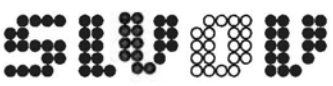
Research activities 1990-1991



1992

SWOV INSTITUTE FOR ROAD SAFETY RESEARCH, THE NETHERLANDS

Photos: Studio Verkoren, Wim Metselaar, Ton Kastermans Fotografie

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What is the SWOV?

The SWOV Institute for Road Safety Research was founded in 1962 in response to a joint initiative by the then Minister of Transport and private organisations. Due to the constant rise in road accidents, scientific study seemed to offer the only effective means of tackling this traffic problem. In doing so, the Netherlands fell in step with developments in neighbouring countries, where similar institutes had already been operating for some time.
The aim of the SWOV, then and now, is to offer a contribution towards improving road safety by means of scientific research.

History
The 1970s saw a shift in social attitudes towards road safety. More than ever before, the interests of mobility were weighed up against those of residential, commuting and living environments. During the 1960s, attention focused on motorised traffic, with emphasis on road systems. By the 1970s, interest in non-motorised traffic intensified: pedestrians and cyclists, particularly the most vulnerable amongst them - young and elderly road users. A distinction was made between residential areas and traffic areas. In residential areas, walking, shopping and recreation were given precedence. The result was the development of the "woonerf" and shopping areas which favoured slow traffic. In traffic areas, rapid relocation was the main aim. Traffic was therefore accorded a different degree of importance, depending on the area classification.
During the 1980s, the trend which commenced in the 1970s was further developed. Road safety was no longer viewed as a separate problem, but as part of a whole, of a system.
The Minister of Transport formulated the following task for the Long Range Plan for Road Safety 1987-1991: 25% fewer road accident victims in the year 2000, with respect to 1985. The aim is to realise an optimal transport system, one which is able to satisfy both relocation needs and minimise road hazard. The 1990s are characterised by a constant rise in the degree of mobility. The Transport and Traffic Plan (SVV-II) sets a new target: 50% fewer road fatalities and 40% fewer injuries in the year 2010. A start has been made to conceptualise an inherently safe - and therefore different - transport and traffic system. The term 'sustained safe traffic' is heard more and more frequently.

Philosophy
The SWOV looks at the functioning of the transport system in its entirety. This means that study into road safety demands an interdisciplinary approach. The solutions to various problems and specific aspects will also be considered in relation to each other, and require an insight into the technical, psychological, sociological and economic background to the transport system and the way in which these factors are linked. This in itself is not enough, however. The aid of systematic data processing of traffic and accident processes and highly advanced analysis techniques is essential to ensure the success of this interdisciplinary approach. The use of the computer for this type of study is of vital importance. The computer plays an important role in the development of mathematical models for traffic and accident processes.

Approach
The SWOV has described an accident as "a critical combination of circumstances". The influence exerted by man on this process can only be properly determined if other influences are also taken into account. For example, if a driver who has only had his licence for a short time is involved in a collision, an explanation of 'lack of experience' is too vague and inadequate. It may have rained heavily at the time of the accident, the road surface might have been slippery and the other driver may have forced him to perform an emergency manoeuvre, after which the inexperienced driver lost control over his car. When taking measures, therefore, it is necessary to regard behaviour on the road as the outcome of various circumstances and events which have an effect on each other. To influence the behaviour of the road user, it would appear to be more effective to modify an aspect of the road or vehicle, rather than to impose standards on people, which they are expected to meet. In addition, when considering the limited potential of people, we must also take into account factors such as age, experience and circumstances such as fatigue and stress. The traffic situation must in

fact be adapted to cater to the least skilled and weakest group of users. If the traffic environment is adapted to suit human ability, then road education will also have the greatest effect.

Since an accident is almost never due to a single cause, and the different attributable factors can also serve to reinforce each other, it is difficult to determine the effects of a single measure precisely. Furthermore, traffic is constantly subject to change. However, the SWOV has been able to estimate the effectiveness of certain measures, such as the compulsory use of seat belts and moped helmets, the Alcohol Act, speed limits and the use of side reflectors on bicycles.

The choice ultimately made is not only dependent on the effect on safety or on the costs associated with introducing that measure. It is also necessary to compare the effect on road safety with the degree to which the transport system, i.e. meeting the need for relocation, is affected. The choice can be simplified by identifying those measures which may affect the aim of the transport system to a greater or lesser degree. This makes it easier to weigh up the various interests against each other. In this way, it is possible to design a strategy to reduce road hazard.

Clients

Aside from work commissioned by the Ministry of Transport, the SWOV is increasingly receiving assignments via regional and municipal governments, private organisations and industry. Studies are also requested by organisations overseas. Over the years, the SWOV has evolved increasingly towards a market-oriented institute, actively acquiring assignments.
In addition to scientific study, the SWOV is also responsible for coordinating road safety research contracted out to universities and other specialised institutes. The study results are then integrated by the SWOV and presented in a suitable form for the client. The SWOV also issues recommendations to its clients on measures that should be taken to promote road safety.

Other activities

Aside from activities in the field of research, the SWOV also looks after the support and distribution of knowhow, data and experience in the field of road safety, both at national and international level. In the 30 years since its foundation, the SWOV has conducted or commissioned numerous studies, published many papers and organised meetings and conferences.

SWOV director M J. Koornstra

Road accident victims in 1991

In 1991, official statistics showed that 13,301 road users were seriously injured. Of that number, 1,281 persons died; the others were admitted to hospital. These road accident victims were subdivided into groups on the basis of several characteristics. Table 1 shows a classification according to type of road user, age and gender.

Pedestrians represent 10% of all registered serious injuries. The following group in order of size is the category of moped riders, at somewhat less than 20%. Although moped riders cover relatively few kilometres, it is the high level of road hazard that leads to such a large number of victims. Cyclists are next, numbering a little over 20%. Car passengers represent the largest group of road accident victims, at over 40%.

10% of seriously injured road accident victims fall in the age group of up to 15 years, half of these as cyclist and about one quarter as pedestrian. The next age group of 15-25 year olds represents one third of all victims, car passengers and moped riders being roughly equally represented. The other modes of transport only represent a small group each. The group of 25-50 year olds also holds one third of all serious road injuries. In this category, however, over half was injured while travelling in a car. Finally, one quarter of victims is aged 50 years or over, with 15% aged 65 and above. With these two age groups, we see that the proportion of car passenger victims drops, while the share represented by cyclists increases. In the category of 65 years and above, the number of cyclist victims is even somewhat higher than for car passengers. In addition, the proportion of pedestrians increases in these age groups, compared with younger age categories. The relationship between the number of traffic fatalities and size of the population is most unfavourable for those aged 65 years and above. This means that for this group, cycling and walking are hazardous activities.

Over half of accidents that led to serious injuries occurred inside the built up area, and less than 10% on motorways. The remaining serious injuries therefore occurred as a result of accidents on other road types outside the built up area.

This distribution is shown in Table 2. Taking into account the mode of transport, the collision partner and the type of road, some groups are of particular interest. These are:
- cyclist versus car on roads inside the built up area;
- single car accidents on 80 km/hr roads;
- car versus car collisions on 80 km/hr roads;
- car versus car collisions on roads inside the built up area;

Each of these groups covers approximately 10% of the total number of seriously injured road accident victims, the first group somewhat more, the last somewhat less.

Collisions with cyclists are known to often occur on intersections inside the built up area. The victims tend to be elderly: of all seriously injured persons, one quarter is aged 65 years or above, while this group represents approximately half of all cyclist fatalities. Single car accidents (without collision partner) are often registered on stretches of road between intersections, a significant proportion occurring on a left hand bend (with respect to the direction of movement of the car involved). Collisions between cars on 80 km/hr roads often occur on stretches of road between intersections, as a result of an attempt to overtake. Inside the built up area, collisions between cars mainly occur on busy intersections with a priority rule, controlled by either road signs or lights.

Table 1: Number of seriously injured road accident victims in 1991, according to mode of transport and age (VOR 1991)

	Age of victim											
	Un-known	00-04 years	05-09 years	10-14 years	15-17 years	18-19 years	20-24 years	25-49 years	50-59 years	60-64 years	65 years and older	Total years
Passenger car	54	58	67	58	111	348	1129	2179	453	162	617	5236
Lorry		1				5	15	54	12	1	1	89
Van	1	5	4	2	2	28	109	179	35	6	12	383
Bus						1	4	2			1	8
Motor cycle	2			3	13	39	269	473	23	4	3	829
Moped	18		2	45	958	393	267	325	69	39	118	2234
Bicycle	12	33	178	436	254	99	204	726	306	161	706	3115
Pedestrian	6	119	239	112	42	38	54	245	83	46	363	1347
Train						1	2	2				5
Other modes of transport			1	4	6	4	3	14	6	2	15	55
Total	93	216	491	660	1386	956	2056	4199	987	421	1836	13301

Table 2: Number of seriously injured road accident victims in 1991, according to mode of transport, type of road and collision partner.

	Type of road		
	50 km	80 km	100 km
Car passengers			
– single car	569	141 7	365
– car versus other car	1212	1578	499
– rest	51	117	8
Total	1 73 2	31 12	8 72
Pedestrian			
– versus car	925	127	26
– rest	239	29	1
Total	1164	156	27
Cyclist			
– versus car	1688	4 73	10
– rest	707	237	0
Total	2395	7 10	10
Moped rider			
– versus car	1112	337	4
– rest	564	2 16	1
Total	1676	553	5
Motor cyclist			
– verses car	321	190	25
– rest	111	151	35
Total	432	341	60
Rest	39	31	–
Total	7924	4903	974

Results of SWOV research 1990-1991

Minus 25% campaign

The Long Range Plan for Road Safety 1987-1991, as envisaged by the Dutch government, formulates the following concrete task: 25% fewer accident victims in 2000. To help realise this aim, the Stimulation Plan 'Minus 25% Campaign' was set up. An important aspect of this campaign is that it offers councils an opportunity to earn result premiums. It was set up by the state in an effort to actively involve all municipalities in this policy, which aims to realise a downward trend in the number of road accident victims. A new policy instrument was introduced, namely one which, over a period of years, offered participating municipalities a premium if the number of local road accident victims dropped by a certain percentage. The size of the premium depended on the degree to which this drop occurred in the municipalities concerned. The drop in the number of injury accidents is measured on the basis of the numbers registered by the police, although it is widely acknowledged that police registration of accidents is not ideal. There is a notion that the standard of registration is declining; however, it is not known exactly to what degree this is occurring and to what circumstances this can be attributed.

Successful?
In order to determine whether the stimulation of municipalities through the "Minus 25% Campaign" has been successful, a number of questions must be answered, such as whether the registration of injury accidents changed during the campaign period. In addition, it must be clear whether the intention of the campaign was brought home to the municipalities, whether as a consequence they developed (more) activities and whether the result of the campaign in fact satisfied the initial aim.

Level of registration
The SWOV carried out two studies in order to supply an answer to the questions above. With regard to the question on a reduced level of registration, the following can be stated: in the Netherlands, various sources are available containing data on road accidents; not only data collected by the police, but also data collected via hospitals, insurance companies etc. offer a source of information. When all these sources are compared against a number of criteria such as independence, availability, consistency etc., it is evident that there is no collection of accident data that is able to measure any reduction in the registration level of the police.

Familiarity
The familiarity with the -25% campaign amongst the population is relatively small. This could be considered as disappointing. After all, it was expected that the public would notice something of an actively conducted or promoted municipal road safety policy. Familiarity with campaigns in the field of road safety seems to be focused primarily at the traditional three areas of interest: alcohol, seat belts and speed (R-90-18, R-90-22, R-90-40).

Long range road safety plan MPV-3

As part of the preparation of the new Long Range Plan for Road Safety by the Ministry of Transport (MPV-3), the SWOV interviewed a number of people in the spring of 1991 concerning their views on the current and future traffic and transport system. These interviews are intended to offer information on a truly safe traffic and transport system, on the feasibility of such a

system and the likelihood that current policy will achieve a considerable reduction in the number of road accident victims. A total of 23 persons was interviewed, active in or with the universities, consultancies, policy, public ministry, education, municipalities and industry.
The question posed - how to design a traffic and transport system resulting in few, or no, road accident victims - demonstrated that people seem to find it difficult to imagine the reality of such a system, unless drastic measures are taken. These measures would then have to relate to restricting the freedom of the driver in particular. With regard to the feasibility of such a system, it was concluded that the aim for safety would restrict individual freedom, and as a result encounter much resistance. Also on the basis of economic considerations, since measures cost money. Many believe the current policy is a wishful one, which does not respond to its task in a sufficiently concrete fashion. In particular the latter is missed on a regional basis. The spearheads formulated in the policy offer too few points of contact for municipalities, who have become important participants in the fight against lack of safety on the road. With regard to the realisation of current policy, people indicate that this is obstructed by the growth in mobility, poorer control, less stringent standards, lack of financial means, lack of information and knowledge, insufficiently equipped regional bodies and municipalities and unfamiliarity with the effect of measures.

Points of concern
Other points cited by the interviewees were: More efforts invested to substantially reduce speed. In connection with this, there should be more and stricter separation between traffic types, and more attention paid to protecting weaker traffic participants. Another subject that received attention was the tougher approach. This is proposed both for information on road safety and for the enforcement of measures, but also in relation to taking physical measures to change the infrastructure. Finally, the costs associated with road hazard should be made more visible. Road hazard should cost society money, visibly and tangibly, also at a personal level. (R-90-55).

Road markings on 80 km/hr roads

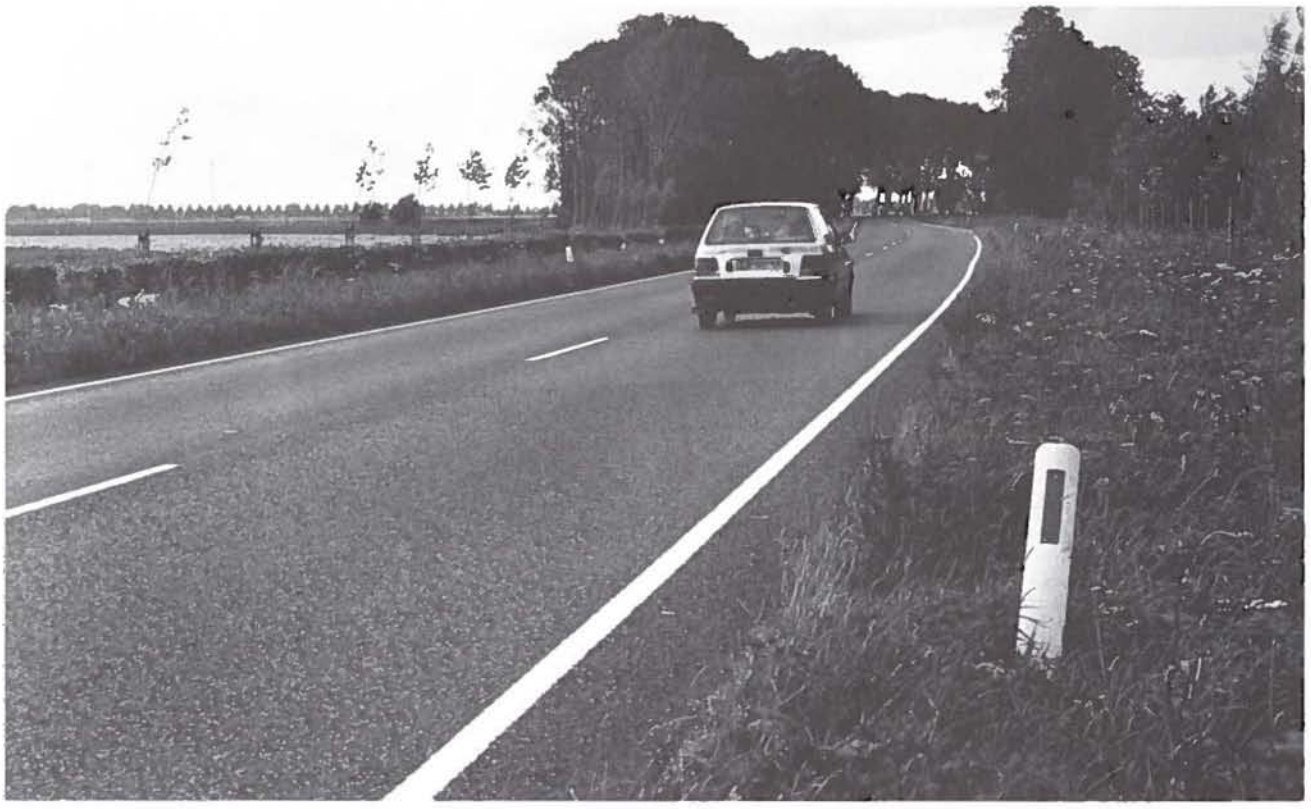
In comparison with motorways, more injury accidents per vehicle kilometre are seen on 80 km/hr roads. The narrowest roads represent locations where relatively the largest number of accidents without a collision partner occur. Unfavourable circumstances (such as darkness, poor weather and alcohol consumption), high speed and poor road markings could all play a role. The following mistakes can be made under these conditions:
- incorrect choice of speed for the situation there and then;
- incorrect estimation of road course and bends;
- incorrect assessment of the transverse position on the road, including bends.

In order that vehicles remain on course and are correctly positioned, road markings and verge reflectors are used as guides. These differ from each other in a number of respects. Road markings are easier to localise, so that they are more suitable for maintaining the transverse position within the lane. Verge reflectors on the other hand can be seen from a greater distance, so that they are useful as a source of information for other manoeuvres, such as seeing bends in the road in time.
Due to their vertical position, verge reflectors are less sensitive to moisture than road markings and are virtually impermeable to snow, so that they remain more visible during poor weather conditions. This is true for both daylight conditions and at night time, when they are lit up by car headlights.

Profiled road markings
On a wet road and during rainy conditions, the traditional road marking consisting of paint or thermoplastic material is not, or hardly visible. Profiled road markings and surface reflectors are well visible under all conditions, daytime and night-time. There are indications that improved observation conditions lead to a drop in the number of accidents.
The profiled road markings have an added positive effect: When the line is crossed, this is heard and felt. Whether this is a disadvantage to motor cyclists has not been demonstrated. On 80 km/hr roads, a profiled marking can be used without difficulty, provided it is not in the vicinity of a residential area. If this is the case, it will be necessary to weigh up the relative merits of improved safety versus noise pollution.

Bends
If a driver has a good insight into the course of a bend, he can select a safe speed and know what manoeuvre should be carried out. A good insight into the course of a bend can be obtained when the overall change in angle is seen before entering the bend. Marking the curve plays an important role. Because it is harder to judge, a bend to the right will require more attention than a left hand bend. In general, it can be stated that it is easier to stay on course with respect to the middle line than with respect to the kerb line.

Anticipation
Anticipation is an important facet in staying on course. If the function of the road is clear, e.g a flow function or a distribution and access function, the driver knows which driving behaviour to adopt. It must be investigated how road markings can accentuate the function of a road. If certain bends and irregularities fall outside the pattern anticipated by the driver, road markings can help to focus more attention on this fact. One objection to clearly visible road marking at a distance is that the road resembles one where higher speeds are permitted. Possible solutions to prevent this: avoid large observation distances, restrict the application of road markings and avoid objects that are characteristic



for roads with a flow function, the application of visual narrowing.

Recommendations
The 'solutions' described in the above could be investigated together with the marking possibilities that can be used to clarify the function of a road, or express the category to which the road belongs. For example, differences in reflector values, variations in size of surface area, differences in shape, etc.
Another point concerns the use of verge reflectors on straight stretches of road. Since these reflectors hardly play a role in keeping a car on course, they should only be placed in bends on the road. The advantage of this approach is that the presence of a bend receives added emphasis (R-90-54).

