SWOV Institute for Road Safety Research

SWOV RESEARCH ACTIVITIES 7

MARCH 1997

Information campaign to prevent neck injury improves safety behaviour

In the autumn of 1995, the nationwide campaign 'Prevent neck injury' commenced. This campaign was designed to focus attention on the safety benefits of the correct use of head rests by the occupants of passenger cars. The campaign consisted of billboards along motorways, a commercial on television and leaflets and articles in free local papers. This report deals with the question of whether the campaign was effective and to what degree. To this end, research was conducted, consisting of an observation study and a questionnaire among drivers and front passengers.

By means of the questionnaire information was gathered on the following aspects:

- *knowledge of and attitude towards the use of head rests;*
- *reported use of the head rest;*
- *reported conspicuousness of the campaign;*
- *reported effect of the campaign on the need for information and use of the head rest.*

By means of the observation study along the roadside it was determined whether the vertical adjustment of the head rests in passenger cars has changed in 1996 compared to 1995.

Improvement in knowledge

In comparison to previous research performed in Spring 1995, improvements in knowledge and self-reported use were noted.
In 1995, only one quarter of drivers indicated that they knew at what height the rest should be set.
In 1996, almost 40% could literally recite the campaign slogan 'top of head rest, top of head'. In 1995, two in five persons questioned had never adjusted the head rest (40%); in 1996, this applied to one in twelve respondents (8%).

Charles Goldenbeld, 36 years old, is working at SWOV as a researcher since 1992. Charles studied psychology at the University of Amsterdam. From 1987 till 1992 he worked at the University of Utrecht as a lecturer in the field of social psychology. He obtained his doctorate with a thesis on human aggression, based on experimental research. During the years Charles is working at SWOV he was involved in research concerning driver education, police enforcement, evaluation of road safety campaigns and surveys on attitudes and opinions of road users concerning traffic rules and measures.

Height adjustment improved

The major outcome of the study was that the actual observation of height adjustment showed a considerable improvement: from almost 40% 'good' drivers in 1995 to over 60% 'good' drivers in 1996: an improvement of about 50%. This improvement was mainly realised through a reduction in the 'observation category' ▸

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'doubtful', rather than through a reduction in the number of drivers registered in the 'wrong' category. On the whole, the percentage of 'wrong' drivers fell by only 7 % between 1995 and 1996.

Conclusions and recommendations

An important conclusion is that the improvement in the observed height adjustment of head rests can be attributed to the campaign conducted.

Firstly, because this improvement agrees with the effect of the campaign as suggested by the questionnaire study: of the drivers surveyed, 21% claimed to check the position of the head rest and to have *changed the position* in response to the campaign.

Secondly, because an alternative explanation for the effect found is not very likely to be found.

Finally, the report offers recommendations for the setup of a follow up campaign. In view of the success of the campaign, particularly in terms of an actual change in behaviour, a periodical repetition of the campaign activities would certainly seem advisable.

Head rest which is adjusted too low

Evaluation of the campaign 'Prevent neck injury'

Research concerning the use of head rests in passenger cars

Dr. Ch. Goldenbeld. R-96-43. 79 pp. Dfl. 25,-. (in Dutch)

Call for papers for the Fourth World Conference on Injury Prevention and Control in Amsterdam

Injury is a threat to health in every country in the world and is currently responsible for seven per cent of global mortalities. This proportion is predicted to rise. In high income countries, injury is the leading cause of premature death. In many low income countries, injury is the leading cause of death and morbidity in the middle range of the age spectrum.

Since the late eighties, the international Injury Prevention and Control Community has met intersectorally on three occasions to share leading-edge research results and state-of-the-art practices in safety promotion: Stockholm 1989, Atlanta 1993 and Melbourne 1996.

The Fourth World Conference on Injury Prevention and Control will be held at the RAI International Exhibition and Congress Centre in Amsterdam, the Netherlands, from 17 to 20 May 1998.

Conference theme

The Conference will stress the need for building an international community for injury control management, sharing experiences in the different countries and regions all over the world. It will also encompass a rich variety of knowledge and experience in the various sectors concerned, such as:

- *road traffic injury control;*
- *safety at work;*
- *home and leisure safety;*
- *sports injury prevention;*
- *prevention of intentional violence;*
- *prevention of suicide.*

The conference theme 'Building partnerships for safety promotion and accident prevention' provides a framework for participants throughout the world to share experiences in developing, promoting and evaluating national and local policy programmes and their implementation in legislation and enforcement, in standards and regulations, and in education and information campaigns.

During the conference there will be plenary sessions, symposia, round table sessions, poster and video sessions, and business and committee meetings.

Call for papers

Participants who wish to contribute to the conference with an oral presentation or by giving a poster or video presentation, are invited to submit an abstract. The Scientific Programme Committee, in which the SWOV Institute for Road Safety Research is participating, will carefully review all abstracts. The deadline for submission of abstracts is the first of June 1997.

A brochure with the second announcement and call for papers is available from:

Conference Secretariat for 'Injury Prevention and Control'
Van Namen & Westerlaken Congress Organization Services
P.O. Box 1558, 6501 BN Nijmegen, The Netherlands
Telephone: +31 24 323 44 71
Telefax: +31 24 360 11 59
E-mail: reg.fowoco.nw@prompt.nl
Internet: http://www.consafe.nl/conference/

What are the principal causes of accidents with *bicyclists?*

In collaboration with the Consumer Safety Institute, SWOV held a written questionnaire amongst cyclists who were involved in a road accident and were subsequently transported to hospital. The Netherlands Transport Research Centre AVV of the Ministry of Transport and Public Works, which commissioned the study, was primarily interested in a number of specific factors that contribute to the incidence of cycle accidents, such as technical defects of the cycle, the quality of the road surface and the presence of protective devices, such as cycle seats and wheel spoke covers. Insofar possible, the use and effect of bicycle helmets also had to be established.

The road accident victims who were approached were selected by means of a stratified random sample, emphasis being placed on the more severely injured victims. Of the respondents, 19% were admitted to hospital, while 81% could return home after treatment at the First Aid department.

Three groups

The respondents were divided into three groups: cyclists who had had an accident while riding, stationary cyclists and cycle passengers, these three categories were again split according to age, i.e. twelve years and above and under twelve years of age.

Causes of accidents

A technical cycle defect was cited as the principal cause of the accident by 7% of cyclists aged twelve years and above. Other causes included their own behaviour (28%), the behaviour of other road users (27%), the condition of the road surface (14%) and various other causes (24%). More than half the cyclists aged under twelve gave their own behaviour as the cause.

