SWOV in 1982

A review of publications in 1982

INSTITUTE FOR ROAD SAFETY RESEARCH SWOV
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This brochure, compiled by the Information Department SWOV is based on the 1982 issues of the quarterly information bulletin 'SWOV-schrift', dealing with SWOV's most important activities. Thus, this brochure provides no complete survey of the publications but gives a satisfactory idea about the institute's work.
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The Institute

The Institute for Road Safety Research SWOV was founded in 1962. Its object is, on the basis of scientific research, to supply the authorities with data for measures aiming at promoting road safety. This information obtained from this scientific research is disseminated by SWOV, either as individual publications, or as articles in periodicals or via other communication media. SWOV's Board of Governors consists of representatives of various Ministries, of industry and leading institutions.

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Introduction

Prof.E.Asmussen
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In 1982 in the Netherlands 1710 persons were killed in traffic accidents. We have to look back as far as 1959 to find a comparable figure (1718). However, it has to be taken into consideration that in 1959 there were less than half a million passenger cars in use, while the corresponding figure for 1982 was about 4.6 million.

Which are the factors (in so far as they can be determined) bringing about this decline? There is certainly a relationship with the economic recession, which manifested itself also in the Netherlands in the last years. The mileage covered by cars decreased and the driving behaviour of car drivers seems to be calmer, most probably due to financial consideration. These factors coïncide with positive effects of a plurality of (sometimes small-scale) measures in the field of traffic engineering, with a slow change of the age groups of population, causing a decrease in the share of inexperienced traffic participants, while on the other hand an increase in the share of experienced ones. The decline in the number of traffic casualties could stop in case of the recovery of economy in combination with a steady increase in the aged groups of population. There are already signs indicating the stabilisation of the number of traffic casualties.

Changing circumstances

Most probably, the future will bring about changed social circumstances, which may have an influence on traffic safety.
The increase in the number of unemployed persons and shorter working times will lead to a modified pattern of activities which, in turn, will affect travel habits and the choice of transport means and routes. The relatively higher mileage costs of passenger cars will not be without consequence to the driving behaviour of car drivers. In general, the development of calmer and more homogeneous traffic can be expected, whereby passenger cars become more and more economical at high speeds and less economical at lower ones.
Consequently, the incentive to drive at lower speeds within built-up areas will be relatively weakened, while the average driving speed outside of built-up areas will increase. There will be no further growth in long-distance passenger car traffic; it might even be reduced. Lorries will be made larger, heavier, there will be a further expansion of road transport, most

certainly involving new traffic safety problems, e.g. unexpected queue forming on motorways, where passenger cars, designed with continually lower weight, will always be the more vulnerable party in collisions with heavier lorries, driving in ever increasing numbers.
General problems of traffic safety and environment will especially occur on the access roads to larger urban areas. This phenomenon will still more be enhanced by the ever growing large-scale urbanisation.
All these factors will make new demands on the fight on behalf of traffic safety. New means will have to be applied in order to influence human behaviour in a way to improve traffic safety. The micro-processor opens up new and quite unexpected modes to achieve a better control over traffic-safety affecting factors.
Of course the improvements have to be achieved without any damage to other functions of public spaces (for example dwelling), which unfortunately happens all too often nowadays.
'Better' in this context also involves the detection of faults in the transport and traffic system before they may lead to accidents. In these activities communication processes play an important role: the communication between road designers, policy makers and traffic participants, furthermore mutual communication between traffic participants. It seems a useful idea to integrate knowledge based on communication theory into knowledge concerning traffic-safety research. The important thing is that 'a person on the road should know what an other person knows about his intentions'. The cyclist must not only anticipate that the lorry driver will make a turn to the right; he also must be sure that the lorry driver sees him along the lorry and that he recognises the cyclist's intention to make a right turn.

An undivided whole

The future will demand a more integrated approach to the fight for traffic safety. The problems in this field are mainly caused by the generally complicated interrelationship between cause and consequence. The time for relatively simple 'wide-range' measures (seat belts, crash helmets) is gone. The fight against isolated problems proves to be continually less affective. Medicine, behavioural science, planology, traffic engineering, traffic control, education and legislation should all form a part of an integrated approach to solve the problems, including an adjustment of theories to practice. The complex character of problems increases the risk of taking wrong policy measures. It still happens that the 'do'-persons realise processes without any previous consultation with theoreticians. Measures taken without due consideration may cause severe faults. It has to be taken into account that theory and practice form an undivisible whole. Practical knowledge is based on theoretical knowledge, each solution brought about by the 'do'-persons has its origin in a theory, while theoretical knowledge, in turn, is based on and improved by practice. In future this interplay shoud be utilised to a far extent in order to successfully overcome the growing complexity of the problems.

Prof. E. Asmussen
Director of SWOV

Development of traffic safety in the Netherlands

A decrease from 1806 killed persons to 1710, from 53,504 injured persons to 12,213: these are the figures characterising the year 1982 as compared to 1981. Such a gratifying decline in the number of traffic casualties can be observed in many countries. In this respect the international reputation of the Netherlands is not unfavourable. The difference between the Netherlands and other countries of relatively high traffic safety, like Great Britain and Denmark, decreased considerably in the last years.

In spite of this positive trend, traffic is still very risky and dangerous for some age groups. Thus, nearly 50% of all fatalities occur in the age groups of 15-20 years old, while the corresponding share of the 20-25 years old and that of the 5-15 years old is about 33%. Even in 1982, the traffic death rate of persons above 65 and to a lesser extent of those between 15 and 25, was disproportionately higher than the death rate of other age categories.
Lately it became possible to make appropriate use of data concerning traffic casualties, who had been hospitalised. In some aspects it seems that the distribution of injured persons as regards age and mode of traffic considerably differs from that of persons killed in traffic. Thus, e.g. the share of moped riders in the total number of hospitalised persons is higher than their corresponding share in the total number of traffic fatalities. As regards aged persons, the situation is just the other way round, which proves their higher lethality (the relationship between the number of killed persons and the total number of casualties: dead + injured persons).