Driving under the influence reduced by one quarter between 1987 and 1989

Since October 1, 1987, the results of breath tests carried out in the Netherlands can be used as legal proof against those suspected of driving under the influence. From October 1 1989, after a transitional period of two years, breath testing has become the principal form of evidence; the blood test has only been used in exceptional cases since then. It was expected that police surveillance would be made efficient by the introduction of breath testing, so that driving under the influence could be combated more effectively.

Between 1987 and 1989, the number of drivers found driving under the influence has remained about the same: the number of charges issued on the basis of infringement of article 26 of the Road Traffic Act (0.5 BAC) was around 33,000 for both years. Considering the reduced use of alcohol in traffic, this demonstrates an increase in the number of drivers subjected to police controls. Whether this increase would be realised using a similar, larger or smaller police effort is not known.

Measurements
In order to establish the development in alcohol consumption after introduction of the breath testing system, random breath test were carried out in 1987, 1988 and 1989 during weekend nights. These measurements form part of a series of studies on drinking and driving habits that the SWOV has been carrying out since 1979 at greater or lesser intervals. In 1988 and 1989, media reporting on alcohol and traffic was surveyed and analysed, in order to see whether there was a connection between driving under the influence on the one hand and the nature and scope of publicity on the other.

Successful police supervision
The increase in police supervision seems to have played an important role in reducing drink driving. This can be deduced from the fact that, between 1987 and 1989, driving under the influence in the south of the Netherlands increased, rather than decreased. A study into reporting in the media on alcohol and traffic shows that, in this region, considerably fewer supervisory campaigns were held than in the rest of the Netherlands. Other Dutch studies have also shown that intensifying police supervision has a favourable effect on driving under the influence. A supervisory campaign which was held from December 1989 to February 1990 in the province of North Brabant resulted in a marked drop in drink driving. On completion of the campaign, the local incidence had dropped to match the level for the rest of the Netherlands. A similar impression, but then in the longer term, was offered by an experiment which used intensified police supervision in the Leiden region. The experiment continued from end 1988 to end 1989. At the close of this period, driving under the influence was shown to have dropped by one quarter.

Effect of information unclear
Nationwide information campaigns aimed at fostering the right attitude towards drink driving seem to be of primary importance for drivers who have not developed a fixed drinking and driving habit yet. This can be deduced from the marked drop in driving under the influence amongst young drivers, measured between 1983 and 1987. The proportion of young drivers with a punishable blood alcohol level (during weekend nights) dropped from 10 to 4% during that period.

In 1986, a large scale information campaign primarily aimed at the young was commenced by The Dutch Road Safety Organisation (VVN). Although the exact effect of this campaign on the attitude and drinking behaviour of young drivers is difficult to ascertain, one may assume that a positive effect was achieved. During that same period, however, an important change in police supervision also commenced, that is likely to have made its own contribution: the early, unreliable breathalysers for the selection of those under suspicion of drink driving were gradually replaced by far more reliable electronic breathalysers. This advance was accompanied by the necessary publicity.
On the basis of available study data, it is impossible to say which proportion of the favourable development noted with the young can be attributed to the VVN information campaign, and which part to improved detection methods.

Future
In order maintain the relatively low level of driving under the influence noted in 1988 and 1989, and possibly lower it even further in the future, information campaigns and police supervision will have to continue to go hand in hand. Here there seem to be ample opportunities to enhance the efficiency of police controls. In particular, combined surveillance of a limited number of important traffic infringements, such as alcohol abuse, the wearing of a seat belt and speed offences (R-91-3).

Alcohol consumption in Amsterdam

Around New Year 1990/1991, the Amsterdam police conducted a three week campaign against alcohol, consisting of increased police supervision combined with information campaigns and publicity. During the campaign, over 8000 drivers were stopped at random by the police and checked for excess alcohol consumption. The information campaign consisted primarily of handing out VVN folders and stickers to drivers who were checked. The alcohol campaign held in Amsterdam received coverage in nationwide TV news, local radio and television networks, national papers and in local door to door papers. The SWOV investigated what effect the campaign had on the alcohol consumption of Amsterdam drivers. This was carried out on the basis of data from police controls prior to and after the campaign. These data concern alcohol consumption, age and sex of drivers stopped at random during weekend nights. The alcohol consumption was measured with portable electronic breathalysers that offered an accurate reading of the Blood Alcohol Level (BAC). During the preliminary measurements, 985 drivers were tested, while 927 were tested subsequent to the campaign.

Campaign had no effect
The Amsterdam campaign seems to have had no noticeable effect on the alcohol consumption of drivers. Perhaps the campaign did not continue for long enough to achieve the desired impact. The study data do show, however, that alcohol consumption in Amsterdam is relatively high: on average during the preliminary and subsequent measurements, 7.4% of drivers consumed an

excess amount of alcohol. This puts the level measured in Amsterdam at over one and a half times higher than in the provinces of Utrecht and North Brabant, where between 1990 and 1991 alcohol campaigns were also held and evaluated by the SWOV.
Driving under the influence in Amsterdam was mainly found with male drivers aged 25 and above. On Friday night, the proportion of drivers under the influence is greater than on Saturday nights; alcohol consumption increases markedly as time progresses. During the night between Friday and Saturday, between 2 and 4 a.m., one in five drivers was shown to have an excess BAC. As would be expected, the highest concentration of drivers under the influence was found in the centre of Amsterdam.

Recommendations
Considering the high percentage of people found to be driving under the influence in Amsterdam, police supervision of alcohol in traffic should be increased, without placing a heavy burden on police capacity. In addition, the special preventative effects of surveillance should be enhanced by punishing drunk drivers more rapidly and in some instances more severely. (R-91-27).

Enforcement and rewarding in traffic

In the United States, campaigns using reward programmes to stimulate seat belt use appear to have had very promising results. Whether such a system would work in the Netherlands and whether it would be accepted is not known. In collaboration with the Ministries of Transport and Defence, the SWOV investigated whether 'enforcement en rewarding', combined with information campaigns, could influence the wearing of seat belts.

Set-up of the study
In October and November 1988, a nationwide seat belt campaign was held amongst defence personnel. The campaign was mainly aimed at young, male drivers between 18 and 25 years of age. In 12 barracks and air force bases spread throughout the Netherlands, 10 different campaigns were held, intended to stimulate use of seat belts by personnel of the Ministry of Defence when driving in their own cars. At the barracks gate, it was noted whether people wore their belt when driving in and out. Three levels of surveillance were used (hardly increased, moderately increased, markedly increased), and two levels of information campaign (publicity about the campaign only, publicity plus extra information on the subject). At eight barracks, six different combinations of information campaign and supervision were used. The reward programmes used two versions (group reward and individual reward) and were applied at four barracks. This led to ten different 'variables'. A comparison of these variables should answer the question of whether reward systems 'work', whether they works better than punishment and if so, what forms of reward are most effective.

Conclusion
A single seat belt campaign consisting of a combination of supervision and information is effective. The same is true for reward campaigns. Whether supervision is more effective than reward, or vice versa, could be established on the basis of the results of this study (R-88-12).

The use of seat belts in the Netherlands

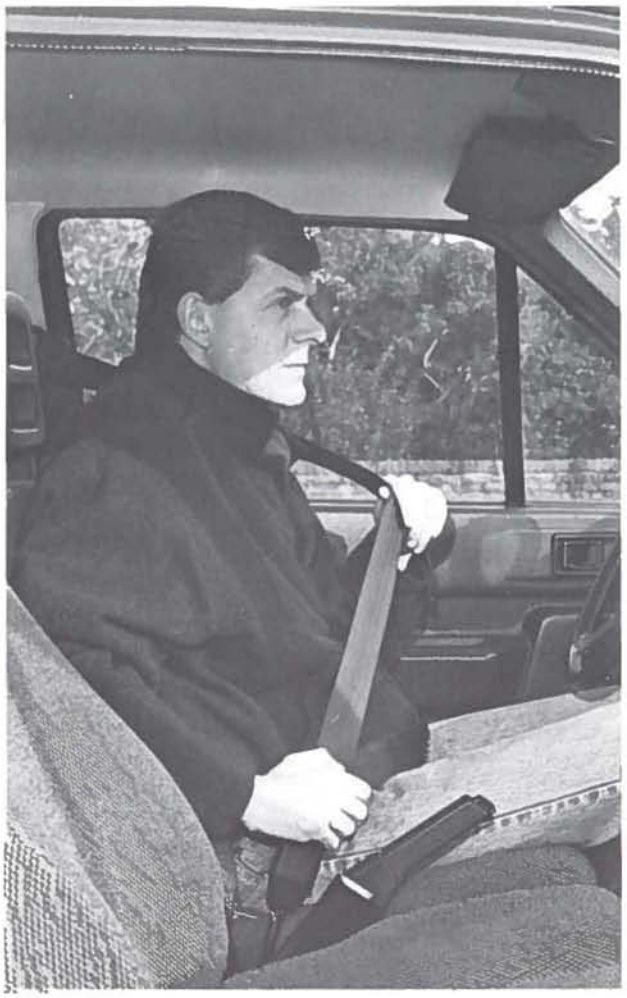
Since 1969, the SWOV has held annual surveys into the presence and use of seat belts on the front seats of passenger cars. In 1990, the use of seat belts outside the built up area was as high as in 1989, namely 78%. The rise which commenced in 1986 seems to have come to a definite standstill at this stage. The use of seat belts on roads inside the built up area has declined slightly to 59%. The decline in use which commenced in 1989 seems to be continuing. In the period 1979 to 1990, the use of seat belts on roads outside the built up area was considerably higher than inside the built up area. The age of the car seems to have little influence on the use of seat belts, except for cars aged 8 years and upward, where a clearly lower wearing percentage is noted, both inside and outside the built up area.

Women versus men

The person's gender seems to influence seat belt use; women wear the belt more than men; outside the built up area, 84% of women wear a seat belt, as opposed to 76% of men. Inside the built up area, these percentages are: 66% of women, versus 56% of men. For men, age clearly has an influence on the use of seat belts; for women, the age is hardly a factor of influence. Men aged 50 years and above show a clearly higher wearing percentage than younger men, and is similar to the rate for women. With regard to wearing percentage outside the built up area, no difference is noted between men between the age groups below 25 years of age and from 25 to 50 years of age (75%); inside the built up area, men aged up to 25 years seem to use the seat belt least (49%), less also than for men aged between 25 and 50 (55%). In 1990, only men, particularly men aged 50 and below have shown a drop in wearing percentages inside the built up area.

Incorrect use of seat belts and child seats

In order to ensure that safety measures have an optimal effect, they should be used correctly. The literature shows that incorrect use is quite frequent. For example, belts are worn with too much slack, or the position of the seat belt or the chair with respect to the passenger is incorrect.



Child seats were often fastened incorrectly. The SWOV has studied their use in the Netherlands. It was noted that there are many different brands and types of child seat on the market. There are also many ways in which the seat can be fastened and differences in how the child is secured in the seat, so that many mistakes were noted in both respects. Another problem area is the group of children aged 5 to 12 who wear the standard seat belt. It is likely that parents are under the mistaken impression that the use of these 'adult seat belts' is the only option available. Nevertheless, it is better to choose a safety device designed particularly for this age group (R-90-26, R-90-24, R-91-6).

The use of seat belts: an international comparison

In collaboration with its Finnish sister institute, VTT, the SWOV conducted a study into the use of seat belts. The aim of the study was to discover which factors contribute to the wearing (or non-wearing) of seat belts. Because a staff member of the VTT worked at the SWOV as guest researcher during 1990, much of the relevant literature in the Scandinavian language has been made accessible.
Making the wearing of seat belts compulsory by law is one of the major factors contributing to their use. Promoting the use of seat belts without such legislation is evidently very difficult and time-consuming. Nevertheless, simply making the wearing of seat belts obligatory is often not enough. Other important factors include making non-use punishable by law, and the use of intensive information and publicity campaigns. A fourth important factor is to apply measures such as supervising the wearing of seat belts and offering rewards to promote voluntary use of seat belts.

Optimal mix
To date, most studies were aimed at assessing the effect different measures had in improving seat belt use. However, it must be emphasised that a broad-based package of measures - an optimal mix - offers the best results. The exact content of this mix depends on the specific behaviour aimed at, and also on target groups and situations. In some countries, e.g. the United Kingdom, (West) Germany and Finland, front seat belts are used by over 90% of passengers. In these countries, where use of seat belts is highest, these results were achieved through legislation, by making non-use punishable by law and through intensive information and publicity campaigns on the subject. Seat belt use in these countries has developed to become a public norm. Most car passengers probably 'belt up' automatically. Because seat belts are now worn habitually, supervision is hardly necessary at this stage.

More efforts
In the Netherlands, use of seat belts outside the built up area is 78% and inside the built up area, 59%. A significantly lower percentage than in the United Kingdom and Germany, for example. Imposing compulsory use and making non-use punishable by law does not seem to offer sufficient incentive in the Netherlands. In order to achieve better compliance with the measure, surveillance campaigns, coupled with information and publicity campaigns are required.
In addition, many small scale experiments have shown that rewards can also help to promote seat belt use.

Rear seats
In recent years, promotion of the use of rear seat belts has become more topical. It is important that optimal use can be made here of experiences gained in the process of promoting seat belt use on the front seat. However, in many countries no legal obligation exists as yet to wear seat belts on the rear seat; such a legal obligation is an

important condition to ensure their increased use. Future attempts to promote seat belt use in the Netherlands and also in other countries could in the first place be aimed at the rear seat, and at a better use of safety measures for children. At the same time, it is the intention that they have a radiating effect, leading to an improved use of seat belts on the front seat (R-91-26, R-91-30).

Rear seat belts in passenger cars

Since January 1 1990, the Dutch government has made the installation of rear seat belts by the manufacturer compulsory in new cars. In October 1990, the SWOV conducted measurements with regard to the presence and use of seat belts and child seats on the rear seat of passenger cars.

Results
Measurement locations *outside* the built up area showed that a safety device was present on 39% of side seats and on 26% of central seats in the rear of passenger cars. At measurement locations *inside* the built up area, the percentages were 35% and 21%, respectively. In comparison with 1989, this means: an increase of 10% outside the built up area, and an increase of 8% inside the built up area. The presence of seat belts and child seats in the rear is strongly dependent on the age of the car. With cars aged 1 year or less, more than 90% are fitted with seat belts or child seats, with cars aged 2 years, this figure is greater than 60% and with cars aged 8 years or over, the level is 18% only. On the front seat, three point seat belts are practically the only type of device used. In the rear, there is a difference in the type of seat belt used. Three point belts are mainly found on side seats (80%), while on the central seat, a lap belt was usually fitted (90%).

Use
Of the safety devices present, 24% of lap belts were used, 18% of three point belts were used and 92% of child seats. The use seems to drop strongly according to the age of the passengers. With children aged up to 5, the use was 72% in 1990, while in 1989 this figure was still 90%. With children aged 5 to 12, the use was 27% and in the group aged 12 to 18, 23%. This use of seat belts for adults on the rear seat was less than 10%. Whether the driver wears his seat belt seems to influence the use of safety devices in the rear. If the driver wears his belt, then 40% of passengers in the rear also wear theirs; if the driver does not wear his belt, the user percentage in the rear is 25%. If child seats are not included in the assessment, then it seems that if a driver does not wear his belt, only 6% of rear seat passengers use their belt; if the driver does wear his belt, belt use for rear seat passengers is 25%. On motorways, the use of safety devices on rear seats rose from 25% in 1989 to 37% in 1990. On secondary roads, the use dropped from 46% in 1989 to 41% in 1990, and on roads with local traffic, use dropped from 35% in 1989 to 26% in 1990.

Compulsory use in the rear?
It seems that adults on rear seats in particular hardly 'belt up', if at all, while this is somewhat better for young people, even though the level remains relatively low. If child seats are installed, however, these will virtually always be used. Only in about 10 years' time will all cars be fitted with rear seat belts. However, the compulsory installation of seat belts does not automatically mean that they are worn. Without supplementary measures, it cannot be expected that in the general presence of seat belts in the rear, the wearer percentage will exceed 30%. Considering the experiences with the wearing of seat belts on front seats, compulsory use in the rear is the only way that an actual change can be brought about; this observation therefore supports the measures announced in this regard, because in the meantime, the Minister of Transport has decided that as from April, 1992, the wearing of seat belts in the rear will be made compulsory (R-91-7).

Retro-reflective material for traffic signs

Because during hours of darkness, a relatively large number of accidents occurs, it is important to devote extra attention to road safety under these conditions. One of the ways in which this can be done is by considering the visibility of traffic signs, e.g. by making use of retro-reflective material. At present, the Netherlands uses two classes of reflection for traffic signs with retro-reflective material: class I and class II. Class I and II hardly differ at observation distances of 50 metres or less with regard to retro-reflection. Only after 60 metres does a small difference become apparent between both materials: at distances of over 100 metres, class II is at least twice as bright as class I. The required observation distance for traffic signs depends on the approach speed. At a speed of about 50 km/hr, the distance required to make an emergency stop is at least 15 metres. This distance, plus the response time, means that traffic signs, for example, must be visible from distances of at least 30-45 metres. In order to brake comfortably at this speed, a distance of at least 58 metres is necessary. From the point of view of road safety, the SWOV concluded that inside the built up area, an observation distance of 50 metres is sufficient, except when actual driving speeds are greater than 50 km/hr. In this situation, class I is satisfactory. In situations where driving speeds exceed 50 km/hr, material of class II is preferable from a road safety perspective (R-90-42).

Towards an inherently safer road traffic system

The SWOV was asked by the Ministry of Transport to take the initiative towards developing an 'inherently safer traffic system'. The conditions created by such a system would be such that serious outcomes of accidents are unlikely, and - via process management - the actual incidence of accidents is low. The system would make no assumptions about the presence of 'a better person' or an 'intelligent vehicle'. Safety must be built into the system in advance.

Inherent safety means organisation, structuring and control of traffic processes, and therefore implies a restriction of the degree of freedom the individual road user possesses. It also means that standards are imposed on the organisation of road safety policy and its execution. Neither centralisation, nor decentralisation can be the principle for such a requirement, but rather the optimal formulation and realisation of a joint policy, based on the characteristics of the organisation as a whole. Inherent safety also means less freedom. The permissiveness that presently characterises the approach towards road hazard, can only be banished if the concept of inherent safety receives a broad base of social and political support, as is the case with environmental policy at present.
Inherent safety means to build more safety into the system, universally and in advance, and does not tolerate the notion that everyone can find their own solution to the same problem at whatever rate they choose.
The following elements could form part of an inherently safer traffic and transport system:

1. organisation of residential areas on the largest possible scale;
2. classification of roads outside these areas;
3. developing information and control systems for some of these, and
4. curbing the growth in mobility. (R-90-36).

Daytime running lights

In 1986, the SWOV concluded on the basis of a literature study ".. that it is likely that the introduction of the attention light in the Netherlands will lead to a reduction in the number of road accident victims...".
Not long afterward, the Minister of Transport decided to aim for the introduction of daytime running lights (DRL). Initially by establishing supplementary vehicle requirements, later - when insufficient support seemed to be offered in an international context - by means of a national code of conduct. Since then, many discussions have been held on the advantages and disadvantages of this measure. In addition, some new study results have become available. To what new insights has all this led?