Eight percent of the older cyclists indicated that the accident would (or might) have been prevented if the cycle had been better maintained. This applied in 5% of cases where the condition of the brakes was poor.

Lights on!

Amongst the cyclists, falling whilst riding represented most common cause of injury (43%) followed by a collision with another party (29%) or a collision with an object (24%). Over 30% of cyclists who were involved in accidents during twilight or conditions of darkness and did not have their lights on, indicated that the accident would (or might) have been prevented if they had put their lights on. (See also: SWOV reports in brief, pp 15. R-96-39.)

The helmet wearers (4% of cyclists aged over twelve years) cycled on racing bikes. This group had fewer head injuries, with a reduced severity, despite the fact that the speed at which they were riding at the time of the collision was considerably higher in comparison to non wearers.

Passengers

Amongst bicycle passengers, getting snagged (feet between spokes) was the most common cause of an accident (a share of 73%). Many cycles were not fitted with a wheel spoke cover (60%) or, if present these were broken in one quarter of cases.

Of the passengers aged under twelve, 45% were transported on a special seat fitted to the bicycle. The quality of these cycle seats was regarded as moderate or poor in 22% of cases.

Recommendations

The following recommendations were made: to promote the quality of the bicycle by imposing quality requirements on the vehicle, to make adults more aware of safe child transport (proper wheel spoke covers, more use of (better) cycle seats) to promote the wearing of a bicycle helmet and to heighten road authorities' awareness of the condition of the road surface.

Impact of bicycle quality on accidents

An analysis of accidents based on a written questionnaire

C.C. Schoon. R-96-32. 127 pp. Dfl. 40,-. (in Dutch)

Closed side protection for trucks should be encouraged

In the Netherlands a demonstration project was carried out concerning side protection for trucks. The aim of the project was to gain practical experience in the purchase, fitting and maintenance of side protection. The researchers were also interested in the fuel consumption of the trucks with side protection, in the experiences of the drivers, and in any damage or accidents involving the vehicles in question. The project also included a practical test to determine the 'subjective feeling of safety' of cyclists and pedestrians in relation to trucks with side protection.

For the project, 42 closed trucks and 27 articulated trucks belonging to the Dutch transport company Van Gend & Loos were employed. In this group, 28 trucks and 14 articulated trucks were fitted with side protection; the other vehicles constituted the control group.

The main point of the study was to determine the fuel savings achieved when closed side protection was fitted. Over a period of six months, the transport company therefore recorded the fuel consumption of vehicles fitted with side protection and of vehicles that were part of a control group. At the same time TNO Road Vehicle Research Institute carried out separate measurements under controlled conditions using both types of truck.

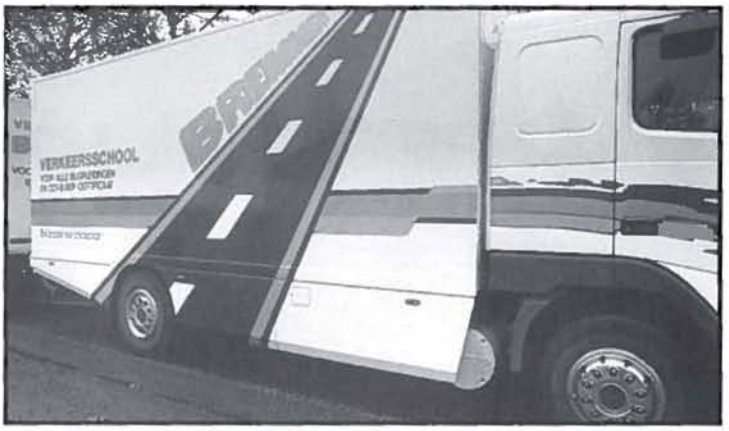
Open or closed?

The results of the study can be used to encourage companies to voluntarily purchase *closed* side protection. With effect from 1 January 1995 only *open* side protection is compulsory for new trucks. Owing to the design and the larger surface area that is protected, it is accepted that closed side protection is more effective in terms of road safety. What is involved here is the reduction of the number of victims that end up under the wheels of trucks every year. In 1995 in such kind of accidents over 30 moped riders, cyclists and pedestrians were killed and 80 seriously injured.

Costs

The main costs for companies are the purchase costs of side protection. The immediate perceptible benefits are seen in the fuel savings made. The study showed that in the case of closed trucks a saving of 4 to 5% can be achieved. A rough calculation indicates that if we work on the basis of the cheapest supplier based on tenders in 1994, the investment costs are recovered in about seven years. In the case of articulated trucks, a saving of 1 to 2% was determined, with a payback period of more than ten years. Further arguments, such as safety image, aesthetic considerations and the possibility of advertising, may prompt companies to make the decision to purchase closed side protection.

Closed side protection



Open side protection

Opinions

The drivers of the closed trucks, in particular, were on the whole satisfied with the closed side protection. Ninety per cent thought that fitting side protection improved the safety of vulnerable road users. The increase in susceptibility to crosswinds was mentioned by just one driver while most of the drivers noted the reduction in spray in rainy conditions or on a wet road surface.

Companies responsible for maintaining the trucks indicated that if the trucks are fitted with folding side protection, this does not increase the cost of repairs or maintenance work.

The practical test to determine the subjective feeling of safety of cyclists and pedestrians revealed that three quarters of the road users interviewed thought that safety was improved. It is worth mentioning, however, that only a quarter of the cyclists and pedestrians interviewed had noticed the side protection (closed or otherwise) on the articulated trucks.

Side protection for trucks

A demonstration project to gain practical experiece in purchase, in fuel consumption and in road safety

C.C. Schoon.
R-96-24. 99 pp. Dfl. 30,-.
(in Dutch)

Promising programme for youngsters to influence their conception on *alcohol and traffic*

SWOV has published the final report on the project 'Alcohol and traffic in secondary education'. The project was organised by the Dutch Road Safety Organisation (VVN), the Netherlands Institute of Mental Health and Addiction (NIAD) and the SWOV Institute for Road Safety Research, supported by Research and Marketing (R&M) and subsidised by the Praeventiefonds.

Peter Levelt, 54 years old studied psychology at the University of Amsterdam. He carried out research on children and traffic. He obtained his doctorate in 1981 with a thesis on the subject: what children can learn from television. For ten years he was head research and one of the editors of the television program Sesame Street. Since 1986 Peter works at SWOV and his main topic is traffic behaviour.

