project on the improvement of traffic safety in Poland. This GAMBIT project will be carried out over the next two years by many Polish universities and research institutes and deals with the problems of traffic safety. The GAMBIT programme is the National Programme of Road Safety Improvement in Poland. It is a research project ordered by the Minister of Transport and Maritime Economy and is sponsored by the National Committee of Scientific Research. The SWOV was asked to give a general opinion upon the contents of the GAMBIT project and to express an expectation about the future development of traffic safety in Poland. The contribution of SWOV has been realized within the framework of a 'Memorandum of Understanding' for bilateral co-operation in the field of road transport between the Dutch and the Polish Ministries of Transport.

Road safety developments

The uprise of motorized transport between 1989 and 1994 in Poland has asked for about 7,000 fatalities and more than 60,000 injured persons per year. The level of road safety in the five years before 1989 was characterized by about 4,500 fatalities and 42,500 injured persons. The economic losses from the lack of road safety in Poland over the last years can be estimated to be more than 15 billion ECU per year. National investments in the improvement of road safety are apart from the moral



need also an *economical* necessity. SWOV has made three quantitative prognoses about the development of traffic safety in Poland. The optimistic scenario is one of steep risk reduction and moderate traffic growth. The scenario of a enormous traffic growth and moderate risk reduction is the pessimistic one. The third scenario is in between. From the three model predictions it can be seen that the effect of moderate and steep risk reduction are much larger than the effects of moderate and enormous traffic growth. No matter which scenario is chosen, safety improvements of the traffic technology deserve a high national priority.

Traffic safety plan

Three conditions are essential and have to be fulfilled to cope with the problems of traffic safety. Firstly there must be the political will to acknowledge traffic safety as a problem which has to be solved. Secondly there must be knowledge about the problem and about the measures that have to be taken to

solve it. And thirdly an organizational framework has to be created in order to implement the outcomes of a plan and moreover that funds should be made available to realize the plan. SWOV investigated the organizational structure of the GAMBIT project and is convinced that the chosen procedure including the proposed contents has the potential to lead to a programme that really shall improve traffic safety in Poland.

Road safety information system

When formulating and implementing a traffic safety plan it is important that such a plan has the support of the community and that the contents of the plan has a relation with daily practice. It is necessary to visualize the problems in a very early stage. A road safety information system (RIS) has to support policy makers and researchers. Description and explanation of accident causes and accident trends, data to define and assess accident problems and basic data for evaluation of measures seem to cover a majority of answers to be given by a RIS. Such a system comprises several elements, more than data collected by the police. In the RIS SWOV has described different questions which ought to be answered by a RIS are mentioned. First it discusses what one would want to know and why. The data that should be available are marked. Furthermore attention is paid to the organisation of the collecting of data, an overview of the required data and the possible links between them.

Road safety in Poland

A contribution to the improvement of road safety in Poland in the framework of the GAMBIT project

M. Brouwer, M. J. Koornstra,
J. A. G. Mulder & F. C. M. Wegman
R 94 58 - 44 pp.

Pilot projects for a sustainably safe road network in The Netherlands

A new approach has been formulated for further improving safety, based on a joint study by Dutch research institutes and launched under the slogan 'Towards sustainably safe road traffic'. The main purpose of this approach is to develop a road traffic system which takes maximum possible account of the abilities and limitations of road users. The object is to dramatically reduce the risk of accidents, and, if accidents do occur, to virtually rule out the possibility of serious injury. Important principles underlying this new approach are: limiting the differences in speed, direction and mass of encountering vehicles; better predictability of traffic situations and road user's behaviour and preventing the improper use of the road network.

A study was conducted in which was described which information is needed to design and create such a sustainably safe road network in a region (the surroundings of Arnhem-Nijmegen); i.e. data on the road network, road functions, traffic and road features, road safety risks and the cost of work involved. The study also describes the process how to develop the road functions in a sustainably safe road network and the ultimate design. Also a description is given of the differences between the target situation and the present



P i m

Sloos is a civil engineer of 61 years old. After his study in Delft he was employed by SWOV from 1967 till 1969.

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situation. In both cases the target situation is also compared with existing plans for the future, as laid down in the regional Traffic and Transport Plan.

Classification of the Nijmegen network

An important component in achieving a 'sustainably safe road traffic' system is a classification of the road network to ensure optimum correspondence between its function, design and use. In another study a system of this kind was developed for the Dutch city of Nijmegen, as a representative medium sized municipality.

The first step was the draft of a classification for the whole of a built-up area, based on the existing road network and taking into account the most important characteristics of that network, the prevailing flow of traffic, likely developments in that flow, necessary functional road links and the existing functioning of the road network.