The literature study conducted by the SWOV in 1986 was based primarily on the results of nine overseas evaluation studies: two preliminary and follow-up studies in countries that imposed compulsory use (Sweden and Finland), and seven fleet-owner studies in Canada and various states of the USA. Despite the fact that each study had its limitations, they also showed that the measure had a positive effect on road safety. Although the observation processes that are at issue here are not yet fully understood, there was a likely explanation for such an effect: there are still many situations during which a car is inadequately noticed and is seen too late, or the anticipation of its movements is not accurate enough.
Based on a number of assumptions, the SWOV thought it could make a well-founded statement about the effect DRL could be expected to have in the Netherlands, in view of these overseas studies: at least 5% fewer road injuries. Even when the estimated structural costs are set against this (mainly extra fuel consumption, more rapid wear and tear of lights and adaptation of the switching mechanisms) the public cost-benefit balance remained positive.

In the subsequent discussions, a number of objections were voiced that partially related to the claimed positive effect of the measure. The three major objections were:

Objection 1
There are too many differences in the other countries to allow generalisation and apply results found elsewhere to the Netherlands (latitude; traffic composition).
This objection has an element of truth. This is also the reason why the SWOV has subjected the differences noted to a different assessment, insofar this was possible with the data available. However, it seemed that the effects found were still valid. In addition, the fact remains that despite the many more unknown differences between all experiments, a positive effect was found in each case. To reinforce this even further: the results of two independent studies were published subsequently (Norway and Israel), which confirmed the perviously drawn conclusion.

Objection 2
The effect found in one of the most broadly set up studies, namely in Sweden, can also be explained by other results (selective increase in car use; rise in non-DRL relevant accidents due to entirely different causes).
The comment on the whole is valid and can be made for all nationwide evaluation studies of this type. This is one of the reasons why the SWOV did place its trust 'blindly' in this one evaluation study. However, it cannot be ignored that the Swedish researchers came to a positive conclusion about the effect of DRL with the data they acquired on the basis of the chosen study set-up.

Objection 3
The effect noted elsewhere is mainly due to a positive effect for motorised road users; the effect for slow traffic could be less, or even negative. The current inequality between types of transport could be further reinforced as a result, and the Dutch situation could lead to a negative balance. If this were true, this would indeed be a significant detraction from the measure. This was already noted by the SWOV in 1986. Therefore, the available data was used on the one hand to see what in particular were the effects on slow

traffic; on the other, the Dutch Institute for Perception TNO carried out a small scale experimental study into the visibility of cyclists in the vicinity of cars using DRL. Neither of the two sources supported the objection made; rather, there were indications to support the opposite: cyclists seem to profit more from DRL than drivers. Considering the importance of this aspect, further studies should be devoted to this matter.

Conclusions

The SWOV draws two conclusion from the above:

1. There is relatively much evidence to indicate an expected positive effect of the measure on road safety. Based on the study it conducted, the SWOV expects that the widespread use of DRL will result in at least a 5% reduction - and a 12% reduction, on average - in road accident victims, i.e. an average of 170 fewer fatalities and 5700 fewer injuries. Insofar the advantages and disadvantages can be "expressed" by a cost-benefit analysis, they also result in a positive balance. Most parties involved seemed to agree with these conclusions, albeit with some reserve with respect to the extent of the safety effect.
2. Studies conducted elsewhere do not offer a definite answer on the effects of the measure under specifically Dutch conditions. This answer can only be given by introducing the measure in the Netherlands and evaluating it thoroughly; the study should avoid a number of pitfalls encountered by the previously cited overseas studies (specific areas of attention should be: actual use of DRL; a control area; position of slow traffic; development of mobility).

This conclusion also seems to be shared by virtually all parties involved. Despite the consensus noted to date, the opinions vary on the introduction of the measure. This is because other considerations are also included, such as: who will pay for the cost of the measure (in this case not the tax payer, but mainly the driver); is the increase in energy consumption - regardless of any effect on safety - desirable; can the safety of slow traffic be improved by allowing them to respond more adequately to approaching (dangerous) fast traffic (or are only those measures that attempt to bring about behavioural adaptations of fast traffic eligible); is it desirable to accentuate the presence of fast traffic on the street - not taking into consideration any effect this might have on safety?

Early measurements of DRL use

In the months November 1989 to April 1990, the SWOV measured the number of passenger cars using DRL.
In addition, a survey was held in June 1990 on a limited scale to discover why people used - or did not use - DRL.

The major factors that determine whether people switch their car lights on or off include light intensity, weather conditions, season and surroundings (inside or outside the built up area). In addition, clear differences were demonstrated with the use of DRL between, for example, passenger cars and motor cycles.

The table shows the percentages of vehicle using DRL during dry and wet weather conditions for the various categories of road user.

	Dry weather	Wet weather
Passenger cars	6%	26%
Lorries and vans	12-18%	26-50%
Motor cycles	76%	76-100%
Mopeds	8%	18-40%

The poll was intended to offer an impression of people's attitude towards the use of DRL. A choice was made for a limited set-up, and not for

a nationwide, representative random sample. It was noted that over half of those persons questioned who used DRL want to be noticed in traffic; for the group not using DRL, the motivation for switching their lights on seems to be mainly dependent on light intensity and weather conditions. Under special daytime conditions such as in tunnels, on polder roads, on the Afsluitdijk or on roads passing through woods, a number of these people did switch on their lights. Half of the persons questioned declared that they were prepared to use DRL, even if it were not compulsory (R-90-15).

Visual observation and DRL: experiments placed into a frame of reference

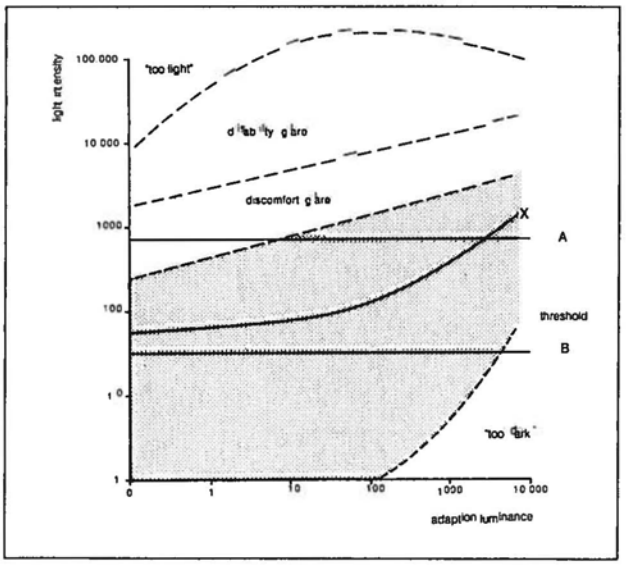
The discussion about whether daytime running lights (DRL) should be introduced in the Netherlands as a rule of conduct often include arguments - for and against - that relate to visual observation. It is claimed that vehicles would become more noticeable as a result of DRL, be detected sooner and/or be better recognised. In addition, the distance to other vehicles would be better estimated. On the other hand, it is suggested that DRL could lead to blinding. What exactly is meant by the term blinding, when does the phenomenon occur and is there indeed question of blinding with the introduction of DRL? The SWOV answered these questions in a study. This study does not deal with the subject of blinding in isolation, but also involved other aspects that relate to visual observation in the discussion surrounding DRL. The central question is when positive or negative effects can be expected from DRL.

Experiments

In the past, various experiments were conducted, mainly abroad, that all dealt with this subject. However, they all describe a different aspect. Some experiments consider the relation between light intensity and detection, estimating distances or visibility; others dealt with recognition and blinding. The SWOV has now placed these various experiments into one framework.

Qualitative model

The associated graph reproduces the qualitative model, as developed by the SWOV.
The horizontal axis shows the adaptation luminance, that is largely dependent on the light intensity of the surroundings; the vertical axis represents the light intensity of the lamps. The area delineated by the curves left top and right bottom denotes the entire area in which 'observation ' is possible. Objects too dark to observe are in the right hand bottom corner; objects that literally blind and make observation impossible are in the left hand top corner. In the area where observation is possible, various sub-areas can be distinguished. The lower curve shows the threshold for the detection of light. The shaded area enables recognition and identification of objects without negative side effects. Observation is possible within the shaded area, although negative signs do occur in the form of blinding (so-called discomfort glare and disability glare). The horizontal lines represent the light intensity of headlights, for example. Headlights were to date used primarily during conditions of darkness, and therefore had to be so bright that they enabled the driver to see unlit objects ahead of time, long enough to enable him to take evasive action if necessary. On the other hand, the lights could not be so bright as to lead to unacceptable blinding of traffic coming from the opposite direction. In general, blinding can be understood to be caused by luminance in the field of vision which is considerably greater than the luminance to which the eyes are adapted (in response to the environment), leading to discomfort, obstruction, irritation or loss of visual performance and visibility.
For example, the graph shows that a headlight with a light intensity of almost 1000 candela (line A), is somewhat blinding at very low adaptation



luminances (less than 10 candela/m2), but is well visible at 100 or 1000 candela/m2. Nowhere does this headlight fall into the 'too dark' area. A headlight of approx. 30 candela, however (line B), will not blind under any conditions, but will be very dim at high adaptation luminances (of almost 10,000 candela/m2), and therefore be hardly visible. It is evident that somewhere between 'too dim' and 'too light', an optimum level can be found in which (DRL) lights do contribute to an improved 'visual performance', but do not blind. Line X in the graph, derived from experiments reported in the literature, roughly indicate the limit above which DRL is useless, i.e. above the line, detection, estimating distance etc. is better than performance measured below line X. What does this mean in practice?

Conclusions

In general, it can be stated that the higher the adaptation luminance, the greater the light intensity of DRL lamps should be to ensure an improvement with respect to a situation without lighting, and the greater the light intensity can be before any form of blinding will occur. It follows, therefore, that whatever light intensity is selected, there will always be some conflict between the desired improvement and undesirable blinding. Under daylight conditions, for which the DRL measure is intended, a light intensity of 1000 candela, for example, will virtually never cause

any form of blinding, while an improvement in visual performance can still be expected. However, during twilight, a light intensity of 1000 candela can cause blinding under certain conditions. If a lower light intensity is selected for this reason for DRL lights, say 400 candela, then at very bright ambient light conditions, e.g. at 1000 candela per square metre or more, no improvement with respect to the situation without lights will be gained.
Therefore, there is no single light intensity for DRL which offers the same (optimum) effects under all light conditions (R-90-41).

Young drivers: a traffic problem

Young drivers aged between 18 and 25 are involved two to three times more often in a serious traffic accident than drivers aged between 36 and 55. The likelihood of an accident with young people aged from 22 to 25 is already less than half that of those aged between 18 and 22. After that age, the likelihood of an accident continues to drop at a slower rate. During weekend nights, all car drivers have a greater chance of being involved in an accident, although young people run an added risk. It is often said that alcohol use by the young is the reason for this. However, this is not an adequate explanation, because it has been shown that relatively fewer young people drive with an excess alcohol level in comparison with older drivers. However, because of their lack of experience, the probability of young drivers being involved in an accident due to alcohol consumption does rise more rapidly. Furthermore, they drive relatively more often during weekend nights. Because on average, young people drive with a relatively large number of passengers, accidents involving this group often have a serious outcome. The lack of experience increases the likelihood of an accident. Furthermore, young men often tend to overestimate their competence and underestimate the dangers. Both processes reinforce each other.

Possible measures
The SWOV has proposed a number of measures to reduce the probability of accidents involving young drivers:

1. No exposure to situations that young beginners, in particular, seem to be least able to cope with. A driving ban for 16 year olds during weekend nights was shown to be effective in the United States; a total ban on the use of alcohol may be considered.
2. After the basic course is completed, a period follows when driving is only permitted in the company of a supervising experienced driver, who is trained by the driving instructor. Positive experiences with such a system have been gained in the United Kingdom and France. The eligible driving age could be lowered using if such a system were in force.
3. A combination: restriction in mobility could be compensated by, or coupled to, a lower minimum driving age, when the novice driver may only use the car under supervision for two years after training is completed, for example. After a successful experiment, the system of 'supervised driving' was introduced in France. This measure will also influence moped use and the lack of safety associated with this category.
4. Driver education must devote more attention to promoting insight and recognising danger. In this way, the beginner learns to know his limitations. Current driver education seems to focus too much on technical driving skills, and rote learning of formal rules.
5. In Germany, the confiscation of a young person's driving licence after one or two serious offences has had a generally preventative effect, and has led to 5% fewer accidents with this group. A compulsory 'driver improvement' course for offenders serves as supplement to the standard driving course.
6. By means of information campaigns (and a code for car advertising), the 'macho status' of the car and the associated driving style could be combated.

Course offers perspective for improved driving proficiency

Young, novice drivers are relatively often involved in accidents. By means of a course, an attempt is made to make young male drivers realise that they are more often involved in accidents, on average, offer them an insight into the dangers and teach them how to anticipate these, and allow them to experience that a car can only be controlled to a limited degree. The course was offered to young novice drivers, who had received their driving licence several months previously, and commenced with a theoretical introduction on the road hazards facing young drivers and on the inherent dangers of different types of road. Subsequently, practical assignments were carried out on an exercise track, and they received practical training on public roads. On the exercise track, they practised their driving skills, emergency stops and braking on a wet road surface. This was supported by theory lessons on the powers of a car, required braking distance, slipping and the like. On public roads, they had to drive without further instruction, i.e. independently, to several destinations. This approach offers the instructor a much better insight into driving proficiency than when each manoeuvre is instructed separately. A different learning process was therefore added. The journey covered various types of road. Much attention was paid to possible dangers and how these can be anticipated. At the end of the course, a closing discussion took place.

Driving test
In order to assess their knowledge, the participants were tested before and after the course by examiners from the organisation which organises driving exams in the Netherlands (CBR). At the same time, they were assessed on their knowledge and questioned about their driving behaviour and attitudes. In order to be able to determine the effect of the course, a group which had not followed a course was also subjected to a driving test. The assessment was carried out by a CBR examiner, who used the same criteria as are applicable to the current driving exam.
The driving test offered a specific assessment with the aid of a new form, that will in principle replace the current paper in future.

Results
If the test had counted as an exam, three quarters of the candidates would have failed. In contrast to the driving test which forms part of the driving exam, this test was not conducted along a standard route. This probably explains to a large degree the poor result. During the driving course, students practise the routes that are used in the driving exam. They learn how to drive along these routes, which of course is not the same as learning how to drive well.
People who had followed the course in advance performed better than those who did not. Of those who did not attend, almost 90% would have failed, of those who did, 60%. The course therefore offers perspectives for improved driving proficiency.

Conclusion
The fact that essential aspects of driving have to date received little attention during training is mainly because they are not considered during the driving exam. The results of this study correspond to the policy that is applied by the Ministry of Transport in the new traffic regulations (RVV 1990), introduced in November 1, 1991. This also states that road users should not only be able to rely on a concrete code of behaviour, but also that they must assume greater responsibility to avoid road hazards. The driving exam should be adapted in response to the new Code.

It is recommended that students themselves should not be in a position to decide how many driving lessons to take, rather they should follow a certain programme. This could also deal with subjects that are not as easy to assess during an exam. In addition, the introduction of an interim driving licence may be considered, which requires that, on completion of their training, young novice drivers first drive under supervision for some considerable time, and follow additional training courses (R-90-33).

Provisional driving licence and point system

Driving a car is a complex task, for which the required learning period is not only represented by the driving course, but is continued after the licence is obtained. A provisional driving licence applies to this learning period, which continues after the exam. Specific rights and obligations are associated with the provisional driving licence, which differ from those for a person with a "comprehensive" driving licence. The following aspects are intended with a provisional driving licence:

- to create a sheltered, safe learning environment after the driving licence has been obtained;
- learning correct actions, such as systematically looking for crossing road users or the correct way to operate the vehicle under specific circumstances;
- the right mentality on the road, e.g. not entering into serious, deliberate traffic infringements such as alcohol abuse, driving through a red light and speeding;

Safe learning environment
A sheltered, safe learning environment can be realised by associating restrictions with the driving licence and by 'driving under supervision'. Some restrictions have proven to be effective, such as a prohibition on night driving. In addition, a prohibition on driving with passengers, and a 0 blood alcohol level seem promising. A restriction of the permitted maximum speed and a ban on driving on motorways will probably not lead to a positive safety effect.
In a test with 'supervised driving', a positive effect was shown. The SWOV recommends that the results of the system, already in use in France, be followed closely.

Correct behaviour in traffic
Learning correct behaviour in traffic can be realised both by further education and by 'supervised driving'. The SWOV does not advocate continued education, insofar this refers to courses that are aimed at enhancing technical driving skills, because these are counter-productive. Courses aimed at enhancing traffic insight have been judged in a positive light.

Correct traffic mentality
A correct traffic mentality can be formed by the strict application of policy for serious traffic offences, where a single offence is already sufficient for a sanction. A points system does not have an added value for such offences.
'Supervised driving' can also have a positive effect on the developing the correct driving mentality.

Supplementary to the current driving education, the SWOV advises that a provisional driving licence system be introduced, which aims for the three objectives described above. It may be worthwhile to close the provisional driving licence period with a test for driving proficiency. The effectiveness of these measures is shown to also be dependent on their enforcement, the type of sanctions, social acceptance, the integration with other facilities and the control of undesirable side effects.

Points system
The SWOV advises against the introduction of a points system. The points system can be regarded as an added sanction. The deterrent effect of such an added sanction seems to become effective only when the individual has accrued sufficient points to land in the "danger zone". This will only affect a small group, considering the current number of people charged. The majority of drivers will only accrue a very small number of points, if any, which means they never reach the "danger zone"; therefore, the points system does not represent a threat to them. The deterrent effect of a points system is therefore strongly dependent on the objective likelihood of being caught.
The points system as a means of identifying "dangerous drivers" has shown to be lacking in efficiency. There is question of a large coincidence factor with regard to who is charged, when and under what conditions. The number of booked offences therefore does not offer a reliable impression of the driving style of road users, and seems to correspond mainly with the number of kilometres travelled.

Effectiveness
Points systems have been implemented in many countries already. In the German points system, people already land in the danger zone after only one serious offence. In principle, no points system is necessary for this, and the added sanction can be imposed on the basis of a single booked offence. The German system proved to be effective during the first year after introduction. However, it remains to be seen whether the effect is permanent; as soon as the objective and subjective risk of arrest are shown to be low, its deterrent effect may decline (R-91-49).

Driving proficiency of older motorists

In April, 1990, the Minister of Transport instituted the 'Committee for the Evaluation of Extending the Validity of Driving Licences'. The SWOV was invited to participate in this committee, and was also asked to prepare a report on the issue of driving proficiency, particularly amongst elderly motorists.

Suitability
A driving licence is compulsory in order to drive a motor vehicle. To obtain a driving licence and be allowed to keep it, particular conditions apply, such as a minimum age, a minimum level of proficiency and a minimum level of physical and mental fitness. Physical and mental fitness are assessed for the driving exam by means of a so-called personal declaration by the person applying for the driving licence. Once someone is in possession of a driving licence, it is in principle valid until the age of 70. When, prior to this time, a person's fitness to drive a motor vehicle has diminished, he can voluntarily report this fact. Alternatively, the police may confiscate the driving licence if the person's fitness to drive is in doubt. Once the individual has reached the age of 70, he must pass a small medical examination by a physician before his driving licence is extended. The reason for making this examination compulsory is that ageing leads to loss of performance. However, the first generally manifested ageing symptoms that can affect driving skill already appear around the age of 40.

Evaluation
Automatic extension of the driving licence up to the age of 70 was introduced in 1986. Prior to this, the driving licence had to be periodically renewed. During the parliamentary debate about this amendment, an evaluation was granted. For this reason, the Minister installed the committee referred to above. The committee has aimed its evaluation specifically at the question of how a medical checkup of holders and applicants for a driving licence can be improved, in the light of the situation in other European countries.