The indicated decline in the number of traffic casualties could be observed in nearly all modes of transport, being the most remarkable for moped riders. However, in view of the continually decreasing use of mopeds this is not very surprising. The situation is totally different as regards other vulnerable categories of two-wheelers. Motorcycle and bicycle become more and more popular. There is no decrease in the number of casualties as regards motorcyclists. In the case of cyclists even a slight increase could be observed.

Traffic safety in residential areas in the focus of interest

In the Netherlands there is a nearly traditional interest in traffic safety in residential areas. On many places experiments are being carried out with measures intended for excluding through-going traffic and for reducing driving speeds of motorised traffic effectively in such areas.

National Traffic Safety Congress

In the last year there was special interest in this problem in connection with the National Traffic Safety Congress (NVVC), at which it formed the central object of discussions. The NVCC is a biannual congress initiated and organised by the Royal Dutch Tourist Club ANWB and SWOV.
It was for the first time that town planners played a dominating part at the NVVC. However, the formulation of Congress recommendations showed quite clearly that cooperation between various groups of experts is still a rather cumbersome job.
It was gratifying to observe that the approach to influence traffic behaviour on the basis of an ideal human image, separately from specific traffic situations, lost from its importance and was replaced by a mode of approach via a coherent packet of measures on infrastructural, controlling and educative level. Such ideas stimulate mutual and reciprocal agreements between designers, traffic and behavioural experts and the authorities taking and controlling measures. Traffic education is given an important role. The Minister of Transport and Waterways was present at the congress and took part in the discussions in order to support the ministry's endeavour for more and better traffic education in schools.
Considerable attention was given at the congress to a better arrangement of the participation of the population in traffic safety planning.
The exchange of knowledge and experience was promoted at the congress by a 'Market of Ideas' with the participation short sketches of the problems, measures taken and their effects.

The programme item 'Traffic safety in residential areas' was sub-divided in eight sub-items, which were dealt with in separate sessions. The conclusions arrived at were then discussed jointly by all congress participants and after due amendments they were summarised into recommendations. Although the term 'residential area' is commonly used, the town planners launched a rather hot discussion about the question, what exactly is a residential area.

Among others, the majority of the congress came to following conclusions:
- Towns and villages have an important residential function. Therefore, it is wrong to determine special, geographically delineated spaces, where people can stay. A road can only be designated as a major road when a distributing function is indispensable and where the slow traffic is safely protected.
- Various measures have to be taken if other uses of the roads are given priority over through-going motorised traffic. The final aim of measures has to be established and accepted by the involved persons before the (re)-construction of the road. The expected results have to be clearly known or evaluated beforehand. After the implementation of rules it has to be checked, whether the effects aimed at have been realised.
- The choice of route and traffic behaviour can best be influenced by traffic-technical measures, adjusted to the possibilities and limitations of the traffic participants. In this respect information and education play an important role.
Traffic training should be included in the curriculum of higher education.

The congress avoided discussions over the conceptions of subjective

and objective traffic safety. Repression of accidents and of the menace involved in them were described as objects of traffic policy. In research the results of accident analyses, investigations in the field of traffic engineering, behavioural and experience aspects have to be used in combination with one another. Initiatives of the 'neighbourhood' and interested groups are indispensable for making safer a given area.

Planning and consultation with the interested persons can best be carried out on the basis of a 'contract', comprising all the means, scope and rules of the 'game'. Authorities should provide a special budget for this purpose and determine the distribution of available financial means. The congress made recommendations for a traffic-safety telephone or consulting hour system (which already functions in the Netherlands) with an extended authorisation to handle complaints and suggestions. This policy should be supported by an official coordinating body. A regional authority for traffic safety (already functioning in some provinces in the Netherlands) is given the important task of acting as a coordinating and consulting body for institutions and organisations operating in the field of traffic safety in a given region.

A complete description of conclusions drawn by the congress, including explanatory notes, was sent to all institutions involved in some way with traffic safety. In the near future they will be asked for their opinion to which extent the congress conclusions had any effect on their policy.

Summarised knowledge concerning traffic safety in residential areas

On the occasion of the National Traffic Congress in 1982, SWOV published a report for the preparation of the Congress.
This report states the situation of traffic safety within built-up areas and its development in the last years. Among other things, the report points out that nearly three times more persons are killed among participants in slow traffic than in passenger cars. In the first place, the share of children and aged persons is extremely high. In addition, these are the age categories determining traffic in residential streets on account of their restricted action radius. For example, children spend about 70% of their outdoor time in their own residential area.
The investigations in residential areas are hindered by conventional methods which quite often are not enough effective. The conflict observation technique which is also discussed on page 18 is not yet refined sufficiently. There are initiatives for detecting unsafe situations in a district by setting up enquiries among the population. However, the value of such enquiry results is not yet known. For example, an enquiry in Eindhoven indicated unsafe places, which differed from those revealed by accident analyses in the same area. Nevertheless, enquiries may give some ideas about the feelings of the population with regard to traffic.

A major part of the report deals with measures implemented in residential areas and with their effect on traffic safety. Among the subjects discussed there are blind streets, 'looping' streets, streets with one-way traffic, 'woonerven' (residential yards), road humps, parking facilities and special provisions for pedestrians and cyclists.
Thus, mainly infra-structural and 'physical' measures are emphasised. Such measures are more apt to reduce the number of accidents between slow traffic and motorised traffic than just traffic rules intended to control driving behaviour (e.g. a 30 km/hr speed limit). Measures including traffic education and informa-

tion can most certainly improve the correct use of traffic provisions. As drawbacks of infra-structural measures the report mentions expenses, which in many cases are high, the difficulty of realising some plans, due to lack of space, problems with parking, negative effects caused by the complicated accessibility to some locations. Finally the report deals with municipal safety policy and the coordination of policies on a municipal, regional and national level.