This classification consisted of a 'monofunctional model', which assigns only one function to every road: either a through road, a distributor road, or an access road. This model was chosen because it provides three clearly separated functional categories to which the specific functional design require-



A a d

Vis, 55 years old, is working at SWOV as a researcher for almost 30 years. Earlier, he was involved in research concerning safety barriers, submerging vehicles and the influence of the use of alcohol, medicines and drugs on traffic safety.

Recently, he carried out research on streetlighting, traffic calming and infrastructural aspects.

ments could be related. The density of coverage of the network of through traffic roads and distributor roads was partly determined using the 'travel time principle', which broadly states that after 3 to 5 minutes, all journeys can be continued on a road of a higher order. Traffic volume was not used as a criterion assigning the (traffic) function, but it did play an indicative role.

Design requirements

Subsequently, the classified road network in Nijmegen was tested against the most important future design requirements. For through roads, these were: physical lane separation, the presence of separate bicycle tracks, no intersections with access roads, and the absence of parked vehicles on or immediately next to the carriageway. For distributor roads, the design requirements were the same, with the exception of the first requirement and the requirement relating to access roads. Intersections were also tested against specific design requirements based on the 'sustainably safe road traffic' approach.

The resulting network consisted of 13 km of through roads and 47 km of distributor roads, with the remaining kilometers consisting of access roads. The network of through roads and distributor roads divided the built-up area into 22 sectors, varying from 60 to 300 hectares each. The same network contains 2 intersections of through roads, 9 intersections of through roads and distributor roads and 16 intersections of distributor roads.

The test revealed that in the existing situation, around half of the through roads and over 40% of the distributor roads (broadly) satisfy the main design requirements. On the other hand, almost none of the link roads or intersections meet all the design requirements assigned to them by the 'sustainably safe road traffic' approach. The modifications needed to bring these elements properly into line with the 'sustainably safe road traffic' requirements vary from relatively limited changes which can be included in regular maintenance work to costly fundamental overhauls.

Conclusions

The main conclusions produced by the latter study are as follows: the modifications which are felt to be needed in the existing situation vary from relatively simple to costly and far-reaching. In spite of the consequences linked to its implementation, the concept is not utopian, but offers a clear, well-considered opportunity to serve as a reference for municipal policies aimed at realising a road network which meets 'sustainably safe road traffic' requirements.



Pilotontwerp duurzaam-veilig wegennet Arnhem-Nijmegen

Eindrapport van het vooronderzoek

(Pilot project to create a sustainably safe road network Arnhem-Nijmegen. Final report of the preliminary study)

M. Slop, J. van Minnen & A. Blokpoel

R-94-33. 181 pp.

(only available in Dutch)

Categorie-indeling van wegen binnen de bebouwde kom

Een voorbeeldproject van indeling van het wegennet van de gemeente Nijmegen op basis van de uitgangspunten van het duurzaam-veilig concept

(Classification system for roads in built-up areas. A pilot project for the classification of the road network in the municipality of Nijmegen, based on the 'sustainably safe road traffic' principle)

A.A. Vis (SWOV) & D.A. Krabbendam (DHV Milieu en Infrastructuur)

R-94-23. 73 pp.

(only available in Dutch)

Cost-benefit study

In the Netherlands the traffic safety of pedestrians and cyclists has been a major concern for many years. Though both the annual number of pedestrian casualties and cyclist casualties have decreased during the past ten to twenty years, as in almost all European countries, Dutch policy aims at further reducing these numbers. Introducing tests regarding the front-end of cars, is strongly supported by the Dutch Ministry of Transport, since it is expected that both pedestrians and cyclists will benefit. SWOV carried out a cost-benefit study on this subject. This Dutch study may be seen as the third in a series of three. The other two have already been published and were carried out, respectively by TRL (United Kingdom) and BAST (Germany).

The proposed introduction of tests is meant to improve the crash safety of pedestrians in case of collisions up to 40 km/hour with cars. Three different tests are proposed, concerning the bumper, the bonnet leading edge and the bonnet top. The injury criteria are such that the majority of serious injuries of adult and child pedestrians up to collision speeds of 40 km/hour are prevented. Some additional effectiveness is expected for collision speeds over 40 km/hour. In the Dutch situation, beneficial effects are also expected for cyclists. For this reason both pedestrian and cyclist accident data have been used in this study.

The first two tests aim at reducing serious leg injuries (both lower and upper leg). The bonnet test (excluding the area of the upper windscreen frame and the windscreen itself) aims at reducing fatal and serious head injuries of adults and children.

Scope

The scope of the problem is derived from Dutch national accident data from 1991. The number of casualties, relevant to the problem of collisions with car front-ends, is at least 6,500 (pedestrians and cyclists). Nearly 200 of these casualties were killed, while 1,900 were hospitalized. It is certain that the remaining number of other (mostly slightly) injured people is in reality far greater than the 4,400 registered casualties, due to the problem of under-registration.