Conclusions
To date, study has only shown a weak link between reduced driving ability and unsafe driving behaviour, while the relation to an increased accident probability is even less certain. This is due to the over-reliance on theoretical principles and on the inadequacies of accident statistics. Nevertheless, some conclusions can be drawn: there are various diseases, handicaps and ageing symptoms that lead to a loss of function and make the driving task more difficult to carry out. However, there are many ways to adapt behaviour and compensate for the loss of function. The self-regulation drivers use to compensate for loss of function can be reinforced by educating themselves and their advisers, such as physicians. In addition, simple checkups and driving tests can be used. On average, loss of function increases more rapidly as age advances,

particularly after 70 years of age. The rise in age is to a very limited degree a predictor of the likelihood of an accident. However, the likelihood of injury does increase if someone in this age group is involved in an accident, due to increased physical vulnerability. Cyclists and pedestrians sooner experience the consequences of this fact than do motorists. There are indications that the current population of older people is better equipped for the driving task than the previous generation, and the generation to come will be better equipped still.

Recommendations
It is therefore recommended to make the report of loss of function for the purpose of an examination for driving fitness dependent on the occurrence of an illness, handicap or biological ageing, and less on age. A legal obligation to report possible diminished driving fitness is desirable. Its purpose can be that possible problems related to driving fitness are taken seriously, that people are checked or tested in time and that the necessary compensatory measures are taken.
If, in addition, an (interim) age limit is maintained at which a checkup upon extension of the driving licence is compulsory, 70 years is much more justifiable as age limit than is 60 years (R-90-9).

Safety of roundabouts

For a number of years, interest in the new roundabouts in the Netherlands has increased markedly; some hundreds have been built to date, and many are in the planning stage or in the process of construction. In general, these refer to the small roundabouts, with a single lane both on the roundabout itself and on the approach road and exit road, where approaching traffic must give way to traffic driving on the roundabout. Aside from aspects such as capacity and costs, it is mainly the expectation that it is a very safe solution to intersections which clarifies the growing interest in these roundabouts.

Safety
With regard to the new roundabouts, the following conclusions can be drawn:
New roundabouts are very safe, as shown by a reduction to about half the number of accidents and over three quarter the number of road accident victims with respect to intersections, whether or not they have priority rule.
The greater safety of new roundabouts also seems to apply to those outside the built up area.
Although the greatest reduction in the number of victims has been noted with car passengers, cyclists and moped riders are also likely to benefit with a reduction of about three quarters as a result of such roundabouts being built. It is not yet possible to make a definite statement about the differences in safety of the various engineering measures and priority rules for cyclists and moped riders. The improvement of safety is in part due to the altered driving situation, so that certain conflicts no longer occur (e.g. head on collisions), and crossing by pedestrians is simplified, but for an important part it is also a consequence of the reduction in speed of fast traffic. It seems that the maximum safety of a new roundabouts is only achieved after a shorter or longer period of adjustment, depending on user frequency.

Capacity
The capacity of roundabouts with priority for traffic on the roundabout is relatively large, and extends to at least 2000 motor vehicles per hour for a single lane roundabout. The capacity of the two lane roundabout is greater, but it is not clear to what extent; for the moment, it will suffice to indicate a capacity ranging between 2600 and 4000 motor vehicles per hour.

Feasible locations
Roundabouts preferably should be used in situations where lowering of speeds is essential, at crossings where traffic lights are not ideal and where other solutions are problematic.
If a roundabout is used, the preferable design is one where traffic on the roundabout has right of way, and the approach roads are laid out in a radial fashion.

Cyclists and moped riders
It is recommended to keep experiments with all types of solutions for the position and priority rule with regard to cyclists and moped riders to a minimum. In principle, the following solutions should be regarded as preferable:
- separate cycle paths for cyclists and moped riders at some distance from the roundabout, where cyclists and moped riders give way to fast traffic at all times.
- a variation on the above solution, where moped riders ride on the carriageway of the roundabout.
- add a lane in red for cyclists and moped riders on the outside of the roundabout carriageway, and insofar possible, physically separated from that carriageway; cyclists and moped riders on the roundabout have right of way.

One or two lanes
The use of roundabouts with two lanes, for the moment built on a very small scale, is recommended. Their use on a larger scale is only feasible if sufficient experience with this variation has been gained, both with regard to safety and capacity.

Uniformity
In future, the priority rule should be made universal to all roundabouts, including older versions. The signs to be used should be replaced by one sign which controls both priority and compulsory driving direction, and which also makes it clear that traffic leaving the roundabout has the same status as traffic turning off.

Information campaigns
The correct driving method when approaching and driving on roundabouts should be promoted through effective information campaigns, which also instruct drivers when to use the indicator and to give way to cyclists on the roundabout when turning off.

Conclusion
A roundabout has been shown to be a relatively safe solution for an intersection. The capacity is acceptable and the costs are relatively low, in many cases lower than the costs associated with building a controlled intersection.
Considering the great degree of safety of new roundabouts, it is desirable that roundabouts are applied on a much larger scale at intersections where safety leaves much to be desired, both inside and outside the built up area.
The more limited improvement in safety during hours of darkness and the increased number of collisions with light poles make a study into the lighting of roundabouts desirable, where attention must also be paid to the number and position of these light poles. (R-89-56, R-90-47).

New traffic regulations

In November, 1991, new traffic regulations (RVV) were introduced, containing basic rules of conduct for road users which must in principle be complied with under all circumstances.

Flanking policy
A flanking policy is required to ensure that the behaviour of road users does in fact improve. A part of that policy affects the road traffic authorities who look after the placement or removal of traffic signs, and are also responsible for taking other physical (engineering) traffic measures. Another part of flanking policy is directly aimed at improving the behaviour of roadusers through, for example, information campaigns, driving courses and police supervision.

Road users
For the latter, the SWOV has offered a contribution in which three principles are formulated:
1. Willingness to adhere to the rules is served by a clear explanation of the aims of the RVV, of possibilities and restrictions of a legal regulation to serve that aim and of a type of 'how to use' instruction for the RVV.
2. In order to keep any contrived interpretations and applications of the RVV by road users in check, it must be clear which rules are considered most important, and under what circumstances.
3. In order to know what behaviour is expected of a road user in a particular traffic situation, road users are assisted with descriptions of that behaviour. In this way, the desired behaviour can be described for a number of standard road situations, according to type of transport.

Explanation
Various options are open to explain the purpose the RVV serves. Strictly speaking, the RVV mainly controls the ranking of road users in traffic, and many rules can be translated in terms of who has right of way (or not, as the case may be). An analysis of accident data showed that the number of road accident victims amongst cyclists and moped riders as a consequence of collisions with cars on intersections inside the built up area

represent a large problem for safety. The cyclist category also claims 100 deaths a year. This problem is largely due to offences by motorists breaking the RVV code, and can also be considered as partly attributable to the relationship between fast traffic and slow traffic on roads intended for mixed use.

Ranking
The SWOV has composed an interim ranking of problems regarding the behaviour of traffic participants from the point of view of road safety. This again demonstrates which rules are most important in certain situations. The literature and accident data generally shows that the use of alcohol and the failure to wear seat belts and helmets are high on the list. Also, speed offences offer sufficient proof of the inherent danger of driving too fast. It can be argued that within the built up area, speed offences and other offences by motorists against cyclists and pedestrians are dangerous and often occur. In the same way, there are indications that both inside and outside the built up area, speed offences not only endanger slow traffic, but also passengers of other cars. Further important regulations include stopping for a red light, using daytime running lights and the correct use of a road, according to its purpose and design. The latter case, for example, is illustrated by the illegal presence of slow traffic on a motorway. Of course, there are also problems involving the behaviour of road users where it is less clear which traffic offence is at issue. For example, the large number of traffic fatalities as a consequence of car accidents without a collision partner; annually, some 200 deaths are recorded on 80 km/hr roads in that category.

Behavioural recommendation
The SWOV has issued a behavioural recommendation as a translation of, and supplementary to, the new RVV. This describes the meaning of good behaviour in traffic. For a number of standard situations as may occur per type of road, behaviour is described in terms of a sequence of choices to be made and actions to be taken. This behaviour is dependent on the type of transport (on foot, by bicycle or by car), and must therefore be described separately for each mode of transport. The description not only includes the rules of the RVV, but also the recommendations, explanations and warnings. For the present, the behavioural recommendations have been drawn up for motorists inside the built up area, with emphasis on the ways they should interact with slow traffic (R-89-21, R-91-39).

Heavy vehicles

When compared with accidents involving passenger cars, accidents with heavy vehicles often have a fatal outcome. The drivers and passengers of heavy vehicles are relatively rarely the victims in this case; victims for the greater part fall amongst the other party. In a study, the nature and scope of accidents with heavy vehicles (lorries and buses) was compared with that applying to accidents with light vehicles (passenger cars and vans).
The main conclusion is that differences in the incidence of accidents between heavy vehicles and passenger cars can largely be explained by differences in exposure. To what degree exposure is a contributing factor, however, cannot be established due to lack of information. The majority of accidents involving heavy vehicles that have a fatal outcome can generally be attributed to the poor collision properties of heavy vehicles. An analysis of accident data in relation to available exposure data has made it clear that this data as such is too limited to offer a good description of the accident situation for heavy vehicles. There is cause to consider the problems of 'heavy traffic' at a higher level than the accident statistics. An integrated approach towards transport and road safety is therefore required. (R-89-30)

Road hazard during misty conditions

Mist leads to incidental, albeit recurrent, problems for the safety of traffic. This sometimes results in veritable disasters. The cause of such a disaster is unadapted behaviour on the road, often a consequence of the incidental nature of mist. Particularly on motorways, a combination of high speed, a high volume of traffic and the presence of heavy traffic sometimes leads to disasters with numerous deaths, tens of injured and the involvement of hundreds of vehicles.
Information instructing people about the required behavioural adaptation can be improved by offering clear behavioural precepts on speed and distance, coupled to easily observable indicators such as road surface markings. Considering the universal incidence of unadapted behaviour, the enforcement of such regulations should also be improved. In addition, better marking of the rear of the vehicle is desirable in the form of compulsory mist lamps (one or two) which can be clearly distinguished from brake lights.
Only in the long term does it seem feasible to develop satisfactory protection against accidents occurring during misty conditions, using electronic aids. Until such a solution has been found, the responsibility will remain with the individual motorist (R-88-49).

Reorganisation of the urban area

The Demonstration Project for the Reorganisation and Redesign of Urban Areas commenced in 1976 in response to problems encountered with the increasing volume of motorised traffic. In the project, urban areas in Rijswijk and Eindhoven were reorganised and split into areas where either the traffic function dominates, or where the residential function (where people live) dominates, thereby obstructing the traffic function to a greater or lesser degree.

Options
With the reorganisation of traffic, a safe and smooth traffic flow has priority. Attention is devoted to the safety of cyclists and pedestrians. In the residential area, mainly housing areas, the functional character is emphasised. Measures that have led to a reorganisation of the areas have been designed on the basis of three objectives: option 1: to discourage traffic that does not 'belong' (mainly by introducing one way traffic); option 2: aside from discouraging outside traffic, to influence speed of local traffic (mainly by introducing speed humps); option 3: aside from discouraging traffic and influencing speed, making the surroundings attractive (by reorganising the area into a woonerf).

Five areas
The effects of the measure have been studied. The study is divided into five parts: traffic circulation, road safety, environmental hygiene, socio-economic aspects and use and subjective assessment of public areas. The SWOV has investigated the effect of the measure on road safety in terms of injury accidents.

Fewer injury accidents
The accident study showed that after reorganisation of these areas, fewer injury accidents occurred. This was true for both the residential areas (the living area) and the traffic routes (the traffic area).
Road safety also improved in the immediate surroundings of the reorganised areas (the area of influence).

It is assumed that the measures taken exercised a favourable radiating effect. The drop in the number of injury accidents per vehicle kilometre inside the traffic area as a consequence of the measurers is estimated at 16%. This drop applies in particular to injury accidents where motor vehicles only were involved. The development in other types of injury accident is also favourable, but less clear cut.
On the access roads (the former arterial roads), it seems that measures were less effective than on the arterial roads.
Inside the residential areas, 70% fewer injury accidents per vehicle kilometre were recorded after the reorganisation. Accidents in which only cycles, mopeds or pedestrians were involved have contributed little to this drop. It is striking to note that far fewer mopeds were involved in accidents; since the proportion of moped riders as a proportion of traffic participants has dropped markedly in these areas, this effect is not attributed to the measures taken.

Option 2 measures
When comparing the three options, it seems the greatest reduction in injury accidents was due to the measures in option 2 (90% reduction). This is followed by option 1, which included the simpler and cheaper measures (over 70%), followed closely by the most expensive package of measures in option 3 (almost 70%). These differences cannot be made 'concrete'. Nevertheless, the comparison does show that the most expensive package of measures is not necessarily the best in terms of a reduction in accidents. The measures that formed part of the package realised in option 2, therefore, showed the most favourable results in the evaluation

study into their effect on the number of injury accidents. Therefore, the aims and the overall description of these measures are emphasised here:
Aim: to discourage through traffic and restrict the speed of local traffic.
Measures:
- change the traffic circulation, partly by introducing one way traffic (approx. 15% of the total number of streets), partly by reversing the driving direction at existing one way streets and the introduction of stops for motorised traffic in some streets;
- physical measures such as speed humps (8 per km road length), axis realignment (1 per km), elongated humps at intersections (2 per km), narrowing intersections and sections of road (1 per km of road) and measures controlling parking facilities (40 per km).

Obviously, these measures cannot be adopted as they stand. The effect will depend on local circumstances.

Conclusion
With the reorganisation of residential districts in urban areas, the woonerf seems to be a less efficient answer towards lowering the number of injury accidents than are cheaper solutions currently recommended for 30 km/hr zones. Because about 80% of the number of road accident victims inside the built up area are recorded in the traffic areas, measures that only apply to residential areas will clearly not be sufficient. The demonstration project has shown that arterial roads function more effectively with good facilities for slow traffic, and that access roads in an urban area do not function well when they continue to allow access to through traffic. An intensive effort by traffic experts and others will be required if they take on the challenge to realise the same reducing effect for arterial roads as has now been demonstrated for measures in residential areas in the demonstration areas of Rijswijk and Eindhoven. (R-89-27).

'Keep your lane' system

The legal requirements regarding staying on course and changing lanes on motorways still date from the time that these roads were standardly constructed with two lane carriageways. Since that time, carriageways have been built with more than two lanes, and as a result, these regulations have come under discussion.

Regulations
Keeping to the right is obligatory, but some motorists do not comply with these regulations, as is shown by situations such as overtaking and passing on the right, continuing to drive on the left or central lane for unnecessarily lengthy periods of time, and the use of the indicator when merging back to the right. Through behavioural observations and a literature study, the SWOV has investigated to what extent current rules with regard to changing lanes on motorways are complied with, and what the consequences are for road safety. It wishes to consider whether the American 'keep your lane' system would offer a better alternative to the current regulations applicable to motorways. In such a system, vehicles keep to their lane as much as possible and are permitted to overtake on the right.

Conclusion
The introduction of a 'keep your lane' system will probably result in fewer lane changes. However, if the system is applied to motorways where there are large variations in speed, there is a high probability that the advantage of fewer changes will not measure up against the disadvantage of increasing road hazard, because vehicles overtaking on the right are not seen in time.
If a 'keep your lane' system were only introduced on motorways with limited variations in speed,

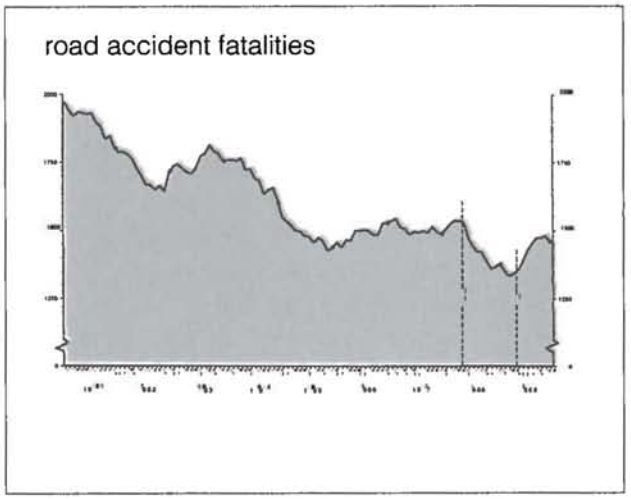
this would not benefit the uniformity of regulations and behaviour in traffic. In the current situation, therefore, it seems preferable for the moment to adapt the regulations such that keeping to the right is not legally prescribed for all traffic situations, although overtaking on the right will not be legalised either (R-89-33).

Speed limits on motorways

As from May 1, 1988, the general speed limit for passenger cars on Dutch motorways was raised from 100 to 120 km/hour. For a limited segment of the motorway network, a local limit of 100 km/hr was introduced. The limit for secondary roads stays at 100 km/hr, and the general limit for heavy vehicles is set at 80 km/hr. These amendments were accompanied by information campaigns, publicity and increased police supervision to ensure that the new limits were adhered to. The background to the amendment was based on the fact that the original limit was widely ignored. The basic thought was that the new system would meet a higher degree of

acceptance from road users. Combined with the accompanying measures, this would not only lead to a reduction in the number of traffic offences, but also to an actual improvement in speeding behaviour. It was anticipated that this would have a most positive effect on road safety.

A SWOV study showed that the changes in speed limit on Dutch motorways, combined with extra information campaigns, publicity and intensified police control, have led to a lowering of driving speeds. This again led to a reduction of traffic hazard in 1988. The effect on road hazard was not only limited to motorways, but was also found on other roads.
In the course of 1988, driving speeds started to rise again, and as a consequence, the level of safety dropped. This trend seemed to continue in 1989.



The graphs shows the development in the number of road accident fatalities in the Netherlands since 1981. After May, 1988 (the date of the amended limit), a fairly sharp drop is noted. Approximately one year later (when the driving speed increased again), the number of road accident fatalities rose once again, which is predictable if this is an expression of the effect of speed. The SWOV assumes that the number of traffic fatalities has stabilised since 1985, and that the drop in 1988 and the rise in 1989 was mainly due to the speed limit policy.

Temporary effect
It was shown that the combination of a legal measure, information campaigns and police supervision in this area can together influence behaviour in traffic. One of the problems, however, is that the effects are usually of a temporary nature only.
The threat of police surveillance seems to be effective initially. If the road user then sees that the actual chance of being caught is not great, he will adjust his speeding behaviour accordingly.

The temporary effect of the change in speed limit can be explained as follows: If behaviour contrary to the law is not punished, this serves as a licence to indulge in such behaviour more often. And if this repeated behaviour again is not punished, the behaviour will no longer be considered as an offence. Speeding behaviour in addition has the particular drawback that it is easy to see others offending against the rules, which can further reinforce erosion of the effect.