Interesting experiments in Eindhoven and Rijswijk

An interesting experiment in the Netherlands is a demonstration project: 'Restructuring and redesigning of urban areas'. In the Netherlands in two towns: Eindhoven and Rijswijk, districts have been chosen, where large-scale experiments are being carried out with regard to traffic engineering measures in order to improve traffic safety and 'livability'. The most important goal of the investigation is to establish through measurements the effects of redesigning prior to and after the implementation of measures and to compare the differences in effectiveness between three packets of measures. The investigation aims at assessing effects on traffic circulation, (the experience of) traffic safety (environment and social-economic factors. SWOV is engaged in the study of traffic-safety effects and works on finalising the investigation. Last year was concluded the 'pre'-investigation consisting of various types of investigations. In addition to an 'evaluation' investigation, endeavours were made to develop instruments for 'measuring' traffic behaviour. Furthermore, attention was given to the development of new investigation methods and to give answer to specific questions. A result of this is, that in the post-period of investigation not the same investigation programme had to be carried out as in the preliminary period.
The concept 'subjective traffic safety' (or 'experiencing traffic safety') has been operationalised in various part-investigations. In addition, in the description of investigation results some relationships with traffic behaviour have been indicated. A further discussion between policy-making and investigating bodies over the concept 'subjective traffic safety' could result in a generally acceptable operationalisation.

The aim of traffic-safety investigation was to answer the questions of authorities. However, it was not possible to delineate an investigation scope, which would exactly correspond to the policy questions. Both practical problems (time, money, manpower, coordination) and the unknown character of such kinds of investigations played a part here. Consequently, no answer could be given to some policy questions. In the evaluation this aspect will be dealt with in detail.

Finally, the following remarks should be made. In planning the demonstration project mainly the residential areas have been emphasised, while in the formulation of definitive measures more attention was paid to the major traffic roads.
The sphere of interest was widened by some investigation results. On being questioned about dangerous locations, the inhabitants of the demonstration areas, not only indicated places in areas where persons, as a rule, are dwelling, but also traffic roads as well. From this it could be inferred that people also include traffic roads in their residential area. It can also be observed that based on the chosen division: residential areas and traffic roads, the majority of accidents involving injuries or killing people was found to occur on traffic roads.

The bicycle: popular and vulnerable

We shall not surprise anybody by saying that cycling is very popular in the Netherlands. 11 million persons of a population of 14 million are using the bike. 1200 to 1300 km are covered by bicycle annually. The popularity of the bicycle is again rising in the last years. However, this involves a problem: the vulnerability of the cyclist as traffic participant. Adequate measures have to be taken, if we wish to prevent unwanted trends in the safety of the cyclist.

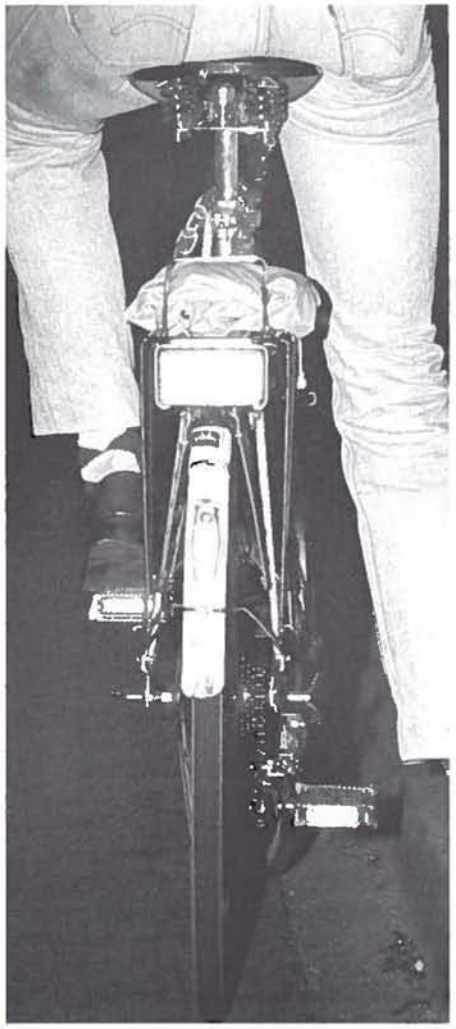
Various policy reports already indicated the necessity of more scientific information, on which such measures can be based. In view of the signalled trends, SWOV set itself the task to provide more information on this subject. In the first place a report was made, which, in addition to a literature survey concerning the cyclists' traffic safety within built-up areas, also contained a plan of an investigation for filling up the gaps in knowledge in this field. No unambiguous conclusions can be drawn from the literature survey, but nevertheless it is useful for the forming of hypotheses, which can serve as points of departure for the investigation to be carried out. The scope of investigation was divided into phases. In the first place it has to be found out, to what extent (if at all) there are differences in the safety of cyclists and moped riders, making use of roads with separate cycle paths, with cycle lanes and in the safety of those who ride on roads without such special provisions.
The second phase should comprise the search for connections between the number of accidents per unit of length of a road sector and the intensities of traffic in the said sector. The object of the third phase is to compare the accident characteristics related to the indicated three road categories: the type of accident, the seriousness of the accident and the conditions under which it occurred. Finally, data will be collected in order to establish possible relationships between the occurence of accidents and local road characteristics.