Costs and benefits

To calculate benefits of the mentioned provisions in terms of fatalities and serious injured saved, and translate those savings in terms

of money, reliable accident and cost data have been used, as well as more general national data on these subjects. Costs of implementation of the measure, specifically costs to be invested to improve the car front-end, are not calculated.

The gross costs pertaining to casualties have been calculated. This resulted in a 1991 value of average costs per fatality of about 415,000 ECU's. The costs per hospitalized are about 53,000 ECU's and the costs per slightly injured are estimated at 13,300 ECU's.

The effectiveness of the proposed measure has been derived from accident data, following the model used in the BAST study, mentioned before.

Using these effectiveness data, Dutch benefits of the proposed measure have been calculated, their total number being more than 750 casualties spared (of whom 11 fatalities and 263 hospitalized). In 1991 money value this means an annual benefit of 24,800,000 ECU's. These benefits are the results of the compliance of

new cars to the proposed measure. Assuming that each year, some 500,000 new cars, complying to the measure, replace the same number of older cars, the cost per new car may be up to 50 ECU's in order to keep a positive cost-benefit ratio. In view of extra cost expectations for new cars, complying to the measure as reported in the TRL study, mentioned above, this means that a positive ratio of benefits over costs of 3:1 is feasible. It is concluded that implementation of the proposed measure will be of great benefit for The Netherlands.



Cost-benefit study concerning car front impact requirements to increase the crash-safety of pedestrians and cyclists

Final Report

*L.T.B. van Kampen
R-94-31. 38 pp.*

Road safety policy seminar organised by *World Bank*

In connection with the European Union PHARE Program, the World Bank has organised a road safety policy seminar for Central and Eastern European Countries. The seminar was held in Budapest from 17-21 October last year. It was a follow up of the World Bank road safety mission which took place in 1992-1993 and dealt with 6 Central European Countries (Hungary, Poland, Czech Republic, Slovakia, Roumania and Bulgaria). The aim of the seminar was to take stock of the present situation regarding the

different aspects of road safety policies in Western and Central and Eastern Countries and to draw operational conclusions from this review. During the seminar a lot of topics were discussed, each topic chaired by two moderators, one from a Western Country and one from a Central European one. From The Netherlands two road safety specialists were present: Mr Hamelyck from the Ministry of Transport and Public Works and Mr Wegman from SWOV. Wegman's paper is summarized here (14):

It is stated that road safety development is strongly related to traffic growth and to the quality of the road transport system. This relationship requires a road safety policy which is integrated in traffic policy and in infrastructure policy. Knowledge about the quantitative relationship between traffic growth and road safety in a certain jurisdiction, combined with knowledge on the effectiveness of road safety measures and interventions opens the possibility of formulating realistic road targets and targeted

road safety programmes. A system is needed to monitor road safety trends and data which are needed for this system have to be collected on a regular basis.

The developments of road traffic and road safety in Poland are described. Traffic growth has to be accompanied by appropriate risk

reducing measures. Fatality rates tend to decrease, but only as a result of collective efforts and in no sense spontaneous. Fatality rates of 8-10% per year can be considered as realistic targets for Central and Eastern European Countries. When traffic growth is anticipated no time has to be lost to invest in safety.

Evolution of road accidents

Paper presented at Road Safety Policy Seminar for Central and Eastern Europe, Budapest, October 17-21, 1994

*F.C.M. Wegman
D-94-23. 14 pp*

SWOV REPORTS IN BRIEF

SWOV carries out research concerning road safety. Our main client is the Dutch Ministry of Transport. Therefore, most reports are written in Dutch. Sometimes however when research is carried out e.g. for the EU or other international bodies reports are written in English. SWOV researchers also participate in international conferences, workshops and seminars and contribute to international journals. These contributions are normally written in English, sometimes in German or French. Some of those are published by SWOV. In this article the available reports in English, German or French are mentioned and a summary of the contents is given. Also some Dutch reports are summarized. The complete reports can be obtained by writing a letter or telefax to Sandra Rietveld of the public information department of SWOV.

Road safety consequences of the 4-TEU-Truck

Road safety consequences of the 4-TEU-Truck. A study based on the literature, observations and interviews. C.C. Schoon. R-94-35. 37 pp. (only available in Dutch).

The 4-TEU-Truck has been used since 1993 for the transport of empty containers in the Rotterdam harbour area. The total length of the truck, linked to two more or less standard trailers, is 30 m. Since the current legislation does not permit motor vehicles longer than 18 m on public roads, an exemption has been granted for this unusual combination.

The study performed by SWOV relates to the road safety aspects of the 4-TEU-Truck, and included a literature study, traffic observations and interviews.