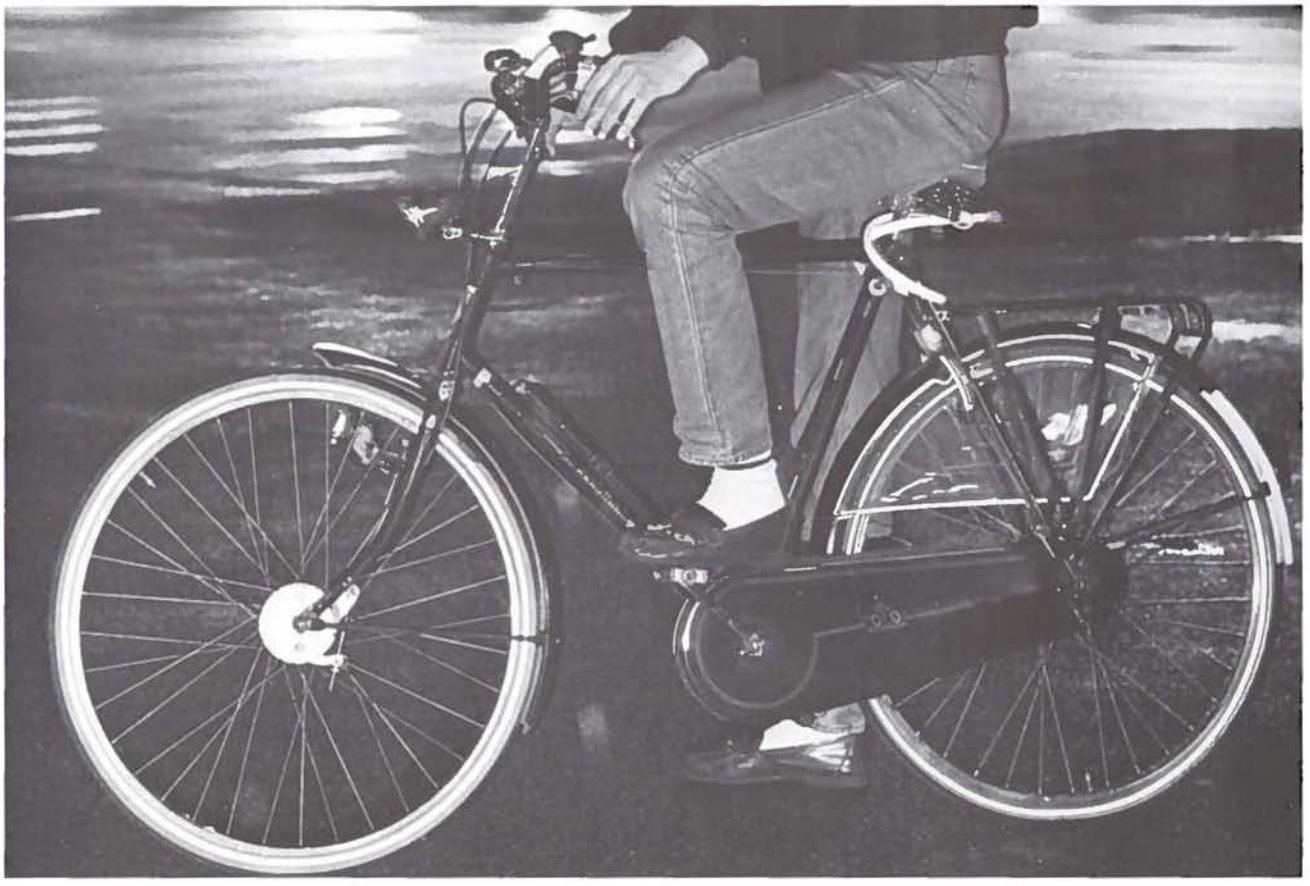
The situation in the Netherlands
The SWOV recommends that a supervisory policy be devised that contains a threat of punishment that agrees more in practice with the threat of punishment as represented by means of information campaigns and publicity. In addition, such a threat of punishment should be maintained until such time as road users have developed a stable new speed behaviour. In future, police supervision should slowly be reduced and an attempt made to have the limit in force widely accepted by road users.
(R-89-48).

Side reflectors for bicycles

Since January 1, 1987, there is a regulation in the Netherlands requiring that bicycles be fitted with circular side reflectors to both wheels. In December 1986, 25% of bicycles were fitted with such side reflectors. Two years later, in November 1988, this figure was 73%. The principle of the study into the effect of this measure on road hazard is that side reflection only has an effect on the development in the number of cycle accidents during twilight conditions and at night. In the daytime, the effect is negligible. It was also noted that cycles with side reflectors more often use lights during night-time conditions than do cycles without side reflectors. The number of fatalities and injuries occurring during twilight and at night has dropped by 4% since the use of side reflectors was made compulsory. On an annual basis, this represents 100 fewer fatalities and injuries amongst cyclists.

Age

The study showed that there was a clear relation between the number of persons using side reflectors in a certain age group and the decline in the number of road accident victims in this age group. With age groups where the presence of side reflectors was lower (and also the use of lights poorer), there is question of an increase in the number of accident victims. Further improvement of visibility (side reflectors and lights) for precisely this group of cyclists is therefore of the utmost importance. The road safety effect that may be expected for this group is relatively greater than has already been achieved by the measure amongst the present group of cyclists using side reflectors. (R-90-4).



Medication and road safety

Reports regularly appear about the degree to which the use of medication is supposed to contribute to road hazard in the Netherlands. The SWOV has set up an overview of current knowledge on this subject.

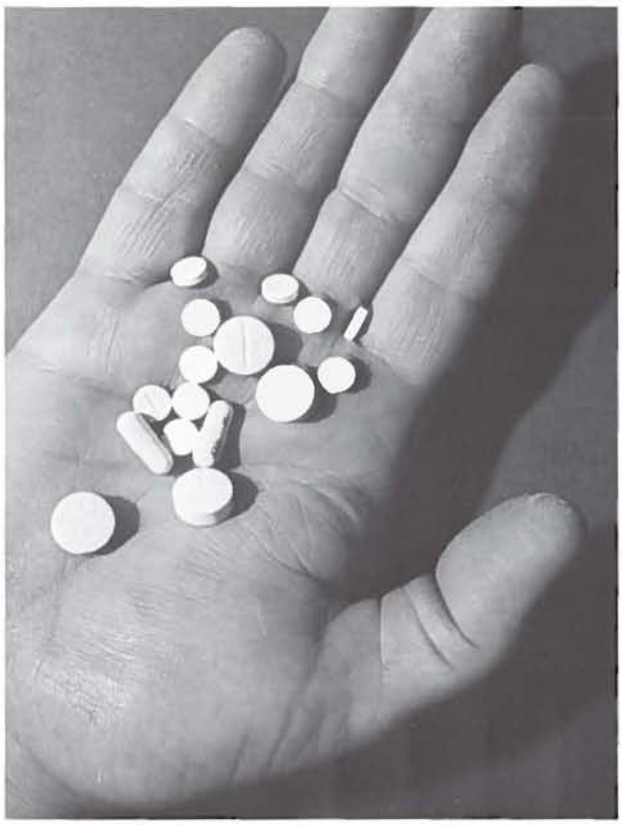
Of the roughly 6500 preparations registered in the Netherlands, about 10% contain substances that may affect driving performance. These are recorded on the list of medications that endanger driving, published and regularly updated by the KNMP, the Royal Dutch Association for the Advancement of Pharmacy. Based on experimental research only, no definite decision can be made on the influence that the various substances may have on the probability of being involved in an accident while driving. Additional epidemiological study is required, study where the use of medications by road users at the time they are involved in an accident is compared to that of a random sample of road users not involved in accidents. A further condition is that circumstances such as distribution in time, place, day of the week and weather condition are equivalent or similar for both groups. With regard to the scarce epidemiological studies that meet these conditions to some extent, it can be concluded that at least for the group of benzol diazepams, it is likely that the use of one or several medications from this group increase the likelihood of becoming involved in a road accident.

Scope
The scope of the problem regarding medications in traffic is only known in global terms. There are indications, however, to suggest that the use of medications which can affect driving ability is only found in a few percent of active road users, at the most, of which only a limited proportion is represented by motorists.

This was the result of a study into road accident victims that were transported for treatment to a number of hospitals, and where for 3% the use of a medicine noted as being hazardous to driving was found.

Policy in the Netherlands
The current policy in the Netherlands concerning the use of medication in relation to traffic consists mainly of admission procedures for new medications, education of (potential) users, physicians and pharmacists and the application of article 26 of the Road Traffic Act (WVW). A trade permit for new medications is provided after the Board has brought out a positive report on the medications on the basis of general pharmaceutical properties. This also considers whether the medication has an effect on the central nervous system or on one of the senses. In that case, it is legally determined that the packaging for the user and the production information for physicians and pharmacists must note that the preparation can have a negative effect on driving performance. A problem here is that preparations made by pharmacists themselves do not have to be provided with such a warning. It is also uncertain whether current instructions, considering the language used, are a suitable means of informing patients.

Education
The central boards of the KNMG, the Royal Dutch Medical Association and the KNMP have offered their members an 'important recommendation' on the question of how the physician or pharmacist, respectively, should act when prescribing or providing medications. Based on this 'important recommendation', users are mainly informed by means of warning stickers on the packaging. Individual advice by the treating physician or pharmacist hardly occurs. There are indications that people are aware of any likely side effect, but that such information is treated in different ways. Some interrupt drug therapy in order to be able to drive, others do not drive or, as they claim, drive 'more carefully'. The general problem with personal education of users is that there is too little knowledge to enable specific behaviour to be prescribed for each individual. Therefore, education can often contain no more than a general caution to be 'careful'. However, it is possible to distinguish risk groups that in general



respond more strongly to medication. In particular, the elderly react to a greater degree. Not only in this respect are the elderly more vulnerable, but as a rule, an increased number of different medications are prescribed for this age group. It is known that the effect of a medication may be intensified if it is taken together with other medications.

Article 26

Article 26 of the Road Traffic Act forbids driving under the influence of a substance of which the driver is aware, or should reasonably be aware, that it can reduce driving ability. The clause 'of which he is aware or should reasonably be aware' assumes that the user has been informed. If the 'experts' do not have the required knowledge at their disposal, how can the user know to what degree the substance can affect his driving performance? Determining whether someone is in fact driving under the influence of medication is in practice a difficult matter for the police, because there are no practical tests methods available for use on the road. At best, medications may be checked for afterwards, if those stopped for driving under the influence are shown to have such a low blood alcohol level that this can never explain the degree of hazardous driving noted.

Conclusion

There appears to be insufficient knowledge to enable an exact statement about the scope of the problem of use of medications on the road. However, this does not mean that it is quite likely that there are various medications on the market that have a risk enhancing effect under certain conditions.

It may be concluded that legislation and education lack a real foundation, due to the lack of knowledge regarding the anticipated effect on driving performance for a specific medication, under specific circumstances for specific users. A heavy burden of responsibility is placed on the users' shoulders. They are assumed to have knowledge that they do not have and could not have had. The knowledge provided on the basis of the instructions and the warning sticker seems to primarily be used to protect the prescribing physician and the issuing pharmacist from any legal responsibility. The road safety value of the information provided seems limited.

Future policy

The policy to be adopted in future should be based on the following principles:

1. Ensure that physicians, pharmacists and patients are optimally informed about the known risks of the use of medication in traffic.
2. Develop test procedures to measure the effect of medication on those aspects of the driving task that are considered to be of the greatest importance, in order to establish the possible influence on the risk in traffic as a result of using such medications. In any case, this should apply to newly admitted preparations, but also at the request of manufacturers for registered products already introduced onto the market.
3. Find alternatives to epidemiological study, in order to establish the scope of the problem relating to the use of medications in traffic (R-89-35, R-89-36, R-89-41).

Incidents in emergency treatment

Since the early 1980s, people active in emergency treatment to assist road accident victims have regularly pleaded for improvement of first aid through the application of current knowledge and technology. Improvement is possible at every phase of emergency treatment, because mistakes are made at every phase, precious time is lost or essential treatments are not carried out. The consequences of these mistakes are: avoidable fatal outcome or avoidable invalid condition of the victims. Some of these mistakes become known to a wider public, either through the press or by word of mouth.

Based on a collection of incidents, the SWOV has compiled a report that carried the subtitle 'a black book'. Some of the incidents cited occurred due to an unfortunate combination of circumstances. Other incidents were symptomatic of the problem, however, they are reinforced by existing practices and situations, or by the rules as they currently apply.
The incidents described are classified according to the various categories of first aid. The backgrounds to the occurrence of these 'black incidents' is described in brief. A chapter is then devoted to measures and their possible effectiveness.

Experiment with tunnel lighting

The greatest visual problem when going through a tunnel is encountered when entering the tunnel in the daytime. When the entrance is insufficiently lit, the tunnel has the appearance of a black hole, in which no single detail can be distinguished. The most critical part of recommendations and guidelines for the lighting of tunnels is therefore always focused on entrance lighting, which is also the most expensive part of the lighting installation.

The cause of the 'black hole effect' is due to a number of properties of the human visual system. Firstly, a certain - sometimes considerable - amount of time is required before the system has adjusted to a different light intensity. This is called adaptation. Secondly, observation in a dark area of the field of vision is made difficult when bright spots surround the dark area. These bright areas act as blinding sources, that draw a 'veil of light' across the entire field of vision. This blinding can be expressed as the brightness (luminance) of this veil.

Field factor
To determine the luminance in the tunnel entrance, certain formulas are used, based on theoretical considerations and laboratory tests. The 'field factor' in this formula is a multiplication factor that indicates the relationship between a certain threshold value as measured in the laboratory, and the value as noted in traffic. The difference between the two values occurs because there is a difference in the observation conditions of the laboratory and the conditions 'in the field'. This factor therefore acknowledges that the observer is also traffic participant: aside from observing object in his field of view, the vehicle must be operated and other traffic must be taken into account. In order to determine this field factor in practice, the SWOV carried out an experiment.

Experiment
Two passenger cars drove through the Drecht tunnel at a fixed distance from each other in normal traffic. The front car carried a contrasting

object, consisting of a sign on which the figures 1 to 6 were depicted. The figures were in grey on a white background. The second car was driven by an observer, who at fixed times had to indicate which of the objects was still visible. The light intensity in the tunnel was varied by turning part of the entrance lighting on or off. Various values of the light intensity outside the tunnel (the adaptation level) were included in the test, by making use of the variations in daylight during the course of a day. All relevant data was recorded on a videotape. In this way, the field factor for a large variety of conditions was determined.

Theory and practice
Based on theoretical coniderations, it was expected that the 'field factor' would be a constant. However, the results for the test conducted showed otherwise. There seems to be a relationship between the field factor and the light intensity outside and inside the tunnel. Whether this is true, cannot be confirmed on the basis of a single experiment. For the theoreticians, this offers an interesting problem to study in greater detail. From a practical viewpoint, it is of secondary importance: those situations where the light intensity in the tunnel entrance is significantly lower than desirable should be avoided from a perspective of road safety in tunnels (R-90-10).

Flashing yellow lights for pedestrians

The new Regulation for Traffic Code and Traffic Signs, introduced in 1991, allowed red pedestrian lights to be substituted by flashing yellow lights. The implications for safety cannot yet be clearly defined; it remains guesswork, because there is no systematic experience with flashing yellow lights as yet. However, some provisional ideas on the consequence of this measure have been noted. Flashing yellow lights offer a substitute for the red pedestrian light; pedestrians cross at their own risk. Those who prefer to cross when motorised traffic has to stop for a red light can wait until the green pedestrian light turns on, because this will be maintained.

Purpose
The introduction of flashing yellow lights is motivated by various arguments:
- People often cross on red if there is no oncoming traffic. Flashing yellow with green at call or included in the system allows people to choose.
- The fact that pedestrians ignore red light has a radiating effect on other road users and traffic situations. Therefore, rather than condoning jaywalking, a choice is made for flashing yellow.
- The use of flashing yellow will enhance the status of the red light.
- Various municipalities are already using flashing yellow lights or intend to do so. By setting up a legal regulation, a proper test situation can be set up.
- Motivations for safety with the introduction of flashing yellow lights are not really included in the consideration. It is hoped that a contribution to safety is made by creating more respect for red light.

Lack of clarity
The SWOV has noted that the proposed regulation is not clear. Drivers must give way to pedestrians at a zebra crossing, but this does not apply if red or flashing yellow is operating. The driver must therefore adjust his behaviour to lights intended for others. This is illogical and confusing.
In addition, the different meaning of flashing yellow for pedestrians (cross at own risk) and flashing yellow for cyclists (lights out of action) is confusing, particularly when push buttons (for green light) are present which apply in the first situation, but not in the second.
Flashing yellow implies crossing at own risk. It

does not mean that crossing traffic has right of way. The best interpretation seems to be that traffic turning off must give way to pedestrians crossing on flashing yellow. This means that flashing yellow cannot be combined with a conflict-free green arrow for traffic turning off. In addition, it is necessary to wait and see how the regulation will be understood and accepted by users. Will pedestrians understand that they cannot derive any right of way from the fact that they are crossing while the yellow light is flashing? This is unclear at present.

Safety

The literature indicates that it is safer for pedestrians to make use of a controlled crossing, that crossing while the light is green is safer than crossing on red (own risk) and that a conflict free set-up is safer than one which allows partial conflicts. The safety of crossing on flashing yellow will be similar to crossing while the light is red. When less use is made of the green light, this means an increase in road hazard. The possible gain in safety with flashing yellow is mainly based on the implied higher status for red light, with possible effects radiating to other situations and traffic participants.

For children, traffic will become less safe. It will be difficult to explain the different situation to children, to convince them that they must always wait for the green light and prevent them from following others crossing on flashing yellow. For the elderly who are not as fast, the use of flashing yellow may lead to hazardous situations. Of course, they do not have to cross on flashing yellow and can press the button for the green light, but they too will imitate the crossing behaviour of others. In particular, the final sprint necessary to get out of the way of oncoming traffic would jeopardise their safety.

Conclusion

In consideration of the above, only one advice can be given: 'Be judicious with the application of flashing yellow'. This is clearly also the intention of the legislator. The notes to the regulations applicable to realisation cite conditions where the use of flashing yellow lights is not recommended. In the near future, more results on the effect of flashing yellow lights will become available on the basis of study at home and abroad. (R-90-23).

Relation between road safety measures and behaviour

It is sometimes claimed that there is a likelihood that certain road safety measures do not come up to expectations, or have unintended, negative results. This refers to infrastructural measures, or measures affecting the vehicle or road user. The explanation for the effect of a measure - positive or otherwise - is sought in the people's behaviour.

Behavioural adaptation
The explanation for whether the effect of a measure is positive or negative is often sought in the nature of incomplete or selective compliance with measures or the avoidance of measures, such as skirting around intersections that have been made 'safe', and the use of radar detectors to avoid speeding tickets. Another manifestation is protesting behaviour: doing precisely what is prohibited. There can also be question of another undesirable behavioural adaptation, where the intended gain in safety is converted, for example, to a gain in time. Lost time on safe stretches of road is 'compensated for' elsewhere, or alternatively people are less aware of possible hazards.
If behavioural adaptation can indeed offer an explanation for the disappointing effect of a measure, then it must be assumed that road users recognise and acknowledge the measure as such, and know what behaviour is expected of them in response to this measure. When one accepts the gain in safety as a consequence of these measures, and does not translate these into an increase in speed, for example, behaviour will not change and the measure will lead to the gaol intended.
An international working group (OECD) has investigated a number of safety measures and examined whether there were any indications for such behavioural adaptations. The SWOV was represented in this group.

Infrastructural measures
Studies carried out in the USA have shown that broadening the width of the carriageway and the hard shoulder leads to higher speeds, but also to increased safety. An additional central line does not offer added safety. Side markings improve safety, but also cause speed to increase. Road lighting inside and outside the built up area promote safety; there is no data on behavioural changes inside the built up area, but outside the built up area more risk-taking behaviour is suggested. A better view at intersections enhances safety, but can also lead to less caution or higher speeds.