Separate traffic light for the cyclist and moped rider may help

It is possible to include a separate phase in the traffic light control for the cyclist and moped rider. Such extra phase permits these traffic participants to pass through the intersection without being hindered by motor vehicles turning-off.
SWOV investigated the consequence of such 'conflict-free' phase for traffic safety in case it will be realised on intersections with protected bicycle lanes. It was found that while less collisions occurred with cars turning off, the number of collisions with crossing cars increased. However, the final effect of the conflict-free phase on traffic safety is certainly a positive one, mainly due to the reduced number of collisions with turning-off lorries. It is just the collision with a lorry, which has the gravest consequences for cyclists and moped riders.
The increase in the number of collisions with crossing cars is most probably caused by the longer waiting times involved in the conflict-free phase. Longer waiting times increase the chance that the red light will be more frequently ignored. Accidents implicating crossing traffic are in such a situation always caused by red-light offences. Such offences could be eliminated to some extent by giving the cyclist (moped rider) several times per cycle, the green light for very short periods of time.

The positive effect of the use of reflectors on bicycles

Apparently the compulsory use of a red rear reflector and of reflecting pedals on bicycles will have a beneficial effect on traffic safety.



The first analysis of accident data referring to 1978 (the year preceding the implementation of the measure) and of data referring to 1980, prove that the number of traffic casualties (dead + hospitalised people) was reduced by 60-80 in the last year. In case of taking into consideration the accident data of 1977, the corresponding figures will vary between 30 and 95. The exact number of killed and gravely injured persons cannot be determined.
These findings concerning the effects of such a measure are in agreement with the expectations formulated by SWOV in 1973.
There are also indications suggesting that the effectiveness of reflectors increases at the rate at which the conditions of lighting become more unfavourable, both as regards the public lighting system and that of the bicycle.

These positive indications are based on an accident analysis. Of course, the effects of reflectors cannot be derived from a simple comparison between the number of casualties in the years preceding the implementation of the measure and in the years thereafter. In this period traffic safety could also have been affected by other factors: increase or decrease in traffic intensity and other (safety) measures, for example. For this reason a distinction was made between the types of accidents, which might have been affected by the presence of the reflector and all other types of accidents. To the first category belong accidents, which occurred in twilight or in the dark and in which the bicycle was hit from the rear. These data then have been related to the trend of other accidents involving cyclists in this period. In this manner other factors, which could have affected traffic safety, could be eliminated as far as possible.
In the near future, SWOV will carry out a more detailed analysis, which will provide more definitive figures.

New trends concerning the collision phase of the accident process

In the last decade important progress was made with regard to the protection of car passengers against the consequence of accidents; seat belts in combination with crush zones, undeformable passenger compartments and interiors, more safe in view of collisions, have shown positive effects on traffic safety.
In the last years there is an ever growing interest in limiting the consequences of collisions with cars for other road users, mainly cyclists and pedestrians.
This trend becomes evident from the work of the EEVC, the European Experimental Vehicle Committee. Following an invitation of and in order to support the Department of Road Transport RDW, SWOV takes part in various working groups of this committee. In 1982 one of these groups made a report on the injuries caused by collisions between pedestrians and passenger cars. This report, in which the collision safety of passenger cars was studied separately in relation to certain groups of road users, was not considered as very effective, neither by RDW nor by SWOV. Since long both bodies advocate an integrated approach to this problem. It should be evident that solutions which are satisfactory for pedestrians would not have the same favourable effect for cyclists and moped riders. According to the aforementioned report, pedestrians mostly come into a sharp contact with the front part of the car, while cyclists may collide with a car from the side or from the back as well. In addition, the bicycle structure itself may aggravate the injuries. Thus, it seems possible that the situation as regards cyclists could be, at least partly, improved by modifying the bicycle structure. It is pleasant that EEVC entrusted SWOV and RDW with the chairmanship and the secretariat of a group, which will have to deal with collisions between cyclists and cars. In this work, of course, the findings discussed in the 'pedestrian' report (to which SWOV made a considerable contribution) will have to be taken into consideration.

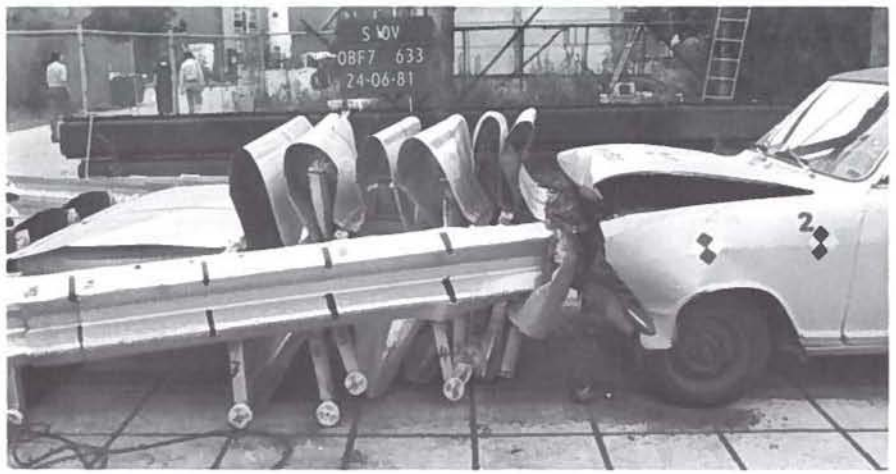
Accidents on the road shoulder remain a problem