The following considerations formed the basis for the project:

- *novice drivers run a high risk of being involved in an accident following the consumption of alcohol;*
- *secondary students form habits with respect to alcohol consumption, both with regard to their own transport or as a passenger to and from social events, initially by bicycle, but soon progressing on to motorised transport;*
- *any good intentions that are initially present evaporate once alcohol has been consumed and social pressure is exerted on the drinker;*
- *cycling whilst drunk is a socially accepted phenomenon.*

Preventative programme

These considerations led to the conclusion that prevention in the field of alcohol and traffic should commence at a time when habits have not yet been formed, i.e. during secondary education.

To do so, data from supporting research was employed (consisting of a literature study, group discussions with students, a survey held amongst teachers and a market analysis) to develop a preventative programme for introduction and implementation at four schools.

The implementation process was then evaluated by means of discussions with students, teachers and intermediaries.

It was concluded that a promising preventative programme has been created, where the quality of the educational material developed, the potential for networking and the programme's pilot implementation at schools offer good prospects for continuation following the preparatory period.

Recommendations

The research data and meetings held between NIAD, VVN and SWOV led to a number of recommendations with

respect to the educational material employed, ongoing implementation and research.

It is considered advisable if, following various improvements to the educational material, the programme is linked to another programme that has already been implemented on a broad scale: 'The healthy school and stimulants'. This implies the need for central coordination and publicity by NIAD and VVN, responsibility for the educational materials by NIAD and the introduction at schools and teacher guidance by intermediary parties: VVN departments, CAD personnel (Advisory Agencies for Alcohol and Drugs) and GG&GD (Area Health Authority staff).

This multiform approach is considered necessary because market research has shown that the programme's introduction will demand a high level of effort. Moreover, initial contacts with representatives from VVN in the Regional Committees for Road Safety (ROVs) have given rise to growing optimism about the introduction of the programme to secondary schools.

Finally, the report proposes further research to study the programme's effectiveness.

Secondary education and drink driving

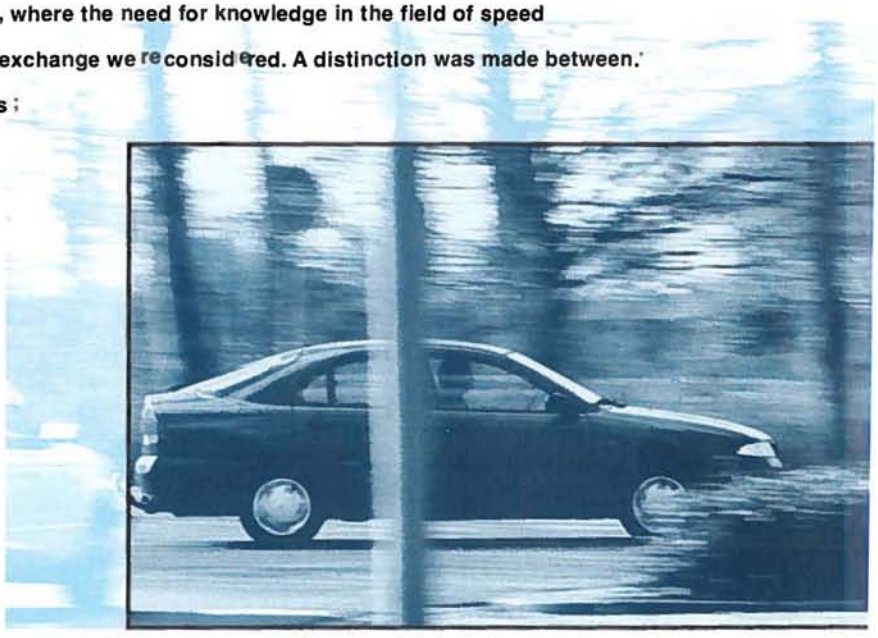
Results of the project 'Alcohol and traffic in secondary education' and recommendations for continuation

Dr. P.B.M. Levelt.
R-96-22. 34 pp. Dfl 20,-.
(in Dutch)

A proposal to develop an exchange of knowledge concerning speed management

The control of driving speed is one of the major subjects of road safety policy. The study reported here was intended to develop a proposal describing how the exchange of knowledge in this field could be organised. Working meetings were organised with policy makers and administrators, where the need for knowledge in the field of speed control and preferences for certain type of knowledge exchange were considered. A distinction was made between:

- **knowledge regarding the content of policy measures;**
- **knowledge regarding the organisation of policy, i.e. the process related aspects.**



It was shown that the need for knowledge regarding speed control is still very great, both with regard to the content of the policy measures and the process related aspects. The need for knowledge relates to a great number of different subjects, which can be summarised in five themes:

1. *underpin policy and provide a general overview of the options available;*
2. *improve the approach taken, both with regard to content and process;*
3. *practical experiences;*
4. *involvement of citizens and the community;*
5. *evaluation.*

On national level

Twelve forms of knowledge transfer were submitted and discussed. A reference book, an electronic database and a periodical publication serve as aids for desktop use. They can supply the data and expertise to enable a stepwise approach. Most of the practitioners who participated in the working meetings expressed a great need for such aids. There is also a clear need for a coordination point which enables the rapid location of supplementary information corresponding with the specific circumstances encountered.

The exchange of knowledge using these four instruments is best organised primarily at a nationwide level.

On regional level

Working on speed management requires cooperation, particularly at regional level. For this purpose, networks and working groups are required, as well as a missionary to involve officers or organisations in policy.

The main tasks of the Regional Committees for Road Safety (ROVs) is to bring about such forms of cooperation. They have already achieved much. The exchange of knowledge also fulfils an important role here. The Regional Directorates of the Department of Public Works have assumed responsibility for the transfer of knowledge to assist the abovenamed forms of cooperation. As a result of decentralisation, the provincial authorities will assume a greater regulating role in the region.

Integrated approach

The control of speed is still a particularly tenacious issue. It is difficult to achieve sustainable effects, and an integrated approach is needed. Hence, much knowledge still needs to be gathered in this field. Therefore, made to measure recommendations, symposia and courses are required. The organisation of these facilities should be realised in consultation between national en regional authorities (in particular the ROVs). A coordination point could be given the additional task of exploring the market for these instruments.

It is proposed to reinforce the existing exchange of knowledge - which is fragmented and does not meet some of the most compelling needs - along these lines.

Exchange of knowledge concerning the approach to the speeding problem

Results of working meetings on the need of knowledge and of specific forms of knowledge exchange concerning speed control

R.D. Wittink & D.M. Wijnolst. R-96-45. 45 pp. Dfl. 22,50. (in Dutch)

Large-scale police surveillance is essential in order to bring road safety targets within reach

The Dutch government has set the following quantitative targets for road safety: a 25 per cent reduction in the number of road deaths and injuries by the year 2000 (compared with 1985 levels) and a further reduction of 50 per cent and 40 per cent respectively by the year 2010 (compared with 1986 levels). Various indicators suggest that road safety in the Netherlands is not showing any significant signs of improvement. According to SWOV, it is now no longer certain that the aforesaid targets will be met.