Measures affecting the vehicle
Measures that promote the control and stability of vehicles do not lead to greater safety; cars with better brakes, more power and better suspension are not involved less in accidents; rather, the contrary is true. Snow tyres offer a varied impression: during snow conditions, they represent a considerable gain in safety, but drive at greater speed; on dry or wet roads without snow, an equivalent gain in safety is seen, with a lower speed. Study into the anti blocking system points in the direction of careless driving. It has not been proven that the wearing of seat belts may lead to more hazardous driving. Rather, there are indications that putting on the belt makes people more aware of road hazard.

Education and supervision
The overall effect of safety measures are in a number of cases less than anticipated, but not zero or negative. Sometimes, the reasons for this can be found in behavioural adaptation. It is not likely that these changes in behaviour occur if people are unaware of the safety measure, or because they do not receive information about it or do not experience the safety effect. When the measure offers a greater degree freedom, such as a broader road or more power, it may be that people also use these and diminish the safety effect. An increase in the subjective level of safety can also lead to more dangerous behaviour. When introducing new measures, it is necessary to anticipate possible behavioural adaptations of road users and ensure that undesirable changes in behaviour are precluded. It can be noted that little has been done to understand the process of behavioural change that accompanies new safety measures.

Recommendations
The international working group has formulated a number of recommendations. The first recommendation is that with the development and evaluation of safety measures, the possible effect of behavioural adaptation must be considered, so that it is not only accident data, but also behavioural data that must be collected, in order that future programmes are better able to reproduce effects.
In this regard, rather than limiting data to the obvious indicators such as speed, a wide range of behaviours must be studied. An attempt must be made to set up a type of 'standard package' for specific safety programmes.
It is impossible to derive behavioural changes solely from accident data; behavioural studies are also important. These should not only be limited to motorised traffic.
Theory development is required to arrive at a better understanding of the processes of behavioural change.
Road traffic authorities must be aware that behavioural changes can also take place as a result of measures that are not taken for the purposes of safety. Finally, the group pleads for an international comparative study. There is a possibility that cultural variations affect behavioral adaptation (OECD Report "Behavioural Adaptations to Changes in the Road Transport System" ISBN 92-64-133898-5).

Moveable concrete barrier

In the Netherlands, a moveable concrete guide barrier with the New Jersey profile has been developed for application in multidirectional lanes at several stretches of national trunkroad 1, the A1 from Amsterdam to Muiden. On these lanes, traffic drives to Amsterdam during morning peak hours and in the opposite direction during evening peak time. It is the intention to use this concrete barrier for temporary, special circumstances on motorways and also at other locations.

The SWOV has studied the safety of such devices. This was carried out on the basis of a literature study and by means of computer simulation using the VEDYAC programme.
The system is built up of linked concrete elements measuring 6 metres in length and with a mass of about 3500 kg. The connection between the elements consists of two parts, one along the top and one in the foot of the element.

Criteria
The studied concrete guide rail that is positioned on the road but not connected to it, must meet the following requirements:

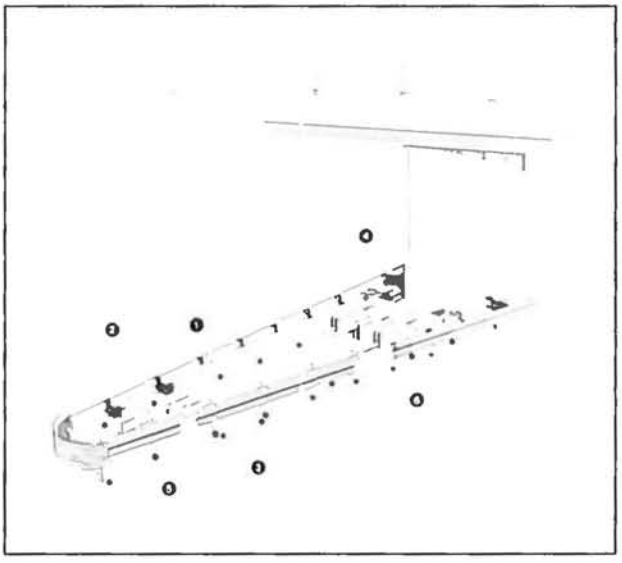
- a colliding vehicle may not break through the barrier, drive over it or tip it up;
- injury to passengers, damage to the barrier and the vehicle must be kept to a minimum;
- the distortion of the barrier must not be of such magnitude that the barrier can move across the adjoining lane and impede traffic there;
- the barrier must continue to retain its function after a collision as much as possible;

Results
From the literature data, which relate to the current situation in the USA, it cannot be directly deduced whether the construction design will be suitable for the Dutch situation. Computer simulations have shown that the proposed connection between elements is too weak to resist a collision with a passenger car at a speed of 100 km/hr at a collision angle of 20 degrees. In particular, the link in the foot of the construction is not solid enough. A simulation of a collision with a lorry showed that the barrier will break, and the lorry will land on the construction.

Recommendations
Therefore, the SWOV in its conclusion did not recommend that the moveable concrete guide barrier be placed in its present form. The barrier would be made suitable for placement if the links between the elements are reinforced. In addition, an element length of less than 6 metres will have a favourable influence on the movement of the colliding vehicle. These smaller elements are also more manageable for handling; and advantage that of course is counteracted by the larger number of connections. It is preferable to always join the first and last element of the moveable system to a foundation, particularly if the construction is relatively short in length (R-90-8).

RIMOB is an effective protective device

Since 1982, the Netherlands has seen many obstacle shields positioned along motorways. These shields, known as RIMOB (an acronym for impact attenuator) are placed in front of obstacles such as portals, light poles, poles carrying road signs, viaduct pylons etc. Collisions with rigid obstacles often lead to serious injury. The RIMOB is designed to catch passenger cars with a mass of about 1500 kg and at speeds of up to 100 km per hour, such that the likelihood of serious injury to passengers - provided they are wearing a seat belt - is small. The Ministry of Transport has asked the SWOV to assess whether the RIMOB is indeed an effective protective device.



How does RIMOB work?
The construction is made up of box-shaped elements (1). These elements contain corrugated tubing, similar to a stovepipe. The aluminium tubes come into play with head on collisions, when they absorb the collision energy. They can compress inwards to up to 20% of their original length. In order to allow this process to go smoothly, the entire construction is placed on wheels (3). The RIMOB is anchored at the rear (4). This is also applies more or less to the front. Because the legs of the front segment are placed in a guide (5), the construction cannot be pushed away during a side collision. The rigidity in a transverse direction is further achieved by the previously mentioned box elements. Although they compress easily in a longitudinal direction, they can absorb a great deal of energy in a transverse direction.
During a side collision, the RIMOB only acts as a guide rail. The entire construction yields somewhat in a transverse direction. This causes the car to change direction and move along the flank sections (6). With frontal collisions, where the entire construction concertinas inwards, the flank parts slide over each other towards the rear.

RIMOB is safe
With regard to its effect during a collision, it has been shown that RIMOB can stand the test. In total, road traffic authorities recorded 97 collisions with the RIMOB. In 38 cases, the police filed a report. It appears that obstacles are screened off in a safe manner. Although collision speeds of over 100 km/hr have been noted, no fatal accidents were recorded. Of the 38 accidents, 1 to 2 involved hospital admissions and 4 to 5 led to slight injury. Of the 59 non-registered accidents, the degree of compression of the RIMOB could be noted in 35 cases: in over half of these, this was less than 1 metre.

Practical considerations
Practical experiences with the RIMOB have been favourable. The construction can be placed quickly, both initially and when replacement is necessary. The RIMOB retains its properties well over time; their is no rust formation; vandalism was only noted in one case. However, it was noted that the sheets of polystyrene used to protect the sides are often missing or loose. (R-90-20).

Bus on the hard shoulder

Because the capacity of many roads (motorways) does not keep pace with increasing traffic volumes, the phenomenon of the traffic jam is more frequently seen, particularly in the conurbation in the west of the Netherlands, the Randstad. This makes travelling times longer, not only for private transport, but also for people travelling on buses that must make use of the same stretch of road. These problems are particularly obvious at peak times, most markedly during morning peak times.

When it is unlikely that the road capacity can be expanded, at least not in the short term, it is clear that a way must be found to make better use of existing roads. One suggestion was that buses could use the hard shoulder during peak hours, and special bus lanes could be built. Through this type of measure, it is attempted to make the bus more attractive, so that some motorists will change to this alternative means of transport, leading to a reduction in traffic volume. But whether and to what degree this aim can be realised and whether there will be negative consequences for road safety was not known.

In cooperation with the Ministry of Transport and the Royal Dutch Touring Club (ANWB), the SWOV and consultancy Bureau Goudappel Coffeng bv were asked by bus company West Nederland to conduct a study into the consequences of the use of hard shoulders by buses during morning peak times. The study, which was conducted over 1989 and 1990, focused on the set aims and on the possible consequences for the safety of traffic and emergency workers. In order to obtain the most comprehensive and reliable impression of the consequences possible, various sub-studies were carried out with which the problem was approached from different angeles. Observers were posted along the relevant stretches of road, driving time measurements were carried out and video recordings made of almost all road stretches. Questionnaires were also held amongst bus passengers, bus drivers and official users of the hard shoulder, and amongst drivers on the relevant stretches of road. In addition, data relating to the number of passengers, traffic intensities and traffic accidents were collected and analysed.

More reliability, not more passengers
The study showed that driving time gains were dependent on the length of the journey, the degree of traffic congestion and the speed of the buses.

Along some stretches of road, no time gain was noted. Average driving time gains were in the range of 0.5 to 2.5 minutes; as the degree of traffic congestion varied significantly, a great spread in the individual results of driving time gains was noted. In fact, this means that a significant improvement in the reliability of the bus service was achieved. The evaluation of bus drivers and passengers was on the whole positive, as was that of drivers. However, the counts and surveys did not show that the improvements led to more people taking the bus; it is therefore unlikely that this measure would help to reduce the amount of traffic congestion.

Road safety not at risk

Both the observations and the accident data did not offer any indication that road hazard had increased for road users or emergency workers. It looks as though a moderate speed of the bus, hard shoulders of sufficient width and the presence of laybys contribute in a positive sense to safety. These factors also seem to influence the assessment of, in particular, emergency workers about the measure.

The study also offered results that can be used to adapt or reconsider experimental measures, involving, amongst other things, the choice and design of the locations and roads, regulations for bus drivers and public information campaigns.

Right wing mirror used more often than anticipated

The legal requirements for the right wing mirror were amended after October 1, 1988. Passenger cars brought onto the market prior to that date were offered a choice between a flat or a convex mirror. After this date, only the convex mirror was still permitted. Considering the training that such mirrors require, the SWOV questioned whether right wing mirrors were actually used. In order to gain an initial answer to this query, a survey was held amongst drivers of passenger cars fitted with a right wing mirror.

The results

In October and November 1990, parking areas at shopping centres and roadside restaurants were used as survey sites. Of the vehicles present at these parking areas, 64% were fitted with a right wing mirror. In total, 146 surveys were held. Of the 146 drivers questioned, 120 (82%) said they used the right wing mirror if they had to move to the right. 93% of mirror users said that the fact the mirror was convex was not problematical. The other people questioned, who did encounter difficulties, said that these were not related to the fact that the mirror was curved.

It is striking to note that in particular women did not use the mirror: amongst the 26 non-users, 24 were female and only 2 were male. The use of the mirror, categorised according to whether the driver was male of female, was respectively 98% and 59%. The use of mirrors proved greater the longer people were in possession of a driving licence, although even the more experienced women used the right wing mirror considerably less often than the experienced men.

Of those surveyed, 13% responded that the use of the right wing mirror was taught during the driving course. The SWOV in fact does not consider it advisable to teach the use of the right wing mirror as part of the driving course, because this could disadvantage the learning process of looking over the right shoulder with a manoeuvre to the right. In addition, this would only serve to make the driving course more complex, and does not seem essential, as its use is evidently learnt when the need arises.

Of the right wing mirrors encountered in the survey, 65% was convex and 35% was flat. The drivers of car with flat mirrors were well informed about the type they had. However, 34% of drivers with a convex mirror thought that their mirror was flat. Whether or not the mirror was used was not dependent on the type of mirror, however, on the whole, the mirrors were properly positioned. Five of the 112 drivers who stated that their mirror was properly positioned were incorrect; in 5 other cases the mirror was partially well positioned.

The interviewees stated that they used their right wing mirror mainly used when moving to the right after overtaking (96%). When turning off at intersections, drivers said they used the wing mirror in 84% of cases. When changing lanes on motorways, in 73% of cases. The fact the information gained from this mirror is not always relied on is shown from the following figures: over 80% said they checked their initial observation again: 75% by looking over their shoulder; 16% by checking in the mirror a second time.

Conclusion

The suspicion that the right (in particular the convex) wing mirror is not used frequently, was contradicted by the survey results. The great majority of drivers claimed that they used the right wing mirror without difficulty. The new requirements imposed on right wing mirrors since 1988 do not seem to have led to any deterioration with respect to the former requirements. (R-91-10).

Trial registration for injury accidents

Not all road accidents that occur in the Netherlands are registered in the national data of the Road Accident Records Office (VOR). The reasons for this are manifold. For example, an accident is not reported to the police by those involved, or the police does not think it necessary to forward information on a reported accident to the VOR.

The incomplete VOR registration is due to the differences in the severity and type of accident. Accidents with a fatal outcome are virtually all registered. For accidents where at least one of the victims has to be admitted to hospital, the degree of registration is approximately 7%. Of those where the victims are treated on an outpatient basis, only 25% is noted in the VOR. In particular, road accidents involving cyclists, and those involving young people and the elderly are under-represented. In addition, there are indications that the degree of registration is declining further still.

Other sources
Road safety policy and research is complicated by this incomplete and selective registration. Therefore, an attempt is being made to obtain the necessary data by other means. For example, as follows: in close cooperation with the Consumer Safety Institute (SCV) and the SWOV, a test was carried out in which road accident victims, treated at the emergency department of a hospital, were registered on the basis of a number of items, as an extension of the current registration of victims of so-called private accidents (PORS).

The PORS
Data registered at the hospital emergency department offer a good opportunity to supplement the present police registration of road accident victims. In principle, all road accident victims that are directly admitted to hospital (by going themselves or by ambulance) are first admitted to the emergency department. It is then decided whether they require admission. The victims that first go to the G.P. and are then referred to the hospital go to emergency first, except in those cases where the G.P. refers victims to the hospital for X-rays. This group falls outside the registration of the emergency department. The PORS (Private Accident Registration System) is based on information from a random sample of hospitals, and does not contain any information about victims of traffic accidents. The pilot project was intended to assess whether the registration of road accidents at the emergency department, as an extension of the PORS, would offer reliable and valid data, and whether this can be done without affecting the reliability and validity of the PORS data.

Trial registration
The trial, which lasted three months, was held at two hospitals, the general Canisius Wilhelmina hospital and the teaching hospital Sint Radboud, both in Nijmegen. It was demonstrated that the PORS has a clear added value with respect to the VOR; about one third of the overall group of PORS road accident victims is registered by the VOR, although this percentage is greater (67%) for seriously injured people (hospital admission), and lower (25%) for the remaining group of road accident victims.
The PORS offers a different and probably better impression of road hazard for this category of emergency admissions than the VOR. Again, the young and elderly, particularly those involved in accidents without a collision partner, are under-represented in the VOR. A disadvantage of the PORS is that less information about the accident is available than supplied by the VOR. The advantage, however, is the availability of data on the location and nature of the injury acquired.

Application
Considering the speed with which data becomes available and the characteristics found, the PROS data could offer a worthwhile supplement to the accident analyses as recently conducted by the SWOV. The advantage here is that the PORS registration is independent of the VOR registration. This offers a better indication of whether there is question of a change in registration if discrepancies are demonstrated, rather than any true change in the development of road hazard (R-90-53).

Measures against splashing and spraying water

During rainy conditions and on wet road surfaces, the water in the air and on the road is dispersed by vehicles. In particular heavy vehicles, such as lorries, can splash the water up to great heights at high driving speeds and disperse it such that other road users find this a hindrance, particularly as visibility is limited. This in addition is often linked to other difficult and even dangerous driving conditions, such as overtaking, tyre tracks and aquaplaning. These circumstances can lead to accidents.

The solutions available for this problem vary from measures which apply to the road, such as limiting water on the road surface, to measures affecting the vehicle, such as streamlining and wheel protection. The SWOV has compiled the available knowledge on the subject from the point of view of road safety. It appears that most obstruction from splashing and spraying water is caused by lorries; however, the problem only occurs at high speeds. Data from the United States has shown that spraying water over 100 km/hr assumes unacceptable proportions, while below 80 km/hr, it is hardly an issue. An estimation shows that in the Netherlands, the number of accidents caused by splashing or spraying water is about 0.4%. Draining road

surfaces, such as very porous hot-rolled asphalt, are a very effective means of combating hindrance due to splashing and spraying water.

Considering the intended application of very porous hot-rolled asphalt for large stretches of the road (motorway) network, it is anticipated that within 5 to 10 years, at least 55% of the vehicle kilometres travelled by lorry will be covered on this material. Reducing the speed of heavy vehicles is another effective means of combating road hazard caused by splashing and spraying water.
A reduction in speed has a favourable influence on safety overall, particularly when the road is wet; in principle, this measure can be enforced at no cost deficit. Improving the streamlining of the vehicle is a third way of combating hindrance attributable to splashing or spraying water, and can also help to reduce fuel consumption. Assuming the presence of draining road surfaces, a drop in speed and streamlined vehicles, considering the limited extent of the problem of 'splashing and spraying water' in terms of accidents, and finally, given the realisation aspects and maintenance problems associated with wheel protection, little effect can be anticipated from the latter solution (R-91-23).

Study into pedestrian detectors

As part of DRIVE, a European cooperative project aimed at improving traffic and transport systems, a study is being conducted into improving pedestrian crossings controlled by lights. In particular, the study considers whether the presence of pedestrians prior to crossing can be better detected than has been the case to date. At present, the pedestrian indicates by means of pressing a button that he wishes to cross. In addition, the project looks at whether the presence of pedestrians who cross somewhat more slowly can be detected, so that they are given more time to safely reach the other side. The project represented a collaboration between French, British and Dutch companies and research institutes, including the SWOV.

Plate

The following changes have been suggested: when the pedestrian wishes to cross, he steps on the plate sunk into the pavement; he is then detected and asks, as it were automatically, for 'green light' to cross. A white lamp, which replaces the old button, then indicates that he or she has been 'detected' and that a 'green light' will follow. If the pedestrian steps off the mat too soon (and therefore crosses while the light is still red) the circuit is broken. The request is no longer valid , no 'green light' is given and crossing traffic is not held up by an empty crossing. The expectation is that the plate would lead to more disciplined crossing behaviour, offer greater convenience than the present button and work more effectively with respect to crossing traffic.

Infrared detector

The infrared detector can offer slower crossers in particular some more breathing space. The pedestrian must cross between the white lines. If he is noted on the crossing, waiting traffic is delayed a little longer. Both detectors (plate and infrared) can therefore promote comfort and safety.

Maastricht model

Aside from the abovenamed changes, the so-called 'Maastricht model' is used. This means that the light is positioned at the same side as the crossing pedestrian, instead of at the other side of the road. The advantages of this are as follows:

1. the green light for pedestrians only has to be very short: it only has to offer the pedestrian enough time to step off the pavement.
2. Red really means 'stop', and nothing else.
3. The pedestrian is not confronted by red during the crossing.

4. More people cross in groups, which is safer.
5. During the crossing, all attention can be devoted to traffic, rather than to the light at the other side of the road.

Gouda and Heemstede
In the Netherlands, the above programme is being tested at two locations: in Gouda, in cooperation with the local council and with Siemens Nederland, and in Heemstede in cooperation with the council, Nederland Haarlem and Nettenbouw.