A wide-range project of SWOV is the investigation 'Road-shoulder lay-out', aimed at establishing the general basic criteria. Until lately the investigation was mainly concentrated on road shoulders of motorways. However, in view of the favourable accident record of motorways (the safest road category!) the focus was shifted to other road categories in the last years. This, however, required extra investigations. Thus, it had to be found out, which factors are important (and to what extent) for the construction of road shoulders, furthermore what is the mutual relationship of such factors. In order to localise the scope of the problems, it is also necessary to establish a relationship between the accident data and the car mileage, the number of cars and occurence of obstacles.
For a start, the report 'Road-shoulder accidents' was published in 1982. This report revealed some remarkable issues.
In the 1971-1980 period the number of lethal traffic accidents decreased by 36%. However, the decline of lethal accidents involving collisions between vehicles and a 'rigid object' on the road shoulder, was not more than 8%! More than 50% of the 'rigid objects' were trees, while 12% consisted of lighting columns and 8% of piles (standards). In the same period, the number of single vehicle accidents with lethal outcome decreased by nearly 50% to 103 in 1980. There are accidents, whereby a vehicle crashes without colliding with a person, with another vehicle or with an object, for example a vehicle turning over or driving into a ditch. The major part of such accidents takes place on the road

shoulder. Thus, the 'rigid object' - accidents form a rather conspicuous group, which cannot be included into the general trend of distinctly decreasing accident figures.
Furthermore, it becomes evident that the lethality (the proportion between the number of deads and the number of victims - dead and injured persons) is relatively high in road shoulder accidents.

New type of protective device for road obstacles

A driver getting off from the motorway with his car must have sufficient and safe means at his disposal, to be able to stop on the road shoulder. However, dangerous obstacles may gravely affect the outcome of such manoeuvres.
Obstacles, on account of their rigid character, may cause severe damage to the car. As examples of similar structures bridge piers, objects in gore areas and legs of road sign supports can be mentioned. The major part of such structures is immobile.
There are already diverse protective devices for dangerous obstacles, which however are either inadequate or much too expensive. This prompted Rijkswaterstaat to entrust SWOV with the planning and testing of a new protective device for such obstacles. The result of this assignment, the so-called RIMOB, was introduced the last year.
This structure is capable to bring both passenger cars and vans to a halt, in such a manner, that the passengers, wearing a seat belt, will pull through the accident with inconsiderable injury or no injury at all. This applies both to collisions with the front of the RIMOB and with its side. In the first case RIMOB absorbs the energy of collision in the following way. The structure (see figure on page 14) is composed of various interconnected box elements. Each of these elements comprises a number of socalled crumple tubes (like aluminium stove pipes).
In case of a frontal collision, these tubes will crumple in longitudinal direction to at most 20% of their original length. The upper and lower plates of the box element are so prepared that under an impact they will be double-folded outwards. In this way the entire structure will be gradually compressed, thereby absorbing collision energy. To ensure that the process can take place smoothly the RIMOB is mounted on small wheels, excepting its rear part, where the structure is anchored. In case of a frontal collision the nose segment of the structure will adjust to the shape of the car. The nose is deformed at first, whereafter the box elements do their work in succession. At apposite sides of the box elements there are fitted short sections of guard rail in overlapping arrangement. During a frontal collision, these flank sections slip backwards and over one another. In case of a lateral collision the flank sections operate similarly to a conventional guard rail construction, the entire structure will slightly bend in axial direction, thereby changing the direction of motion of the car and guiding it. In order to prevent that in such a collision the RIMOB should be completely pushed away, the structure is not only anchored at its back but (at least crosswise) at its front as well. For this purpose the foremost legs are introduced (over a distance of about 1 meter) in a guiding rail. Due to such arrangement, in case of a frontal collision the legs will glide out from the guiding rail in longitudinal direction, while they will stay in their place in lateral collisions.
A large part of lateral rigidity of the structure is provided by the box elements. Due to preliminary deformations, they can easily be double-foulded in the longitudinal direction. Under axial loads RIMOB is capable of absorbing considerable forces.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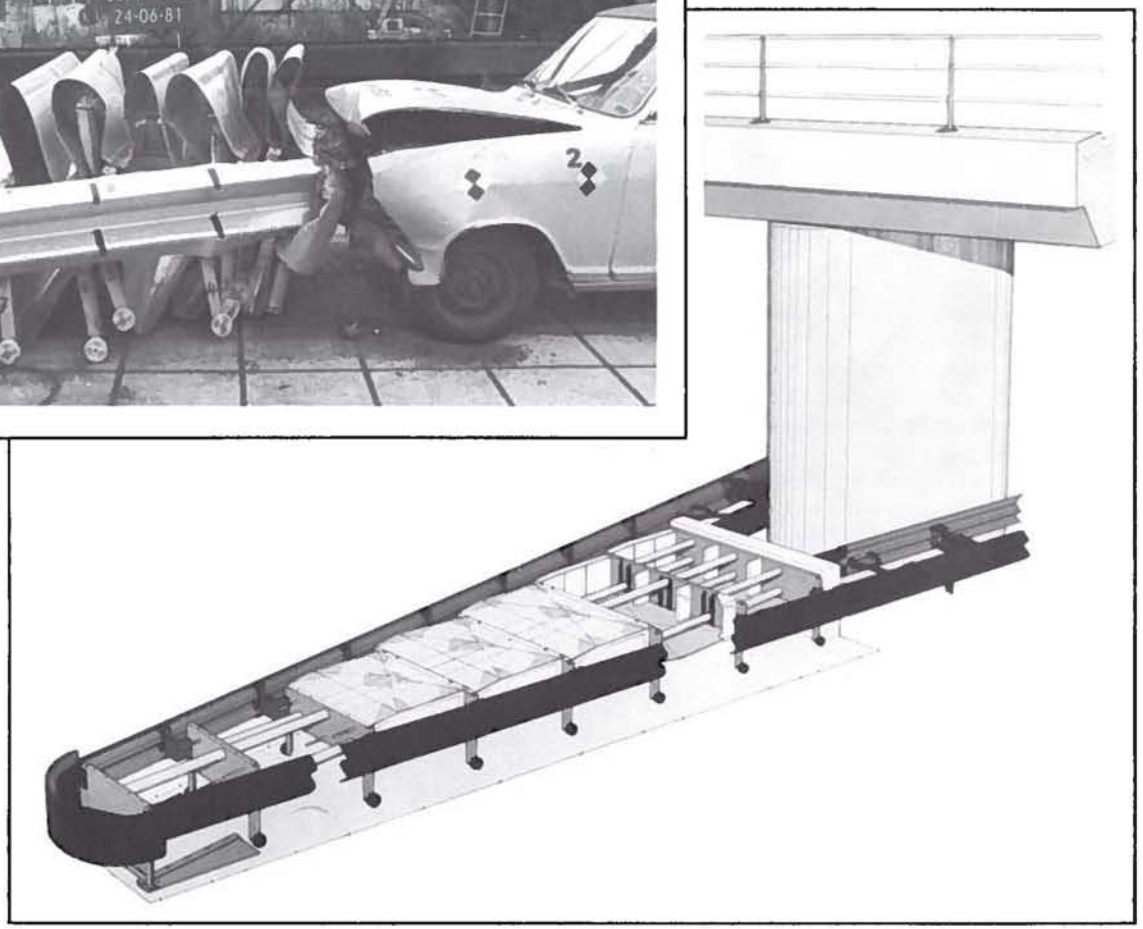