To an important degree, both the infrastructure of the harbour area and the minimal traffic intensity

on the connecting roads to the depots have contributed to the positive outcome of the observations. If the current conditions of exemption are upheld and the recommendations of this report are taken into consideration, then the proposed expansion with a relatively small number of 4-TEU-Trucks is not considered problematical for road safety.

Incident Warning Systems: Accident Review

Hopes, Horizontal Project for the Evaluation of Safety. DRIVE II Project V2002. Research carried out for the Commission of the European Communities. R&D programme Telematics. Systems in the Area of Transport. S.Oppe, J.E. Lindeijer (SWOV) & P. Barjonet (INRETS) R-94-50. 28 pp.

SWOV-contributions to the HOPES Annual report 1994 concerning WP 31.2, WP 32.3 and WP 31.4

Prepared for DRIVE II Project V2002 Horizontal Project for the Evaluation of Safety (HOPES). T. Heijer, J.E. Lindeijer & S. Oppe. D-94-19. 30 pp.

The purpose of traffic incident warning systems (IWS) is to make road users aware of the hazards along the road ahead. After receiving the warning, road users are expected



to reduce their speed, increase their alertness, or to divert to an alternative route avoiding the location of hazard. When they reach the problem area, they are supposed to be better prepared to avoid possible accident situations, caused for instance by shock waves. The changes in behaviour are expected to improve the efficiency of the network in the hazardous situation.

One major aim of the IWS is to increase safety. The effectiveness of such a system can be measured intermediately by behavioural improvements of road users, but should be measured finally by the reduction in the number and the severity of accidents.

The accident review which was carried out is meant to detect specific types of problems that resulted in accidents, which could possibly have been prevented if the drivers had been warned in time by an incident warning system. In this review three systems are considered. The first one is the Eurotriangle project which is part of the Belgian Antwerp ring road just before entering the

Kennedy tunnel. The second one is the Portico system: the motorway A1 near a toll station just outside Lisbon in Portugal. The last one is the Melyssa location, situated on the north-south motorway A6 in the neighbourhood of Lyon in France.

It can be stated that for a large proportion of accidents, the type and cause can be regarded as relevant for an IWS, but that special attention should be given to specific types of problems that are located dependent. Furthermore, it is to be recommended that for the coding of accident causes more objective categories and more systematic scoring procedures should be used in the European countries, to make international comparisons easier.

Influence of infrastructure and road's environment on road safety

*Paper presented at the Traffic Safety Conference, Rynia, Poland, 26-28 October 1994.
Fred Wegman. D-94-22. 12 pp.*

In this paper it is described that it is seldom easy to assess a simple accident cause. Often is critical combination of circumstances is involved. Human error is the undelying cause of almost all accidents. Proper road design is crucial to prevent human errors in traffic and less human errors will result in less accidents. To prevent human errors three safety principles have to be applied in a systematic and consistent manner as much as possible: preventing unintended use of roads, preventing large discrepancies in speed, direction and mass, and preventing uncertainty amongst road users. The function of a road should explicitly be defined in a traffic policy plan or in a plan dealing with land use planning or town planning. It turns out that road classification enables roads to fulfil their various functions satisfactorily and solves the problem of contradictory design requirements of different functions.

Road safety in The Netherlands: Policies and Management

*Contribution to the First Hellenic Conference on Road Safety, Thessaloniki, Greece, 28-29 March, 1994.
F.C.M. Wegman. D-94-8. 12 pp.*

The Netherlands is one of the highly motorised countries with a relatively good road safety record. Although, 1,300 road deaths per year and ten thousands of injured people are considered as unacceptable. The Dutch Government has set targets: to reduce the number of road deaths with 50% by the year 2010 and the number of injured people by 40%. To reach these goals six priority areas are defined: drinking and driving, accident black spots, speed, seat belts and helmets, heavy vehicles and cyclists. A rather new approach has been introduced as well: sustainably safe road transport.

Experiences from counter-measures, including the role of driver instruction and training

*Paper presented to OECD Workshop B2 Education and training of drivers, Warsaw, 3-5 October 1994.
D.A.M. Twisk. D-94-16. 13 pp.*

This paper aims to discuss how driver training may contribute to a greater safety of young and novice drivers.

The main conclusions are:

- the licensing age is too much taken for granted while it can be an effective tool in reducing young driver accident involvement;
- on theoretical grounds it is concluded that professional driving instruction has an important role to play, although the effectiveness of current driving instruction still needs to be confirmed;
- improvements can be found in the domain of cognitive skills such as hazard perception and self-assessment skills;
- driver training in itself will not suffice in lowering accident rate of young drivers.

Combinations of measures are necessarily, especially the introduction of a provisional driver licence.

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