Based also on these two test locations, the SWOV is studying the reliability, comfort and safety of the new system. To this end, pedestrians will be observed and questioned.

More attention for injury prevention needed

In 1990, the Ministry of Transport, the Road Vehicles Research Institute TNO and the SWOV organised a workshop on injury prevention. The reason for holding this workshop was due to concern about the diminished interest in injury prevention as a solution to problems in the field of road safety. During the workshop, an overview was given of the extensive area covered by injury prevention, and its implication for road safety. The texts of the introductory speeches and a report the discussions were compiled in a SWOV publication, which also included conclusions and recommendations.

One of the conclusions that resulted from the workshop was that developments in the field of injury prevention are only known to a small circle of initiated parties. Therefore, it is necessary to convey knowledge about injury prevention to those bodies that are involved in policymaking or otherwise. Also, the great effectiveness of injury-preventing measures and the effect of new measures on road safety is little known to these groups. Often, doubt (surprise) is expressed about the estimated scope of these effects. Furthermore, injury prevention must receive more attention in the government's road safety policy, while greater involvement by business and industry concerning the safety of lorries is desirable. Safety must not be seen as an additional cost-creating factor - the results should cover the costs. Other factors to which attention should be paid include international developments in the field of regulations (applicable to vehicles). The first priority of manufacturers is not road safety. In this regard, the government has an important task: to ensure continuity in the law, both with regard to new regulations and with regard to the enforcement of current regulations.
It has also been established that the use of existing safety devices must be improved; here, responsibility must be assumed by both the manufacturer and the user (R-91-15).

Telematics and road safety

The Dutch government intends to radically improve transport and traffic systems. This is also demonstrated by the Bill introduced by the Ministry of Transport and Public Works: 'Telematics, Traffic and Transport'.
Telematics looks for ways to unite the possibilities offered by electronic data processing, telecommunication and micro-electronics.

In June 1990, the Road Safety Council issued a recommendation on the Telematics Bill. The recommendation examines the Ministerial Bill more closely from a perspective of road safety. The Ministry of Transport then asked the SWOV to publish a recommendation on the road safety aspects associated with the use of telematics.

Possibilities
The introduction of telematics in traffic and transport are associated with great social and economic interests. The mobility in our densely populated country will have to be controlled and regulated, since transport is a cornerstone of the economy.
While road hazard results in a gigantic loss of capital, telematics can offer as yet untapped possibilities. In this field of tension, the challenge is to guide the application of telematics in transport and traffic along the right track, without excluding future developments in advance.

Two phases
In its recommendation, the SWOV offered an initial impression of the course along which telematics could be introduced, where the safety of traffic and transport is specifically taken into account. The introduction consists of two phases, one in the short term and one in the medium term. After all, specific parts should be implemented in a logical sequence and supporting research and development must commence in time.
The attention is mainly focused on the interface between telematics and the control of mobility and traffic.
Telematics can help to control mobility by changing traffic composition, reducing the volume of traffic by substituting transport with communication and by spreading the traffic volume in time. To enable traffic control, the main interest is focused on the spread of traffic across the road network, regulating and guiding traffic and supporting individuals in carrying out their driving tasks. With regard to traffic control and guidance, the first phase makes maximum use of existing methods, mainly affecting the road traffic authorities. In the second and subsequent phases, an increasing link will be created between the road traffic authority and the user (R-91-13).

Bicycle master plan

The Bicycle Master Plan (MPF) of the Ministry of Transport is intended to promote the use of cycles as a substitute for the car, and improve the safety of cyclists in the process.

The objectives with regard to future use and safety seem ambitious, but should be compared to the situation that may be expected without MPF.

With regard to safety, the objective for 1995 is 15% fewer road fatalities amongst cyclists and 10% fewer injuries. For 2010, the plan aims for 50% fewer fatalities and 40% fewer injuries. These objectives are all measured against the 1986 statistics. Even without MPF, it can be anticipated that safety will improve over a period of 20 to 25 years. Between 1970 and 1990, the

number of cyclists who have died on the road has dropped from over 500 to approximately 300. During this period, the number of kilometres travelled by cycle has not changed dramatically. The target for kilometres travelled by cycle is a 30% increase by 2010. Considered from this perspective, the safety objective is most certainly ambitious - a great deal must be achieved to realise this aim. Recent figures for 1989 and 1990 have already indicated that in order to reach the target set for 1995, a concerted effort is needed.

Incomplete picture

Furthermore, the figures used in the MPF offer an incomplete impression of the road hazard confronting cyclists. It is known that the number of cyclists admitted to hospital is twice as great as the number registered with the Road Accident Records Office (VOR) and the Central Bureau of Statistics. Although the lacking figures may on average relate to less serious accidents, their range is so great that they must be taken into account. In addition, the missing statistics largely concern (victims of) accidents that are rarely seen with the registered cases: accidents without a collision partner. It is also known that the number of injured cyclists which meet the definition of road accident victim is over nine times greater than the official number, and therefore represents about half of all road accident victims in the Netherlands. These figures emphasise yet again the necessity of the MPF and the attention this plan focuses on safety.

Use of the cycle

Compared with other western countries, the use and safety of cyclists in the Netherlands is already very high. This begs the question: is there still room for the wide-ranging changes as proposed in the MPF? As stated, the use of the cycle has changed little in recent years. Before that time, the number of kilometres travelled by cycle was even greater. A 30% increase in cycle kilometres would mean that the level of use would return to that measured before 1970.
The scope for greater use of the cycle seems to be related to the age of the population. The ownership and use of the cycle is so high amongst school-age children that little can be gained amongst this group, although the level of safety leaves room for improvement. For adults, cycle use can certainly be boosted, in particular amongst commuters. Roughly estimated, this should have no consequences for safety, in the sense that any increase in the number of road accident victims in this category will show a parallel drop in the accident rate for car passengers. It does mean, however, that it will make the attempt to reduce the number of victims amongst cyclists particularly difficult. There is also scope for the elderly to make greater use of the cycle. In this case, not always as a substitute for the car. For this group, therefore, both the number of cycle victims and the total number of road accident victims would increase. In addition, the elderly are far more likely to become seriously injured while cycling. Despite the fact that the elderly only cover a relatively small distance, almost half of all cyclist fatalities relate to those aged over 65. A change in use of the cycle by this age group would therefore contribute strongly to the total number of seriously injury road accident victims amongst cyclists. In order to achieve the objective of the MPF with regard to safety, it is therefore of the utmost importance that the safety of this group is improved.
The above comments should not be interpreted as criticism of the MPF. For many years, policymakers have focused attention on the use and safety of cars. Concern for the use and safety of the cycle is therefore urgently needed, although the efforts needed to realise the objective of the MPF should not be underestimated.

Study into safety

For a long period of time, studies into road safety did not devote much attention to cyclists either. Although the MPF does not refer to any studies, it is encouraging to note that it has initiated research through which the gap in knowledge on the safety of cyclists can be closed. Perhaps this state of affairs is also the reason why no definite plans were included to improve the safety of cyclists. In principle, it is established that in order to make the use of the cycle safer, emphasis must lie on adapting the infrastructure and changing the behaviour of cyclists, but - in particular - to alter the attitude of drivers toward cyclists and

protect the cyclists against injury resulting from a collision. The infrastructure must be adapted such that the cyclist is safer on the road, without this being to the detriment of the cyclist's freedom. In order to promote the use of the cycle, the cyclist should in fact be given more room on the road. Adapting behaviour can be included as an element of education. In this context, it must not be forgotten that the government can contribute to this aim with statutory rules. With the introduction of the new traffic regulations (RVV), a first cautious attempt was made to strengthen the position of slow traffic. The response of the SWOV to the RVV has shown that there are more possibilities in that regard. Protecting the cyclist against the consequences of a collision can be realised both by adapting the design of cycle and the car, and by encouraging the use of protective devices by the cyclists.

Notes

As already stated, further study is now being conducted into cyclists' safety. Two notes can be made in this regard. It must be ensured that means are also made available for follow-up study based on the results of current study, and in response to the intended measures. In addition, it must be ensured that the results of the study are translated into practice. The study into the infrastructure already takes into account a plan for a Handbook of Cycle Measures. The study into education and collision safety has not yet advanced to this stage.

Moped Master Plan

Finally, it is worthwhile to note that the MPF does not consider the use and safety of the moped. There are urgent reasons to do so, however. With regard to its use, the moped is similar to the bicycle. Furthermore, the regulations moped riders must adhere to and their position on the road is almost identical. Although the moped is used much less often than the cycle, the number of seriously injured road accident victims amongst moped riders is not much less than amongst cyclists. This makes the moped one of the most dangerous modes of transport. Furthermore, the moped is the only form of transport for which the probability of a fatality does not fall with advancing age. It is therefore imperative that clear aims be set for the moped and plans made accordingly. The increased use of the low-speed moped in recent years reinforces the need for a Moped Master Plan.

Reports published in 1990-1991

1988

+ Diepte-onderzoek naar ongevallen in personenauto's; Onderzoek naar de relatie tussen voertuigeigenschappen en de ernst van letsels bij auto-inzittenden. Ing. C.C. Schoon, ir. L.T.B. van Kampen & V. Kars. R-88-53. 98 blz. (In depth study into car-accidents. IRRD No. 829508)
+ Daytime running lights; Consultative document commissioned by the Road Safety Directorate. Dr. D.A. Schreuder. R-88-54. 56 pp. (IRRD No. 829509)

1989

+ Rijstrookwisselingen op autosnelwegen; Een analyse van rijstrookwisselingen op autosnelwegen en de daarbij gebruikte signalering. M.P.M. Mathijssen. R-89-33. 26 blz. (Lane changing on motorways. IRRD No. 829513)
+ De verkeersonveiligheid in 1988; Een kwantitatieve beschrijving van de verkeersonveiligheid in 1988. A. Blokpoel. R-89-34. 108 blz. (Road safety in the Netherlands in 1988. IRRD No. 828210)
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+ Schattingen over de effecten van toegenomen gordelgebruik op de aantallen verkeersdoden. Een bewerking van de bijdrage van de 12de International Technical Conference on Experimental Safety Vehicles, Gothenburg, Zweden, 29 mei-1 juni 1989. Ir. F.C.M. Wegman; J.M.J. Bos & F.D. Bijleveld. R-90-31. 34 blz. (Estimations of the effects of increased safety belt use on the number of traffic fatalities. IRRD No. 838958)
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+ Autogordels en kinderzitjes op de achterzitplaatsen van personenauto's in 1990; Verslag van waarnemingen naar de aanwezigheid van het gebruik van beveiligingsmiddelen op de achterzitplaatsen van personenauto's op wegen binnen en buiten de bebouwde kom. P.J.G. Verhoef. R-91-7. 68 blz. (Safety belts and child seats on the back seats of cars in 1990. IRRD No. 844601)
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+ Het gebruik van autogordels en factoren die daarbij een rol spelen: Een internationale vergelijking. Dr. T. Mäkinen (VTT); drs. R.D. Wittink & drs. M.P. Hagenzieker. R-91-26. 62 blz.
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+ Functie en gebruik van de verkeersinfrastructuur; Deel 1: Functie en vormgeving; verkeerskundige doelstellingen bij en eisen aan het vormgeven van een verkeerstechnisch ontwerp. Ir. A. Dijkstra. R-91-50. 21 blz.
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+ Categorisering van wegen; Deel 2: Psychoergonomische gezichtspunten, Drs. D.A.M. Twisk. R-91-53. 33 blz.
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+ Is my country safer than others? A comparison of road safety data between different countries. Paper presented to the PIARC XIth World Road Congress, Marrakesh, Marocco, 22-28 September 1991. S. Harris & F.C.M. Wegman. R-91-57. 16 pp. (IRRD No. 847415)
+ Statistical assessment and targets. Contribution to PIARC XIXth World Road Congress, Ad hoc Group IV: Road Safety, Marrakesh, Marocco, 22-28 September 1991. F.C.M. Wegman. R-91-58. 16 pp. (IRRD No. 847416)
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+ Rijden onder invloed in de provincie Gelderland, najaar 1991; Beknopte beschrijving van het alcoholgebruik van automobilisten in weekeindnachten. M.P.M. Mathijssen. R-91-62. 22 blz.
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+ Rijden onder invloed in de provincie Zuid Holland, najaar 1991; Beknopte beschrijving van het alcoholgebruik van automobilisten in weekeindnachten. M.P.M. Mathijssen. R-91-64. 22 blz.

Brochures

1990

+ A century of automobiles: Past present and future of automotive safety: Scientific meeting of the research institutes BASt (FRG) and SWOV (The Netherlands), The Hague, October 7th, 1988. 109 pp.
+ Min 25% bijvoorbeeld; Succes- en faalfactoren voor gemeentelijk verkeersveiligheidsbeleid. Pre-advies voor het Nationaal Verkeersveiligheidscongres 1990. Ing. J.A.G. Mulder & ir. F.C.M. Wegman. 21 blz.
+ Research activities 1987-1989 SWOV Institute for Road Safety Research, 61 pp.
+ De verkeersonveiligheid aangepakt; Succes- en faalfactoren voor gemeentelijk beleid. 24 blz.

1991

+ Gemeentelijk verkeersveiligheidsbeleid. Ir. F.C.M. Wegman. Bijdrage VNG Congres 1991. Mobiliteit tussen leefbaarheid en bereikbaarheid; Deelcongres Verkeersveiligheid.
+ Enforcement and rewarding; Strategies and effects. Proceedings of the International Road Safety Symposium; Copenhagen, September 19-21; 1990. M.J. Koornstra & J. Christensen (eds.). 168 pp.
+ Iedereen kent wel iemand...; De eerste stap tot een Nationale Verkeersveiligheidsverkenning voor de jaren 1990-2010. Ir. F.C.M. Wegman; drs. M.J. Koornstra & M.P.M. Mathijssen. 28 blz.

Published by other institutes

1989

- Road safety developments in European countries; A quantitative mathematical and theoretical analysis. M.J. Koornstra. Proc. of Road Safety in Europe, Gothenburg, Sweden, 12-14 October 1988. VTI Rapport 344 A: Complementary aspects on road safety. Väg- och Trafik Institut, 1988.
- Drinking and driving in the Netherlands 1977-1988. P. Wesemann & M.P.M. Mathijssen. In: Perrine, B.M.W. (ed.). Alcohol, drugs & traffic safety; Proceedings 11th International Conference on alcohol, drugs and traffic safety T89, Chicago, Ill., October 24-27, 1989, pp. 565-566 (incompleet: zie ook blz. 149 en 150).
- Bewoners oordelen over straatverlichting. Dr.ir. D.A. Schreuder. PT Elektronica-Elektrotechniek 44 (1989) 5 (mei): 60 t/m 64.
- SOS: Spoedritten een gevaar op de weg? Ir. Oei Hway-liem. De Ambulance 10 (1989) 6 (december): 12 t/m 15.
- Verkeersonderwijs als instrument voor de gemeente. Drs. R.D. Wittink. Verkeerskunde 40 (1989) 11: 472 t/m 475.
- Minder automobilisten onder invloed, minder alcoholdoden. M.P.M. Mathijssen e.a. Verkeerskunde 40 (1989) 12: 522 t/m 525.
- Past and future use of TCT in the Netherlands. P.C. Noordzij. In: Theoretical aspects and examples for practical use of traffic conflicts and other interactional safety criteria in several industrial and developing countries: Proceedings 2nd Workshop of ICTCT, Munich, November 1989, pp. 53-56. Bulletin 86. University of Lund, Sweden, 1990.
- A closer look at drinking drivers in the Netherlands. P.C. Noordzij. In: Proceedings of the International Workshop ICADTS-INRETS High alcohol consumers and traffic, Paris, November 28-30, 1988, pp. 195-200. Actes INRETS No. 18. L'Institut National de Recherche sur les Transport et leur Securité, Paris, 1989.
- Ouder worden en de verkeersveiligheid. A.G. Welleman & P.I.J. Wouters. In: Schroots, J.J.F. e.a. (red). Gezond zijn is ouder worden. Bijdragen Jubileumcongres t.g.v. 40-jarig bestaan van de Nederlandse Vereniging voor Gerontologie, Amsterdam, 21 en 22 mei 1987, pp. 269 t/m 286. Van Gorcum, Assen/Maastricht, 1989.
- Research and policy: Relationships in the Netherlands. J.H. Kraay. In: Hakkert, A.S. & Katz, A. (Eds.). Proceedings International conference on New ways and means for improved safety, Tel Aviv, February 20-23, 1989. pp. 265-279. Transportation Research Institute, Haifa, 1989.
- Voor alle veiligheid; Bijdragen aan de bevordering van de verkeersveiligheid. F.C.M. Wegman, M.P.M. Mathijssen & M.J. Koornstra (red.). SDU-Uitgeverij, 's-Gravenhage, 1989, 206 blz.
- Alcohol and the use of seat belts. P.C. Noordzij, A.A. Vis & W.L.G. Verschuur. In: Perrine, B.M.W. (ed.). Alcohol, drugs & traffic safety; Proceedings 11th International Conference on alcohol, drugs and traffic safety T89, Chicago, Ill., October 24-27, 1989, pp. 677-683.
- Costs and benefits of police enforcement in the Netherlands. P. Wesemann. In: Perrine, B.M.W. (ed.). Alcohol, drugs & traffic safety; Proceedings 11th International Conference on alcohol, drugs and traffic safety T89, Chicago, Ill., October 24-27, 1989, pp. 142-148.
- Kontra-produktive Aspekte der Fahrausbildung. D.A.M. Twisk & R.D. Wittink. In: Kroj, prof.dr. G. & Porschen, K.M. (eds.). Fortschritte der Verkehrspsychologie '88. Mensch-Fahrzeug-Umwelt Band 22. Verlag TüV Rheinland GmbH, Köln, 1989, S. 178-183.
- Individuelle Differenzen der Fahreignung und internationale Differenzen der Fahrdiagnostik. P.C. Noordzij. In: Kroj, prof.dr. G. & Porschen, K.M. (eds.). Fortschritte der Verkehrspsychologie '88. Mensch-Fahrzeug-Umwelt Band 22. Verlag TüV Rheinland GmbH, Köln, 1989, S. 184-188.

1990

- Onveilig verkeer voor ouderen, het moet niet zo blijven! Bijdragen aan de Discussie Nationaal Verkeersveiligheidscongres 1988, Amsterdam,

3 en 4 maart 1988. (SWOV: E.M. Geljon, ir. A.G. Welleman, drs. P.I.J. Wouters, A. Blokpoel, drs. R.D. Wittink, ir. L.T.B. van Kampen, drs. M.J. Koornstra). ANWB, 's-Gravenhage, 1990. 128 blz.