The RIMOB has been thoroughly tested on the collision test track of the Research Institute for Road Vehicles TNO. It was found that the tested structure works in a satisfactory manner under various impact angles. Vehicles with a weight of about 1500 kg could be safely stopped in frontal collisions at speeds up to 100 km/hr. On collisions at the nose, but outside of RIMOB's central axis, the vehicles were turned about their axis in such a way that there is a danger of their coming partly to a halt on the road. By varying the thickness and the number of tubes and the number of segments, it is possible to 'programme' the RIMOB according to diverse traffic situations. Such programming can be carried out with help of a computer at fairly low expenses.

Head rests help moderately

Head rests in passenger cars have a modest but nevertheless positive effect on traffic safety. This conclusion is stated in an advisory report compiled by SWOV on behalf of the Department of Road Transport RDW and the Road Safety Directorate DVV both of the Ministry of Transport and Waterways.

Head rests have to do their work in collisions from the rear. In the rear part passenger cars have a relatively large crush zone far from the seat of the driver. Furthermore, in such type of collisions, the speed differences are mostly rather low. This can be concluded from a SWOV accident investigation, including the examination of more than 8000 accident-involved passenger cars, with regard to the injury data of the car occupants. The investigation proved that collisions from the rear, in contrast with frontal or lateral collisions, are not causing serious injuries. Fairly frequently occurring injuries are the 'whiplash' injuries, involving a dislocation or spraining of the neck vertebrae. However, such injuries are as a rule not very serious and not endangering the life of the injured person; nevertheless, they are troublesome and moderately painful. Whiplash injuries may cause long-term complaints. It is interesting that such sort of injuries is less often caused in collisions from the rear than in frontal or lateral collisions, where the head rest gives no protection at all. This is also a proof of the relatively light character of collisions from the rear.
It could be proved that the head rest is capable of reducing the risk of such injuries by about 25%.
Due to their generally light character such injuries have only an inconsiderable effect on the total injury pattern of collisions from the rear. But, of course, the car occupant can be helped by the head rest.

The applied practical data, however, are already some years old. The head rest enjoys greater popularity at present, perhaps due to the working of up-to-date head rests being more expedient. The modern head rest may have a more favourable effect on the outcome of the collision. It seems advisable to check the accuracy of the present conclusions in due course with a new investigation. The advisory report ends with a recommendation to set up new regulations for head rests in order to establish an integrated arrangement of the car occupants seating. Seat, seat back, head rest, seat belts and the fastening of the seat to the floor of the car must be regarded as a whole and designed and tested as such.

A possible solution against wind disturbance

In our flat country, abounding in water, the unpleasant effects of cross-wind manifest themselves quite often in road traffic, mainly on roads on a higher level, such as dikes, dams, bridges. Wind gushes unimpeded and with increasing force at greater, unprotected heights.
The wind force is still more increased by the air currents, driven up against the dike or the dam. Under such circumstances it is rather difficult to keep a car on the right track. The situation can still be aggravated by sudden and unexpected changes in the speed and direction of wind gushes. This can happen when a smaller car is temporarily shielded from the wind by a passing bus or lorry and then suddenly it is exposed to the 'bow wave' arising in the wake of large vehicles. Constructions along the road, like the piles of sluice gates on dams, can also temporarily shield vehicles from the wind. In case such structures are placed at regular distances from one another and the car driver has no chance to correct the car's deviation in the intervals, the effect of a new disturbance will be added to the rest of the previous one, thus it will be reinforced. Under such circumstances the change of the course of the car may become quite irreparable within a very short time.

SWOV has been assigned by Rijkswaterstaat to make an advisory report on wind-caused disturbances. This report contains, in addition to a problem analysis, a series of possible solutions. A promising solution seems to be a partly-permeable screen to brake the wind and to change the windprofile for westerly winds.
Furthermore, the report proposes a project for studying road situations with regard to possible wind disturbances already in the planning phase of roads.

There are various ways of approach to this problem. The most simple solution is to place warning signs and wind bags. In addition, the road lane borders can be provided with special markings, by which the drivers can easily and in time perceive the deviations of the car. Another possibility would be to provide sufficient space for correcting the deviations.
Furthermore, there is the solution at present applied to the Moerdijk-bridge. There advisory speed signals are given, when force and direction of wind become critical.
All the aforementioned possibilities shift the responsibility, at least partly, to the road user. This responsibility can be reduced by partly-permeable screens along the road, which have to be constructed in a way to drive part of the wind current over the top and a part of it through the screen. A closed screen would only permit the passage of wind over the top. On account of this, however, a vacuum could develop behind the screen, leading to a reversal of the wind direction. In case of a partly-permeable screen, this vacuum is filled up by the wind blowing through the screen, thereby reducing the wind force. A gradual transit between the completely open and the screened situation can be realised by varying the degree of permeability of the screen.