Since 1991, there has been almost no reduction in the annual number of road deaths. SWOV has formulated a large number of recommendations for ways of bringing the government's targets back within reach. In doing so, SWOV endorses the guiding principle underlying the 1996 Long Range Programme for Road Safety 1996-2000, which is to try to implement an agreed two pronged road safety policy. This policy consists of the 'spearhead strategy' (focusing on drink driving, speeding, seat belts and crash helmets, hazardous situations, heavy traffic, bicycles and motorcycles) and of consolidated efforts to develop a sustainably safe traffic system.

Traffic law enforcement

Police surveillance of traffic behaviour will continue to be one of the most important instruments for meeting the Dutch road safety targets, in conjunction with improvements in the road infrastructure and awareness raising and communications activities. It is even possible that within a period of five to six years, traffic law enforcement may become more effective even than education, awareness raising initiatives or improvements in the road infrastructure as a means of bringing road user behaviour back in line with the government's targets. Traffic law enforcement, and more specifically police surveillance, is one of the ways in which a government can clearly show the public its determination to improve road safety. Traffic surveillance is also regarded as being able to yield effective results in the short term. Of course, if surveillance is to be genuinely effective it will need to be carried out far more intensively than it is at present.

If police surveillance is to be given the chance to make a real difference, the available manpower must be focused as effectively as possible on improving road safety.

and resources must be provided to broaden their deployment. In other words, police surveillance and traffic law enforcement will require greater investments. The various authorities responsible for administering police surveillance (the police themselves, the public prosecution service, the ministers responsible for the police and public prosecution service and the Road Safety Minister) must recognise the crucial role which traffic law enforcement can play in improving road safety. They will also need to be able to conclude agreements allowing the police to perform this role.

Conclusions

In order to bring the government's road safety targets back within reach in the short term, large scale police surveillance is essential. There are no other known policy measures which could yield a similar large scale effect in the short term. Both the quality and quantity of police surveillance need to be improved. Examples from other countries have shown how these improvements could be made. It is recommended that surveillance be concentrated on three areas: drink driving, the wearing of seat belts and persuading drivers to keep to the speed limits. Provisional estimates suggest that some 180 road deaths could be avoided in the year 2000 if traffic law enforcement and in particular traffic surveillance are substantially intensified. This intensification will need to be introduced on a gradual basis, and it is recommended that this should be done using the results that have been achieved so far.

There will need to be a substantial increase in the perceived risk of being caught, backed up by a substantial increase in the actual chances of being caught and prosecuted. The publicity surrounding these increased controls will also need to be intensified. It is anticipated that police surveillance will have to be maintained over a period of several years, and it must also be made a structural part of police work. Police surveillance should be coordinated by a centralised unit which should take decisions on, say, choice of topic, timing, campaign strategies and similar areas. The police corps remain responsible for implementation in a given context. It is recommended that a road safety calendar be (re)introduced.

After the year 2000, police surveillance can be gradually relaxed if a sustainably safe traffic system is being gradually introduced. This development is more relevant to behaviour relating to speed than to drink driving and seat belt use.

Fred Wegman, 48 years old, studied Civil and Traffic Engineering at the Technical University in Delft. From 1974 till 1977 he was working at the Municipality of Amsterdam as a traffic engineer. Since 1977 he has been employed by SWOV, firstly as a researcher, later as research manager responsible for various projects. Since 1989 he is Research Director at SWOV. His main tasks are: the management of research projects, advising on road safety strategies for the Netherlands, the developing of evaluation schemes and policy information systems related to national, regional and local road safety programmes and the developing of road safety research programmes (national and international).

In conclusion, then, traffic law enforcement and as part of that police surveillance of traffic behaviour will need to 'set a new course' if it is genuinely to be able to contribute to meeting the government's road safety targets.

When winning counts...

Traffic law enforcement and road safety targets for the year 2000

Fred Wegman & Charles Goldenbeld. D-96-9. 21 pp. Dfl. 17,50. (in English)

New list of SWOV Publications available

The SWOV Public Relations Department has made a new list of the publications which are written in English, German or French. The list contains titles of reports, papers and articles published in 1985-1996. If you want to receive a free copy of this list, please send a letter or telefax to Sandra Rietveld and ask for the publication with number R-97-2. If you want to receive a free list of all 1996 publications, including the ones written in Dutch ask for publication R-97-4.

How to achieve and finance a *sustainably safe* traffic system

In 1990 SWOV, in collaboration with other Dutch institutes, described her vision on a sustainably safe traffic system. In such a system the road infrastructure has been adapted to the limitations of human capacity through proper road design. Vehicles are technically equipped to simplify driving and to give all possible protection to vulnerable human beings. And road users have been properly educated, informed, and, where necessary, deterred from undesirable or dangerous behaviour.

The idea of a sustainably safe traffic system was adopted, not only by the central government, but the idea was also supported by local and provincial authorities and by other organisations. The principals were translated into rules and regulations for the design of road networks, roads and crossings. A Steering Committee with representatives of national, regional and local authorities was wondering how to implement such a system in the Netherlands. And: how much would it cost and who should pay for it.
It was clear that the creation of a sustainably safe traffic system -in the long run - would lead to an ideal situation. Unfortunately, this ideal situation will not be achieved in the next five to ten years. It will take some time to implement the principles of a sustainably safe traffic system. Therefore SWOV conducted a study to be able to advise on the different stages of implementation. Another study was conducted concerning the financing of a sustainably safe road traffic system. This last study was held in cooperation with two other Dutch research institutes: KPMG Bureau voor Economische Argumentatie en H&R Economisch Advies en Onderzoek

Implementation

Firstly conceptual contents were explored, specifically in relation to relevant developments since the introduction of the concept in the Dutch Road Safety Plan of 1991.

The main conclusions related to:
- *the relative priority of road design, as compared to the other components of the traffic system;*
- *its translation on various hierarchical levels: local design, specifying categories of roads, structure of the road network;*
- *the position of rules and regulations in road design, taking properties of man and vehicle into account;*
- *the combination of 'bottom-up' and 'top-down' approaches: local experimental or demonstration projects versus adaptations of the road network on a nationwide scale;*
- *the importance of phasing and the development of implementation stages.*

Starting version

Then, these conclusions were reduced to a number of relatively simple starting points, measures were selected, and composites of countermeasures were construed that could serve as a first phase programme or starting version towards a sustainable safety.
In the forefront was the combination of feasibility in the short term and a stepwise contribution to longer term goals. Low cost and cost effectiveness served as criteria for inclusion.