- Discussion on accident analysis methodology. S. Oppe. In: Michon, J.A. & De Bruin, R.A. (eds.). First ISIRT Round Table, Apeldoorn, 1989. IATSS Research 14 (1990) 1 : 50-54.
- Integrated traffic safety management in urban areas. OECD Scientific Expert Group (Chairman: P.I.J. Wouters (SWOV); A. Dijkstra (SWOV) a.o.) Organisation for Economic Cooperation and Development, Paris, 1990. 121 pp.
- Meer verkeersdoden in 1989. Ir. F.C.M. Wegman. Verkeerskunde 41 (1990) 1: 13 en 14.
- Gewonden gevonden! S. Harris, M.A. Verkeerskunde 41 (1990) 1: 26 t/m 29.
- De ontwikkeling van de verkeersonveiligheid in Nederland. Ir. F.C.M. Wegman. In: Over & Weer Speciaal, Regionaal Orgaan Verkeersveiligheid Gelderland.
- Voor alle veiligheid. Ir. F.C.M. Wegman. Mobiliteitschrift 24 (1990) 2 (maart): 37 t/m 41.
- Safety aspects of 30 k.p.h. zones in the Netherlands. A.A. Vis & A. Dijkstra (SWOV) and M. Slop (CROW). In: Proceedings Speed management in urban areas, Copenhagen, Denmark, 14-16 May, 1990, pp. 70-91. Danish Road Directorate, 1990.
- Dertig-kilometermaatregelen effectiever dan woonerven? Ir. S.T.M.C. Janssen. Verkeerskunde 41 (1990) 4: 212 t/m 217.
- Veiligheid en de weg. J.P.M. Tromp. In: Werkbouwkundige werkdagen 1990. Ede, 9 en 10 mei, 1990, Deel I, Sessie II: Evaluatie en herdimensionering, blz. 185 t/m 197. Stichting C.R.O.W., Ede, 1990.
- Snel en veilig: niet in woongebieden. Ir. F.C.M. Wegman. Brabant Veilig 2 (1990) 3 (mei): 11-12.
- SOS: Spoedritten gevaar op de weg? Ir. Oei Hway-liem. Brand & Brandweer 14 (1990) 5: 204 t/m 206.
- Het Alcogram, een nieuw hulpmiddel bij het zelf bepalen van het alcoholgehalte in het bloed. J.A.G. Mulder & P.H. Polak. Ned. Forensisch Tijdschr. 9 (1990) 2 (juni): 10 t/m 13.
- Effect 'licht overdag' gebaseerd op elf evaluatiestudies in zes landen. Reactie op het artikel "Zweedse bewijsvoering Licht overdag opnieuw bekeken". Verkeerskunde 41 (1990) 6: 305-306.
- Verschil in ernst van aanrijdingen met stalen en betonnen geleideconstructies. C.C. Schoon. Bijlage 3 in: Geleiderail of betonnen geleidebarrier in middenberm van autosnelwegen? Een vergelijkend onderzoek naar de kosten van aanleg, beheer en onderhoud en de verkeersonveiligheid. DHV Raadgevend Ingnieursbureau BV, Amersfoort, 1990 (Zie ook SWOV-rapport R-89-54).
- Snelheidsontwikkelingen in relatie tot de ontwikkeling van de verkeersonveiligheid. R. Roszbach & A. Blokpoel. Verkeerskunde 41 (1990) 7/8: 372-373.
- Individual differences and accident liability: A review of the German literature. P. Noordzij. Contractor Report 195. Transport and Road Research Laboratory, Crowthorne, 1990. 40 blz.
- Traffic accidents of elderly people in the Netherlands; They really are more vulnerable than other road users. L.T.B. van Kampen. In: Proceedings 12th International Technical Conference on Experimental Safety Vehicles, Göteborg, May 29 - June 1, 1989, Vol. 1, pp. 85-91. U.S. Department of Transportation, Washington D.C.
- Estimating effectiveness of increased seat belt usage on the number of fatalities. F.C.M. Wegman, J.M.J. Bos & F. Bijleveld. In: Proceedings 12th International Technical Conference on Experimental Safety Vehicles, Göteborg, May 29 - June 1, 1989, Vol 2, pp. 1132-1138. U.S. Departement of Transportation, Washington, D.C.
- Roundabouts - Safe for cyclists too? J. van Minnen. In: Proceedings of Seminar G held at the PTRC 18th Annual European Transport and Planning Summer Meeting: Traffic Management and Road Safety, University of Sussex, 10-14 September 1990, Session G20/G21 (ii), pp. 247-258. P.334. PTRC Education and Research Services Ltd., 1990.
- Comment: The Petersburg paradox; There we go again: A reply to Bierman and Rapoport. S. Oppe. Behavioral Science 35 (1990) 3 (July): 233-234.
- The relation between traffic accidents and the lighting level in urban streets: Dr.ir. D.A. Schreu-

der. In: Proc. Lightec '90: Light for the people. University of York, 18-20 September 1990, pp. 70-77. The Institution of Lighting Engineers, Rugby, 1990.
- A mathematical theory for related long term developments of road traffic and safety. S. Oppe & M.J. Koornstra. In: Koshi, M. (ed.) Transportation and traffic theory; Proceedings of the Eleventh International symposium on Transportation and traffic theory, held July 18-20, 1990, Yokohama, Japan, pp. 113-132. Elsevier Science Publishing Co., Inc, Amsterdam, 1990.
- Aktion minus 25% in den Niederlanden. F.C.M. Wegman. In: Verkehrs(un)sicherheit. ILS-Taschenbücher, pp.136-140. ILS, Dortmund, 1990.
- The real number of road traffic accidents casualties in the Netherlands; A year long survey. S. Harris. Accid. Anal. & Prev. 22 (1990) 4 : 371-378.
- Time courses in visual-information processing: Some theoretical considerations. M.P. Hagenzieker & A.H.C. van der Heijden. Psychol. Res. (1990) 52 : 5-12.
- Time courses in visual-information processing: Some empirical evidence for inhibition. M.P. Hagenzieker; A.H.C. van der Heijden & R. Hagenaar. Psychol. Res. (1990) 52 : 13-21.
- Bromfiets op de rijbaan. Ir. A. Dijkstra (SWOV) & ir. T. de Wit (C.R.O.W.). Verkeerskunde 41 (1990) 11 : 518 t/m 521.
- Het alcogram; Een nieuw hulpmiddel bij bepaling van het alcoholgehalte. Ing. J.A.G. Mulder & dr. P.H. Polak. Verkeersknooppunt 18 (1990) 4 (november) 96 t/m 98.
- Knowledge-based expert systems for traffic safety. S.T.M.C. Janssen. In: Jämsä, H. (ed.) OECD Workshop on knowledge-based expert systems in transportation, Espoo, Finland, 26-28 June 1990, Vol. 1, pp. 229-248. VTT-symposium 116. VTT, Espoo, 1990.
- Actie Autogordel vast is de moeite waard. Drs. M.P. Hagenzieker (SWOV) & D. van Lingen (Kon. Marech.). Algemene Politieblad 139 (1990) 21 (27 oktober) : 500 t/m 502.
- De kwaliteit van voorzieningen voor fietsers en bromfietsers. A. Dijkstra & S.T.M.C. Janssen. Verkeerskunde 41 (1990) 12 : 586 t/m 589.
- De (brom)fietser centraal. R.D. Wittink. Verkeerskunde 41 (1990) 12 : 586 t/m 589.
- The integration of traffic safety in urban management (Sécurité routière: La gestion integrée en ville). Drs. P.I.J. Wouters. In: Living and moving in cities (Vivre et circuler en ville), Actes du congres, Paris, 29-31 Janvier 1990, pp. 66-73. CETUR, Paris, 1990.
- System theory and individual risk (Theorie des systèmes et risque individual). M.J. Koornstra. In: Benjamin, T. (ed.). Driving behaviour in a social context (Le comportement des conducteur dans un contexte social). Proceedings of the International Symposium organised by La Prevention Routière, 16-18 May 1989. Transport & Communication 26, pp. 21-45. Paradigme, Caen, 1990.
- Cyclists and traffic rules (Les cyclistes et la réglementation de la circulation). J.E. Lindeijer. In: Benjamin, T. (ed.). Driving behaviour in a social context (Le comportement des conducteur dans un contexte social). Proceedings of the International Symposium organised by La Prevention Routière, 16-18 May 1989. Transport & Communication 26, pp. 442-452. Paradigme, Caen, 1990.
- Individual and social factors influencing accident risk (Facteurs individuels et sociaux influençant la probabilité d'accidents). G. Grayson (TRRL) & P. Noordzij (SWOV). In: Benjamin, T. (ed.). Driving behaviour in a social context (Le comportement des conducteur dans un contexte social). Proceedings of the International Symposium organised by La Prevention Routière, 16-18 May 1989. Transport & Communication 26, pp. 635-641. Paradigme, Caen, 1990.
- Een blik over de Noordergrens; Over de effecten van fietsvoorzieningen op de verkeersveiligheid. Ir. F.C.M. Wegman. In: Veilige fietspaden, Studiedag, Antwerpen, 4 december 1990. Opzoekingscentrum voor de Wegenbouw en de Diensten van de Vlaamse Executieve Openbare Werken en Verkeer. Brussel, 1990.
- Behavioural adaptation to changes in the road transport system. OECD Scientific Expert Group (P. Levelt, SWOV a.o.). OECD, Paris, 1990.
- Het stimuleringsplan voor gemeenten 'Actie -25%' geëvalueerd + Vervolg van het stimuleringsplan. Ir. F.C.M. Wegman. Beleidsanalyse 19 (1990) 4 : 15-17 en 30-31.

- The elderly in traffic: Mobility and road safety. Drs. P.I.J. Wouters. In: Norrbom, C-E. & Stähl, A. (eds.). Mobility and transport for elderly and disabled persons. Proc. of the 5th Int. Conference Stockholm, Sweden, 21-24 May 1989, Session B1: Traffic Safety. Transportation studies Volume 13, pp. 323-331. Gordon and Breach Science publishers, Philadelphia, 1990.
- The integration of traffic safety in urban management. Drs. P.I.J. Wouters. In: Intern. Congress, Living and moving in cities. Paris, 29-31 January 1990. Text of the Communications, pp. 65-74. CETUR, Paris, 1990.
- Police enforcement and road user behaviour. P.C. Noordzij & M.P.M. Mathijssen. In: Koornstra, M.J. & Christensen, J. (eds.). Enforcement and rewarding; Strategies and effects; Proceedings of the International Road Safety Symposium, Copenhagen, September 19-21, 1990, Session 2. Influencing individual and group safety values and norms, Nr. 24, pp 105-107.
- The effects of enforcement and rewards on safe-ty-belt use: A field study in the Netherlands. M.P. Hagenzieker. In: Koornstra, M.J. & Christensen, J. (eds.). Enforcement and rewarding; Strategies and effects; Proceedings of the International Road Safety Symposium, Copenhagen, September 19-21, 1990, Session 1. Modifying individual road user behaviour, No. 14, pp. 65-68.
- Evaluation of a stimulation plan for municipalities in the Netherlands. F.C.M. Wegman (SWOV); J.A. van Selm (Ministry of Transport) & M. Herweyer. (Groningen State University). In: Koornstra, M.J. & Christensen, J. (eds.). Enforcement and rewarding; Strategies and effects; Proceedings of the International Road Safety Symposium, Copenhagen, September 19-21, 1990, Session 3. Influencing corporate and public safety decisions, Nr. 30, pp. 129-133.

1991

- Report of the High level Expert group for an European policy for road safety (M. Koornstra, SWOV a.o.). Commission of the European Communities, 1991.
- PAO-cursus Openbare verlichting, Delft/Eindhoven 22-24 januari 1991, dr.ir. D.A. Schreuder e.a. (Algemene inleiding; Inleiding, functie van wegen, wegtype; Oog; Lichtniveau, luminantie en verlichtingssterkte, verblinding; Informatieverwerking en beslissingen in het verkeer; Openbare verlichting en voertuigverlichting; markering. Orgaan van post-academisch onderwijs in de verkeerswetenschappen en de verkeerskunde, Rijswijk, 1991.
- Least squares optimization of linear dynamic systems using majorization, multiplier and quasi-Newton methods. F.D. Bijleveld (SWOV); C.C.J.H. Bijleveld; J. de Leeuw & S. Oppe (SWOV). UCLA Statistics Series # 84. (1991).
- Breath alcohol legislation in The Netherlands. J.A.G. Mulder (SWOV); W. Neuteboom & R.M. Wessel. Blutalkohol 28 (1991) : 94-107.
- In gevaarvermijding is nog veel mogelijk. In: Syllabus PAOG-cursus 'De bejaarde patiënt IX', K.U. Nijmegen, april 1991.
- De bijdrage van regels en toezicht aan de verkeersveiligheid. P.C. Noordzij & P. Wesemann. In: Vijver, drs. C.D. van der & Zeven, mr. P.J. (eds.). Verkeersregels, handhaving verkeersveiligheid: Op zoek naar innovatie. SMP-publikaties 6. Gouda Quint, Arnhem, 1991.
- Het alcogram: een hulpmiddel bij het zelf bepalen van het alcoholgehalte. Ing. J.A.G. Mulder & dr. P.H. Polak. Preventie 15 (1991) 4 (juni/juli): 25 t/m 27.
- 25 jaar rij-instructie. Drs. R.D. Wittink & drs. D.A.M. Twisk. Rij-instructie 25 (1991) 10 (mei) : 441
- Road safety in urban districts; Final results of accident-studies in the Dutch Demonstration Projects of the 1970's. S.T.M.C. Janssen. Traff. Engng & Control 32 (1991) 6 (June) : 292-296.
- Enforcement or incentives? Promoting safety belt use among military personnel in the Netherlands. M.P. Hagenzieker. J. Appl. Behaviour Anal. 24 (1991) 1 : 23-30.
- Accident risks on bridges and tunnels compared with the total road network (Abstract). S.T.M.C. Jansen. In: IIe Symposium international et exposition INRR: Les ouvrages d'art et la securité routière, Luxembourg, 19-22 Juin 1991, pp. 23-24. INRR, Luxembourg, 1991.
- Conception of the equipment (Lighting) (Abstract). Dr. D.A. Schreuder. In: IIe Sym-

posium international et exposition INRR: Les ouvrages d'art et la securité routière, Luxembourg, 19-22 Juin 1991, pp. 69-70. INRR, Luxembourg, 1991.
- Bijna halvering aantal verkeersdoden onder jeugdigen in tien jaar. F.C.M. Wegman & P.H. Polak. Tijdschrift voor de gezondheidszorg 23. (1991) 4 (augustus): 54 t/m 57.
- SWOV Institute for Road Safety Research, Profile of an organization. TR News 154 (May-June 1991): 14-16.
- Tunnel entrance lighting in traffic conditions. D.A. Schreuder. In: CIE Proceedings 22nd session, Melbourne, 1991, Volume 1, Part 2, Division 4, pp. 3-5.
- Visual perception and vehicle lighting during daytime: A conceptual model. M.P. Hagenzieker. In: CIE Proceedings 22nd session, Melbourne, 1991, Volume 1, Part 2, Division 4, pp. 6-7.
- Lighting near astronomical observatories. D.A. Schreuder. In: CIE Proceedings 22nd session, Melbourne, 1991, Volume 1, Part 2, Division 4, pp. 34-35.
- Road lighting for road safety, public security and amenity. D.A. Schreuder et al. In: CIE Proceedings 22nd session, Melbourne, 1991, Volume 1, Part 2, Division 4, pp. 36-37.
- A device to measure road reflection in situ. D.A. Schreuder. In: CIE Proceedings 22nd session, Melbourne, 1991, Volume 1, Part 2, Division 4, pp. 38.
- Why do we need an extensive evaluation study of the DRL regulation in the Netherlands? J.E. Lindeijer. In: Rumar, K. (ed.). Proceedings Third European Workshop on Recent Developments in Road Safety Research, April 26-27, 1990. VTI Rapport 366A, pp. 95-99.
- Safety on motorways. R. Roszbach. In: Rumar, K. (ed.). Proceedings Third European Workshop on Recent Developments in Road Safety Research, April 26-27, 1990. VTI Rapport 366A, pp. 77-80.
- A comedy on TV to promote traffic safety. R.D. Wittink; W.J.A. Nelissen & M.P. Hagenzieker. In: Proc. of Road safety and traffic environment in Europe, Gothenburg, September 26-28, 1990. VTI-rapport 365A, pp. 68-77.
- Alcohol and road safety in the Netherlands. P. Wesemann & P.C. Noordzij. Alcohol, Drugs and Driving 7 (1991) 2 : 83-92.
- RVV en BABW: van idee tot beleid. P.C. Noordzij. Verkeerskunde 42 (1991) 7/8 : 16 t/m 18.
- Knipperend geel voor voetgangers: Alternatief voor rood. P.B.M. Levelt & T.A. Oenema. Verkeerskunde 42 (1991) 7/8 : 46 t/m 47.
- Gedragsaanbevelingen voor weggebruikers. P.C. Noordzij. Verkeerskunde 42 (1991) 7/8 : 50 t/m 52.
- Safety in the Netherlands. F.C.M. Wegman; S.T.M.C. Janssen & S. Oppe. In: XIXth World Road Congress, Marrakesh, 22-28 September 1991, Question IV: Safety, pp. 269-288.
- Statistical assessment and targets (F.C.M. Wegman). In: XIXth World Road Congress, Marrakesh, 22-28 September 1991, Question IV: Safety; General report, pp. 25-39.
- A comparison of road safety data between different countries (Is my country safer than other?). S. Harris & F.C.M. Wegman. In: XIXth World Road Congress, Marrakesh, 22-28 September 1991, Question IV: Safety; Individual papers, pp. 180-187.
- Veiligheid in transportmodi; Samenhang, diversiteit en overdraagbaarheid Drs. M.J. Koornstra. In: Stoop, dr.ir. J. & Kroes, prof.ir. J.L. de (eds.). Verslag Symposium Toekomstig transport, Veiligheid voorzien?, 21 mei 1991, T.U. Delft. Delftse Universitaire Pers, Delft, 1991, pp. 9 t/m 22.
- Familie Oudenrijn; Evaluation einer niederländischen Fernsehsendung zur Verkehrssicherheit. R. Wittink; M.P. Hagenzieker; W.A.J. Nelissen; H.M.J. Brounts. Zeitschr. f. Verkehrssicherheit 37 (1991) 4: 156-162.
- Verkehrszeichen zur Geschwindigkeitsbeschränkung und Verkehrssicherheit. H.L. Oei & J.H. Papendrecht. Zeitschr. f. Verkehrssicherheit 37 (1991) 4: 163-167.
- The development of traffic and traffic safety in six developed countries. S. Oppe. Accid. Anal. & Prev. 23 (1991) 5: 401-412.
- Development of traffic and traffic safety; Global trends and incidental fluctuations. S. Oppe. Accid. Anal. & Prev. 23 (1991) 5: 413-422.
- Indicators for traffic safety: A new yardstick for safety. In: Hakkert, A.S. & Katz, A. (Eds.). Proceedings the Second international conference on New ways for improved road safety and quality of life, Tel Aviv, October 7-10, 1991, pp. 117-126.
- Nieuwe rotondes ook veilig voor fietsers? J. van

Minnen. Verkeerskunde 4 (1991) 10: 14 t/m 19.
- Nieuwe rotondes ook veiliger voor fietsers? J. van Minnen. Brabant Veilig 3 (1991) 4 (oktober): 8-9.
- Modellen maken verband duidelijk tussen mobiliteit en veiligheid. Drs. S. Oppe. Verkeerskunde 42 (1991) 11: 40 t/m 43.
- The effects of low alcohol beers on the blood alcohol concentration. W. Neuteboom & A.A. Vis. Blutalkohol 28 (1991) : 393-396.
- Evaluation of a stimulation plan for municipalities in the Netherlands. F. Wegman; J. van Selm & M. Herweijer. Safety Science 14 (1991): 61-73.
- 365 dagen per jaar, 24 uur per dag. Gladheidsbestrijding: verkenning van problemen en mogelijke oplossingen. Ir. F.C.M. Wegman. In: Syllabus Symposium "Gladheidsbestrijding", Rotterdam, 27 november 1991, Lezing A. NIRIA/KIVI, 1991.
- Is gladheid wel zo onveilig? J.P.M. Tromp. In: Syllabus Symposium "Gladheidsbestrijding, Rotterdam, 27 november 1991, Lezing C. NIRIA/KIVI, 1991.