The advisory report of SWOV discusses the development of investigation methods for wind-caused disturbances, which can be applied to the most various situations, among other also dealing with further investigations necessary for developing the partly-permeable screens.
In case the screens come up to expectations, they will provide a solution that can be used for many in practice often most complicated situations.

Research methods and techniques

In which way can results be achieved more quickly in traffic-safety research?
This was the central issue of an international seminar preceding the National Traffic Safety Congress. This seminar was organised by SWOV in Amsterdam under auspices of OECD, the Organisation of Economic Co-operation and Development. The seminar discussed short-term evaluation of safety measures, related to a certain area, e.g. a region, part of a town, a village. This successful seminar was attended by about 80 researchers and policy makers from many countries.

An important conclusion arrived at was that research has to give more support to policies. Among other things, this means that in providing investigation results for policy decisions, the data have to presented in a form permitting to make optimum use of the presented informations. The traditional way followed in scientific investigations (the testing of hypotheses or assumptions) is less suitable for this purpose. Investigators often do not take into account that policy makers have to make choices. Research has to give for every proposed alternative an assessment of the results of practical application and indicate the reliability of the given assessment. In this manner it can be prevented that policy people will not make use of measures, which could be prove valuable.
Policy-making authorities wish to get the results of evaluation research in a short time, while scientists have their doubts about this requirement. According to them, time is necessary for achieving reliable results. However, quick results are favourable for the scientists as well. Long-term evaluation involves the risk that certain factors will change during the investigation period, so that observed changes cannot anymore be attributed exclusively to a certain measure, which has been decided upon. Furthermore, it is important to recognise the effects of measures as fast as possible, mainly if there are still some doubts about them. In such cases suitable adjustments can be effected for better results.
Thus, according to a recommendation of the seminar, a short-term investigation can be very effective, but it cannot replace the long-term investigation. However, they can complement each other. A problem still remains: in which way can short-term investigations yield more reliable conclusions.
According to the seminar discussions, accident analyses are often carried out without sufficient knowledge concerning previous and following situations. Such gaps in knowledge make the correct interpretation of investigation results rather difficult. For this reason in reports on investigations due information should be given about the scope and conditions of the investigation in question. In this way it would be possible that investigation results are used by third parties or in combination with other investigations. The seminar recommendations indicate the informations, which are necessary to achieve this purpose.

Other research techniques

There may be circumstances, under which evaluation research, based on accident data, is only possible if such data have been collected during a period of several years. Should for some reason such long investigation period be unacceptable, other investigation techniques have to be applied, e.g. the analysis of near-accidents (near-misses): the conflict observation technique (see next page). However, much information has still to be gathered about the correct application of this method.
In evaluating the effects of measures not only the possible decrease in the

number of accidents or the chance of accidents has to be taken into account: it is also important to reveal the causes why some measures are successful or not. It has to be found out, whether traffic changed under the effect of a certain measure. In this way it can be disclosed whether a measure, destined to promote traffic safety by influencing the traffic process, reached its goal or not. The jargon term for this procedure is 'process evaluation', which often can take place within a short time. Process evaluation applies conflict and behaviour observations. With the aid of this process many interesting informations can be gained about the implementation of new measures.

International aspects of conflict observation techniques

Prior to the OECD seminar (see preceding section), SWOV organised at its premises in Leidschendam the third International Workshop of the International Committee on Traffic Conflicts Techniques (ICTCT). This committee deals with the development of the analysis technique of traffic conflicts. This technique analyses near-accidents or conflicts and is thought to be mainly useful in situations, where accident analyses do not provide sufficient information; where a quick evaluation of traffic measures is required or where a process evaluation of measures seems to be desirable. In spite of the expectations one has about this technique, it still displays practical problems. There are differences in the definition of conflicts, in data collecting techniques, and the like. Moreover, the manner in which the relationship between conflicts and accidents could be correctly quantified, is not yet cleared up either.
The most important task of the workshop was the preparation of an international calibration (= comparison) study, aimed at establishing in practice the similarities of and the differences between conflict techniques applied in various countries. The study was carried out in Malmö (Sweden), in the summer of 1983. SWOV had a considerable share in preparing the study and will analyse the study results.
One of the most significant objects of the study was the establishment of a technique foir large-scale application in practical situations.