The measures concentrate on redistribution of traffic and redesign of the road network by - as the first step - relatively modest means: uniform priority rules, extension of 30 km/hour zones within built-up areas, establishing a comparable 60 or 40 km/hour zoning system outside built-up areas, changing the priority rules for cyclists within zones, a limited set of physical road measures and the application of road safety audits to large infrastructural projects.

Then, the infrastructural design versions were linked to other areas of safety policy: procedures and information and communication, education, driver training and behavioural control, police enforce-

ment. Finally, follow-up steps to be taken after adoption and implementation of a first phase programme towards a sustainable safety were given.

Costs of road hazard

The second SWOV study to be described in this article concerns the financing of a sustainably safe road traffic system.

The *material* costs of road hazard in 1993 amounted to 9,500 million Dutch guilders. This is about 2% of the gross domestic product. Material costs are assumed to mean the medical costs (440 million), potential loss of production (4,300 million, following temporary or permanent incapacitation), damage to vehicles (4,200 million), administrative costs (300 million, police) and the cost of traffic jams (250 million, time loss). The costs of prevention (driver training etcetera), estimated for 1993 at about 3,000 million, are not taken into account.

Road hazard also leads to *immaterial* costs. These tend to be included in the social costs (environmental damage, noise pollution). The immaterial costs relate to the suffering, loss of enjoyment of life for the victim and their environment. When the immaterial costs are also included in the calculation, the total costs are even more.

B o b

Roszbach studied experimental psychology at the University of Amsterdam. He is 53 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.

Financing a sustainably safe system

When a sustainably safe road traffic system is realised, not all these costs fall in proportion to the reduction in the number of accidents, at least not immediately. Nevertheless, the investment in such a system would be profitable from a social perspective, even when a cautious estimate for the effect on the number of accidents is applied, and even when immaterial costs are not included in the assessment.

The Dutch government annually spends about 6 800 million guilders on the road infrastructure; just over half of this is invested in (major and minor) maintenance work, while the rest represents investments, excluding the (no longer freely disposable) capital costs. In view of both the size of this sum and the number of kilometres of road annually renewed or newly constructed, this offers sufficient space to realise a sustainably safe system within a period of thirty years, provided the criteria and guidelines for such a sustainably safe system are also consistently applied over that period.

Benefits for various groups

The benefits of a sustainably safe traffic system can be divided into its effect for various groups: government, private individuals, employers. The group of private persons and the group of employers would benefit most, such that a proportionate investment would be profitable in this case. However, this leads to a kind of paradoxical obstruction: if only the odd individual invests, no gains are made; if many invest, the benefits are also shared by those who did not contribute. In order to still encourage individuals or companies to invest, therefore, government intervention is likely to be necessary.

F r a n k

Poppe is 42 years old. Frank studied for some years Traffic Engineering at the Technical University in Delft and has been employed by SWOV since 1980 as a researcher. His main topics are the analysis of road accidents and risk measures in relation to road and traffic characteristics, the interface between road safety, rural and urban planning and decision making on these aspects, and the social costs of road safety related to investments in road safety.

Insurance companies (both damage and health cost insurers) who would also profit from the steady drop in claims - and hence payments - could be employed as intermediary for this purpose.

In order to further analyse the relationship between investments and the reduction in accidents, distinguished on the basis of category and according to the distribution over those who would benefit, it is necessary to further specify the package of measures for the entire thirty-year period.

A sustainably safe traffic system: from concept to implementation

Final report

R. Roszbach, R.D. Wittink & F.C.M. Wegman.
R-96-34. 108 pp. Dfl. 35,-.
(in Dutch)

Financing a sustainably safe road traffic system

Existing expenses and return on investments in road safety

F. Poppe & J. Muizelaar.
R-96-49. 52 pp. Dfl. 25,-.
(in Dutch)

How to order SWOV Publications

SWOV carries out research concerning road safety. Our main client is the Dutch Ministry of Transport. Therefore, most SWOV reports are written in Dutch.
In these reports, normally an English summary is incorporated. Sometimes however when research is carried out 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 magazine the newly published reports are mentioned and a summary of the contents is given.
The complete reports can be obtained by asking for a SWOV order form, completing it and sending it to Sandra Rietveld of the Public Relations Department of SWOV. The price of each report (in Dutch guilders) is mentioned in this magazine, as well as the language in which the report is written.
Reports can be paid by credit card.
For bank transfers we will charge an extra Dfl 15,- per transfer.
After SWOV has received your payment, the reports will be sent to you by mail.

SWOV REPORTS IN BRIEF

Road design, human behaviour and road accidents: towards a 'learning design community'

Paper presented at the International Conference 'Road Safety in Europe', Birmingham, September 9-11, 1996
Fred Wegman. D-96-6. 19 pp. Dfl. 15.- (in English)

This paper discusses a number of unsolved problems in the field of road design (i.e. geometric design), human behaviour and road safety, particularly concerning the operationalisation of the existing design principles for a safe road network in terms of concrete road design in existing circumstances. Some proposals for an agenda for the future are put forward.

1. *Attention should be put on meta analyses. Meta analyses do not consider each individual research finding as such, but relate research results in accordance with their quality.*
2. *It is recommended that the production of best practice guidelines, incorporating all available knowledge with a sufficiently sound scientific basis is drawn up and periodically updated if necessary.*
3. *International research should be carried out concerning road design, human behaviour and road accidents. Efforts must be made to increase the 'learning capacity' of this field as well in substantive terms as in organisational terms. Within Europe a cooperative research community should be developed.*
4. *The use of road safety impact assessments, including safety audits, should be encouraged, in order to involve road safety considerations explicitly in decision making.*
5. *For the long term a road system should be conceived which is much more safer than the current one.*

Traffic education for children up to four years of age

A survey and recommendations
Dr. P.B.M. Levelt.
R-95-80. 56 pp. Dfl. 22.50. (in Dutch)

This report studies the methods by which traffic education is taught to children aged under four. The study mainly relates to projects from abroad. With each of the various projects the study sought to find an answer to questions relating to the problem analysis, the teaching objectives, the theoretical development model, the teaching material, the parties involved, the implementation and the effect.

The following types of activities were found:

- *Traffic clubs, for which parents can register their children. At regular intervals, child and parent will receive mail on the subject.*
- *Campaigns by means of intermediate parties. These intermediate parties contact parent groups.*
- *Television programmes, including both open network and educational television.*
- *Campaigns aimed at the use of proper safety devices.*

The above examples show that choices have to be made with respect to the designated objectives, the degree of integration with safety information in general, the targeted age groups and the stability and composition of the various projects.

It is contended that objectives concerning the current state of children's safety should not be the sole endeavour; less immediate objectives, such as children's attitudes and the suitable involvement of parents in education should also be aimed for.

Based on these examples, a number of options have been given for the Netherlands, describing the advantages and disadvantages of each. The organisations and factors of influence involved are also mentioned.

Finally, a pilot project based on the above options is proposed. The policy recommendations made to the state government - primarily aimed at facilitating a good start and enabling attendant study - complete this report.

Safety effects of road design in Europe

Paper presented at 'The European Market for Infrastructural Projects', Rotterdam, September 24-26, 1996
Fred Wegman. D-96-14. 16 pp. Dfl. 15,-.
(in English)

This report deals with the result of several studies related to the theme of the relationship between road design and road safety.

Low-cost measures: an overview of organisational and procedural aspects

Contribution to the ETSC International Symposium 'Low-cost/high return engineering measures for safer roads' in Brussels, November 5, 1996
Fred Wegman. D-96-16. 12 pp. Dfl. 15,-.
(in English)

This paper gives an overview of the organisation and procedures used to implement effective and cost-efficient programmes such as low-cost road and traffic engineering measures (LCM). It was concluded that LCM programmes fulfil a modest role in the field of road safety policy in many countries. Low-cost programmes need to be conducted on a massive scale if they are to contribute to the sustainable improvement of road safety in an area.

Cruise control in passenger cars

An literature survey on road safety aspects
L.T.B. van Kampen
R-96-21. 18 pp. Dfl 15,-.
(in Dutch)

Based on the literature available, a survey was carried out on the anticipated road safety effects of a general introduction of cruise control.

The survey found little evidence of studies primarily investigating the road safety effect of cruise control. Those effects which were examined (mainly through practical tests with and without cruise control) showed that in addition to positive effects governing individual fuel consumption, cruise control was also likely to lead to positive road safety effects. This was linked to the fact that drivers would have fewer tasks to perform, the fact that they would be driving at lower average speeds and the fact that the flow of traffic would be more stable.

On *theoretical grounds*, these studies anticipate a significant road safety effect following the general introduction of cruise control on motorways in the form of a 50 per cent reduction in the number of fatal accidents involving passenger cars. This dramatic effect is linked to the calculation that the widespread introduction of cruise control would slightly reduce average speeds and significantly reduce the distribution of speeds on these types of road. This would result in fewer changes of lane, less overtaking and less braking, all of which would lead to fewer accidents.

The studies recommend encouraging a more widespread fitting of cruise control in passenger cars through the provision of a financial incentive when the car is being purchased. This incentive could be provided both by the government and by the car industry.

A follow-up study could be used to further examine the practical effects of the introduction of cruise control by means of a survey among users. It should also be used to find out how many cars are currently fitted with a cruise control device.

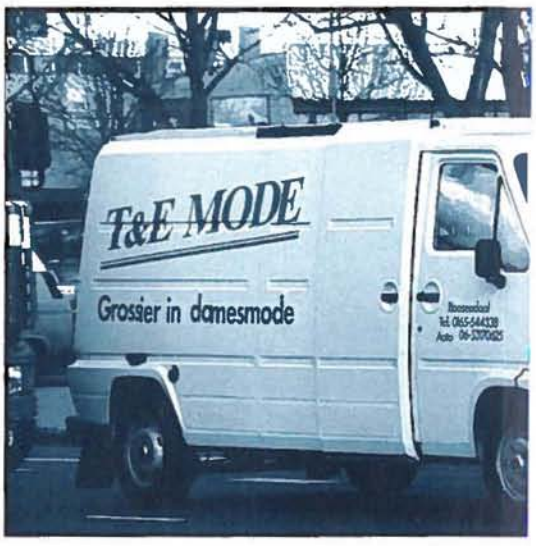
One possible specific application of cruise control is in cars towing caravans, for which comfort is an important factor as well as road safety.

Commercial vans and road safety

An analysis of accidents with a classification in subgroups of vans
C.C. Schoon & G.P.J. Hagesteijn.
R-96-23. 69 pp. Dfl. 25,-.
(in Dutch)

The marked rise in the number of fatalities with respect to the occupants of delivery or commercial vans gave rise to the performance of an accident analysis. The increased interest in commercial vans in the Netherlands offered a good opportunity to further examine the many subgroups within this vehicle category. This had not been done to date. Based on the various vehicle properties, the vans were divided into six categories, as follows:

- *standard delivery buses, such as the Ford Transit;*



- *vans derived from the passenger car type, such as station wagons;*
- *vans with a chassis derivative of a lorry type;*
- *jeeps, pick-up trucks, all-terrain cars etc. without rear seats;*
- *standard passenger cars with no rear seats and blinded rear side windows (special commercial category);*
- *space wagons with no rear seats.*

The first category, the standard delivery bus, is most often represented in the van accident database, with a share of 38%. Converted passenger cars are involved in 21 % of accidents and the jeep or pick-up truck and station wagon in 15 and 13% of cases, respectively. The remaining categories represent less than 5%.

Based on the number of severely injured van occupants (fatalities and hospital admissions), it was determined for the converted passenger cars that three characteristics were over-represented: age (drivers of 65 years and over), alcohol consumption and point in time (weekend days and evenings/nights). The standard delivery bus is over-represented on 100 and 120 km/hour roads.

The conditional probability of occupants of commercial vans becoming severely injured, defined as the number of severely injured persons with respect to the total number of accident victims, is relatively high on account of the single car accidents. As far as accidents involving other vehicles are concerned, a relatively high probability also occurs with respect to the vans with a chassis. This could be related to a lower percentage of seat belt use.

For the overall group of vans, the likelihood of a severe injury is 28%, whereby single car accidents (collisions with an obstacle) have a more serious outcome than those accidents involving two road users: 36 and 25%, respectively.

The extent to which severe injury is sustained by the collision partner is determined on the basis of the risk factor. This is formulated by the report as the relationship between the number of severely injured registered amongst the collision partners and the number of severely injured registered amongst van occupants. For those accidents where two parties are involved, this factor results in a value of 4.2 if the vans are considered overall. We see marked variations between the various subcategories of vans: jeeps/pick-ups have a risk factor of 7.9, vans with a chassis 4.9 and station wagons 2.8. Aside from differences in mass, this can also be attributed to differences in design.

Change of routes and road safety

The effect of extra in-car traffic information on road safety
J.M.J. Bos. R-96-25. 32 pp. Dfl. 20,- (in Dutch)

In this report an attempt has been made to estimate the road safety effect brought about by drivers who change their routes as a reaction to the extra in-car traffic information they receive by means of RDS-TMC, the Radio Data System - Traffic Message Channel.