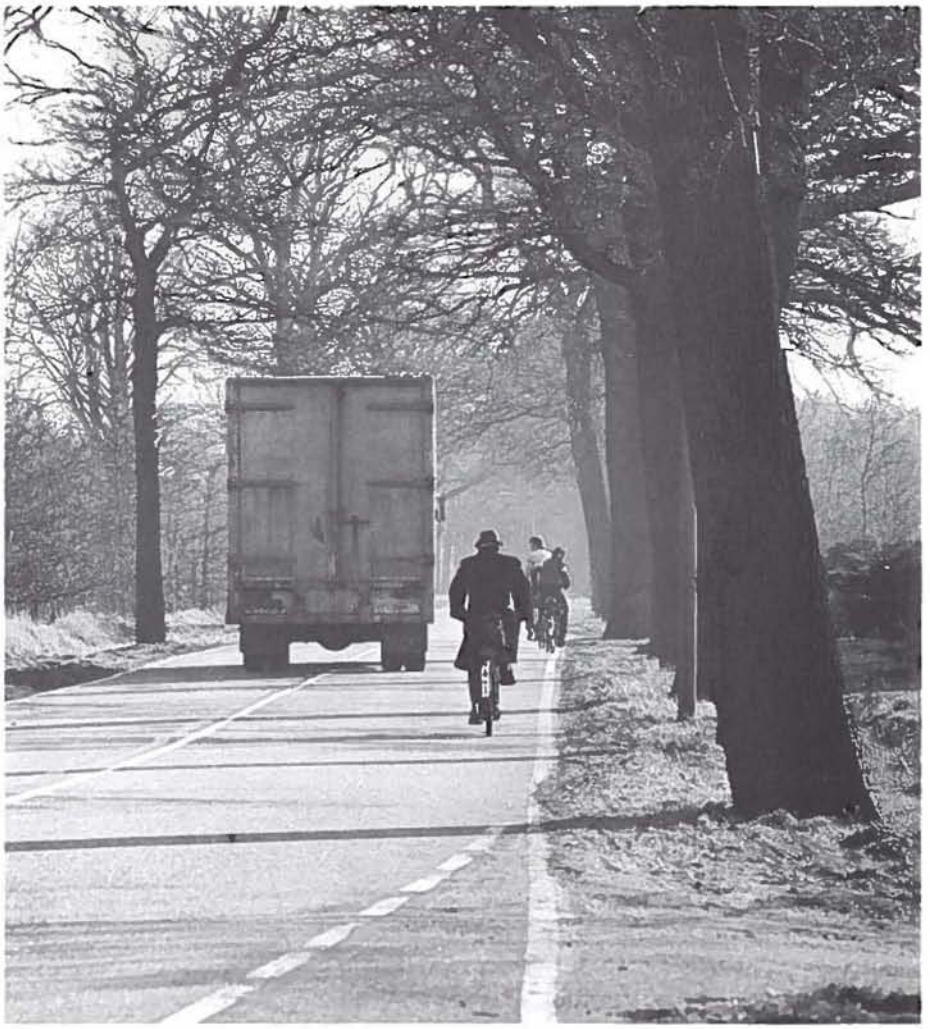
Possibilities and impossibilities of recorded data

Recorded data concerning accidents, traffic and infrastructure, are indispensable for traffic-safety research. Without such data accident analyses (on which measures have to be based) are impossible. Unfortunately, however, these data are much too often incomplete or they cannot be processed for some reason. Sometimes they become available only too late nor not at all. Since its very foundation, SWOV tried to provide means for reinforcing this weak link in the chain of traffic-safety research. In 1982 some interesting trends in this field could be observed.

How to detect black spots, even with few accident data?

'Black spot' is the jargon term for a place in a traffic system with a relatively high chance of accidents. Many road controlling authorities in the Netherlands regard it their main task to get rid of black spots. The relative chance of an accident in various locations can be established by counting the accidents in a given location in a given period of time and by relating this number to the traffic intensity of the location.

In many locations, mainly in residential areas, the number of recorded accidents is much too low for a correct forecasting of the accident chance.
It would be highly irresponsible to set up priorities for the traffic-safety policy on such a weak basis. When this method is used in detecting, the next step should be to reveal the causes of the assumed accidents in a given location. From a small number of accidents not much information can be obtained by statistical analysis. In such cases the investigator has to turn to qualitative analysis, on the basis of general theories on the occurrence of accidents.
Within the framework of an extended investigation in the province Noord Brabant SWOV tried to establish an alternative statistical method, involving the comparison of all investigated locations. The central problem was: what is the common feature of accident-prone locations and in what respect do they differ from locations, with less accidents? In order to find the answer, the accident figures had to be related to the corresponding road and traffic characteristics of the concerned locations. However, the conventional analysis techniques were not suitable for this purpose. More recently, these



techniques were amplified by the Data Theory Department of the Leyden State University and further developed in co-operation with SWOV.
The improved alternative method gives a description of safety in relation to a combination of road and traffic characteristics, while also permitting a more reliable classification of locations, according to the chance of accidents. At present, the locations are not classified on the basis of the number of accidents which occurred there, but in accordance with certain road and traffic characteristics of the locations, characteristics, which in the first phase of the analysis will explain the differences between locations with high and those with low numbers of accidents. This modification is a valuable aid in determining priorities.
The indicated method has been applied to the aforementioned investigation in Noord Brabant, describing the relationship between accident, road and traffic characteristics.
Within the framework of this investigation has been carried out with the purpose of establishing relationships between the number of accidents within a given road sector (e.g. a sector of 200 m) and the road and traffic characteristics of the sector in question.

According to a preliminary investigation it seemed expedient to divide road sector into categories (two-lane roads, single-lane roads, roads destined to and marked as slow-traffic roads and roads for mixed traffic). It was also found reasonable to investigate not only the general aspects of accidents, but also aspects of special types of accidents, like frontal collisions and collisions from the rear, lateral collisions, single-vehicle accidents and those of accidents occurring in the dark and twilight, in rain, and the like.

Quick presentation of accident data

It is highly important that trends in traffic safety are closely followed. On the basis of figures issued by the Central Bureau of Statistics in the Netherlands CBS, preliminary analyses of accident data are published quarterly by SWOV.
In view of the huge amount of work involved in these regular publications, methods had been sought to produce them "automatically". In addition the data presentation should indicate whether the established differences are really worthwhile to be noted. SWOV developed a method for this purpose, resulting in a novel presentation of the quarterly preliminary accident figures. Such presentation contains two comparisons: one with figures relating to the same quarter of the preceding year and one relating to the same quarters of four preceding years. This latter comparison indicates whether a trend continues or whether it discontinues. These trends can have a declining, a constant or a rising character, however, in any case with a linear course. Thus, a more or less straight line can be assumed. According to the line most closely related to previous measuring points, the trend is transduced by the computer to the last quarter, thereby indicating the expected figure. This figure then is compared to the actual one, the difference being evaluated on the basis of the computer programme as to significance and relevance. No expectations are calculated on the basis of non-linear trends.