Use is made of data that was already available from another research project. It was gathered by means of logbooks that were kept for several weeks by a sample group of drivers, in whose cars, at a certain point in time, RDS-TMC terminals were installed. In the study traffic information induced route changing is compared between the periods with and without RDS-TMC, assuming that congestion problems both occurred and were reported to the same extent.

Essentially the traffic safety effect as calculated is caused by changes in the number of vehicle kilometres driven and the average risk drivers were exposed to by choosing an alternative route along another motorway or turning off onto a main road.

By the very nature of these mechanisms this traffic safety effect will be negative, since route changing almost always will mean an increase of the number of vehicle kilometres. Moreover, this increased mileage partly occurs on roads that are less safe than the motorways initially driven. Results show that the number of serious traffic accidents will increase by about 1% as a consequence of the extra route changings, arising from the availability of RDS-TMC to the drivers and related to the increasing degree of traffic information which they heard.

Two full scale tests on the steel STEP-barrier

A report of two full scale tests, carried out by the testing institute LIER in France
W.H.M. van de Pol. R-96-26. 58 pp. Dfl. 47,50 (in Dutch)

In 1993, SWOV performed a simulation study in order to investigate how the profile of concrete vehicle barriers could be further optimised. The results of this simulation study were so encouraging (e.g. there were no cases of 'roll over' with light passenger cars during simulation) that the Dutch Ministry of Transport decided to perform full scale tests. Three versions of the profile developed by SWOV were made. One of these, the anchored steel STEP barrier, is the subject of this test report.

The STEP barrier should satisfy the 'higher containment level' H2 as indicated in the NEN-EN standard. The trials required for assessment are TB 11 and TB 51. The TB 11 test is a test using a light passenger car with a mass of 900 kg, travelling at a speed of 100 km/hour and colliding at an angle of 20 degrees. Both tests show a satisfactory result.
The collision with the passenger car is stable; hardly any rolling movement is observed. The angle of exit also remains within the accepted NEN-EN standard at 9 degrees.
At a calculated value of 1.36, the ASI value for the passenger car satisfies

Level B of the NEN-EN standard (ASI ≤ 1.4).

The TB 51 test with a bus (travelling at a speed of 70 km/hour at an angle of 20 degrees) also proceeds satisfactorily, with a small angle of exit of maximally 2 degrees. The barrier is not ruptured, nor do pieces break off. The maximal angle of roll is greatest during the 'rear end' effect: about 25 degrees.

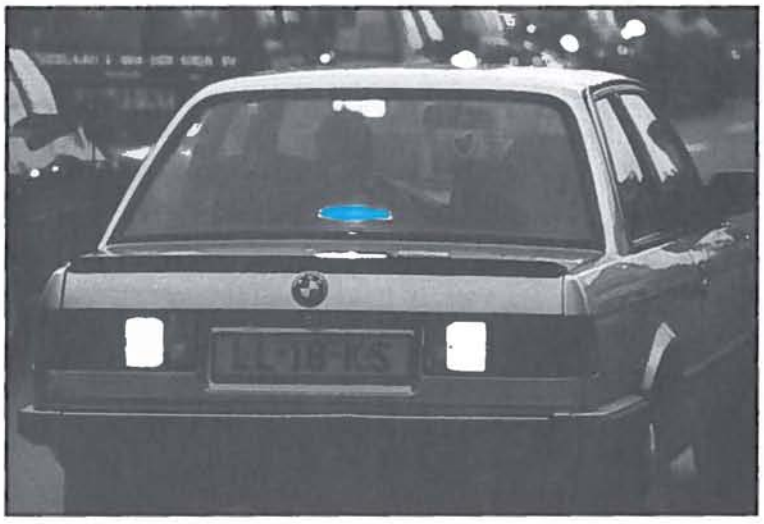
The steel ST EP barrier, with each element anchored to the road surface, meets the 'higher containment level' H2. The required working width level is ≤0.8 metre.

Presence of third stop lamp

An inventory
C.C. Schoon & G.A. Varkevisser
R-96-38. 22 pp. Dfl. 17,50.
(in Dutch)

In early 1996, SWOV first performed an inventory of the presence of a third stop lamp on passenger cars in the Netherlands. This measurement is necessary to enable an evaluation of the potential effect of the third stop lamp with future analyses of rear-end collisions. In recent years, an extremely marked rise in this type of collision has been reported.

In combination with an inventory conducted for another study, the number of third stop lamps fitted to passenger cars was counted at ten locations spread throughout the Netherlands. Three types of locations can be distinguished: roads inside the built up area, 80 km/hour roads and the exit and entry ramps of motorways. All locations represented intersections controlled by traffic lights, so that the presence of a third stop lamp could be established during braking manoeuvres.



In-car electronics for heavy traffic

T. Heijer & P.I.J. Wouters.
R-96-46. 47 pp. Dfl. 22,50.
(in Dutch)

The study tries to offer an insight into the costs and benefits associated with a range of existing or forthcoming electronic aids for heavy vehicles (lorries and coaches). The cost/benefit assessment performed was based exclusively on the possible costs or benefits related to road hazard (accidents saved or potentially caused), and the costs of purchase and exploitation of the necessary equipment. Two points of view were applied and compared in this regard: that of the user (the transporter) and that of the community.

The study led to the following conclusions.

Firstly: the transporters and the community have a totally unequal interest in the application of this equipment. Even if the intended positive effect of the equipment on road safety (the number and severity of accidents) affects only a small proportion of the outcome (10%), the beneficial effect for the community is still great (expressed in financial terms: tens of millions of guilders).

In contrast, the cost savings of these accidents for the transporter are virtually always far less than the costs of purchasing and maintaining the equipment. Therefore, additional economic motives are required to make the purchase of this equipment attractive to the transporter.

Secondly: equipment that is still relatively economical for the transporter and also offers great benefits to the community are:

- *in the shorter term: visual aids such as vision enhancement and blind corner detectors, and the introduction of the black box (all parameters of the trip and any accidents are registered);*
- *in the longer term: applications that control driving speed, such as intelligent cruise control, as well as anti-collision systems and aids for keeping on course.*

Experiences with the implementation of the 1993 Motor Vehicle Driver Instruction Act

D.A.M. Twisk. R-96-56. 101 pp. Dfl. 35,-.
(in Dutch)

The Motor Vehicle Driver Instruction Act has laid down the required competence to offer driving instruction since 1974. On January 1, 1995, the new Motor Vehicle Driver Instruction Act (WRM 1993) came into being. The revised legislation imposes stricter requirements on driving instructors. The intention of WRM 1993 is that by enhancing the quality of instruction (i.e. instructor training), a better driving education can be offered to candidate drivers, one that is appropriate to the requirements as imposed by the current Road Traffic Act.

The instruments used for this purpose are as follows:

- *setting preparatory training requirements for candidate instructors prior to admission to the instructor exam;*
- *expanding the content of the instructor exam;*
- *appointing a central examination institute;*
- *introducing a compulsory five-year application test.*

In the period of June-October 1996, a study was performed to take stock of the experiences with the implementation of WRM 1993. The study was qualitative in nature, in the sense that the organisations involved were asked to describe their experiences.

In addition, quantifiable data were also collected to allow the developments to be charted.

With the implementation of WRM 1993, the main problem areas were found to be as follows:

- *coordination between instructor training and the exam;*
- *verification of the quality of the exam;*
- *the exam regulations;*
- *the nature and duration of the vocational training procedure.*

The results of the study were used to formulate subsequent recommendations.

The use of lighting on bicycles, mopeds and low speed mopeds

Results of measurements carried out in the beginning of 1996
C.C. Schoon & G.A. Varkevisser.
R-96-39. 54 pp. Dfl. 22,50.
(in Dutch)

This report describes a study into the use of bicycle lighting. The last measurements of bicycle lighting (in operation) were performed by SWOV in 1988 and 1993. At that time, the percentage of bicycles that used lighting during conditions of twilight and darkness was 65% and 54%, respectively. The measurements were conducted in the months of January and February. 1996. If we confine ourselves firstly to the same four measurement locations as used

in 1988 and 1993, then it appears that the percentage of bicycles using front lighting had fallen to 51%. Here, Amsterdam represented the greatest anomaly with a user percentage of 27%. In order to reduce the influence of individual measurement locations as far as possible, the number of locations was extended to ten with the latest measurements. For these ten locations (including Amsterdam), the percentage of bicycles that used front lighting was 55%, while for moped riders and low speed moped riders, the figures were 94% and 91%, respectively. The figures for operative rear lights were only a few percentage points below those for front lights. The presence of (compulsory) rear reflectors was 94%. If there was no rear reflector, the rear light only burned in 13% of cases.

Personal characteristics such as gender and age were determined 'at a distance'. Cyclists aged over 25 used lighting more often than the younger age categories. Also, women more often used their lights than men.

Translation into English of Terms and Definitions used in the Road Accident Statistics of the Netherlands

As reported by the police to the Basic Data Department of the Transport Research Centre of the Ministry of Transport, and published by Statistics Netherlands
S. Harris M.A.
R-96-54. 29 pp. Dfl 17,50.
(in English)

This report is an update of the SWOV publication of the same name and author, in 1977. Its number is R-77-31. This report's purpose is to assist road researchers over the whole world to understand what the Dutch police record on the report form and what it means in English. It is also meant to facilitate reading Dutch accident tables in publications of, for example, Statistics Netherlands. As an addition to the old report this report also offers an alphabetical list of the terms used, an English translation of the Road Accident Form as used by the police and a short article about the registration of road accidents in the Netherlands, especially about the extent of its incompleteness.

Prognostic analysis of road safety in Poland

An update of Appendix I in 'Road safety in Poland', SWOV report R-94-58 (using data from 1953-1993), now based on data from 1953-1995 (incl.) and a partially improved methodology
M.J. Koornstra.
R-96-41. 15 pp. Dfl. 15,-.
(in English)

In 1994, the development of traffic as measured by passenger cars and road safety as measured by road fatalities has been analysed by SWOV on the basis of the data from 1953 to 1993 inclusive for Poland, using models for traffic growth and risk development. That analysis tentatively resulted in alternative prognoses for passenger cars, fatality risk per 1,000 cars and fatalities. The data for 1994 and 1995 are now available on the basis of these the prognostic analysis is updated.

Some aspects of the safety of elderly pedestrians and cyclists

Paper presented at the International Conference 'Road Safety in Europe', Birmingham, September 9-11, 1996
Marjan P. Hagenzieker.
D-96-4. 21 pp. Dfl. 17,50.
(in English)

The numbers of elderly people are increasing worldwide. Also, the mobility of the elderly people increases and the elderly generation of the coming years will spend much more time and distance in traffic than the present elderly generation; as car drivers, but also as pedestrians and/or cyclists. This paper discusses some aspects of the safety of elderly pedestrians and cyclists such as safety figures (fatalities) in a number of countries, exposure, mobility figures and safety measures.

GAMBIT: Integrated Programme of Road Safety Improvement in Poland

Some observations about the road safety situation in Poland, about the structure of the GAMBIT programme and about programme components
Fred Wegman.
R-96-42. 16 pp. Dfl. 15,-.
(in English)

Poland, like all Central and East European Countries (CEECs), is faced with the enormous task of implementing political, economic and social changes in converting its centrally controlled planned economy to a market economy. Transport and infrastructure are of vital importance in bringing about these changes and achieving economic growth. Economic growth will lead to increased prosperity and to a rise in the number of private cars owned. Once economic growth is established, this will also result in increased mobility, more transportation of goods, including by road, and higher mileages by private motorists. Unless the road system is expanded and the quality of the existing road system improved, major problems will arise: capacity problems that lead to less efficient use of the infrastructure and hence to economic losses and problems relating to nature and the environment, various difficulties (such as through traffic passing through small towns and villages, city centres congested with cars) and more accidents and casualties.

Fundamental characteristics of the road safety problem in Poland are well described in different reports: first of all in documents of the GAMBIT project, as well as in a Worldbank report and during a policy seminar on road safety in CEECs in Budapest.

The GAMBIT team produced a draft version of the final GAMBIT report (GAMBIT, 1996). This SWOV report (R-96-42) discusses this draft. An oral presentation of this paper has been presented during a special seminar in Gdansk, March 21-23, 1996. After that the GAMBIT report was completed.

Multiple Driver Support Systems and Traffic Safety

T. Heijer.
R-96-52. 18 pp. Dfl. 15,-.
(in English)

This project was aimed at investigating the effects on road safety of various applications of Advanced Traffic Telematics (ATT systems) intended to support the driver in different aspects of the driving task. Such ATT systems are being developed (or are already on the market) e.g. to provide up to date route information, to maintain a constant speed and headway, to adapt the maximum speed to the local limit or to prevent collisions etc. Although many of those support systems are intended to make driving easier or safer, they can also change or extend the driver's tasks in such a way that safety is impaired. This project aims to develop a checklist and a test bed for structured field testing in order to assess these adverse safety effects.

COLOPHON

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