ACTIVITIES

SWOV Institute for Road Safety Research

OCTOBER 1995

Trial with accident helicopter launched

SWOV will evaluate an experiment in which a helicopter trauma team will assist severely injured road accident victims. The experiment was organised through the initiative of the Royal Dutch Touring Club ANWB. The SWOV will be assisted in the study by the Centre for Health Service Policy and Law of the Erasmus University in Rotterdam. The Medical Insura Tice Board is subsidising the study.

A hel cop er trauma team has been in operation in a 50 km radius around Amsterdam since May 1, 1995, offering spec fic medical assistance in response to serious accidents. The helicopter is based at the Teaching Hospita¹ of t ^he University of Amsterdam VU.

The SWOV formulated the set up of the evaluation study at the request of the Netherlands Transport Research Centre AVV of the Ministry of Public Works. The study considers the question of whether transporting a trauma team by helicopter to assist road accident victims will benefit the health outcome for the victim, and assess the associated costs involved. To do so the study will compare two groups of patients. The experimental group comprises accident vi tims with multiple severe injuries, who are

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Trial with accident helicopter launched

Road accidents: worldwide a problem that can be tackled successfully! Cognitive organization of roadway scenes

organization or reading source

More drink drivers, while police enforcement is declining

250.000 people a year injured in Dutch road traffic

Rules governing priority for cyclists on roundabouts with separate cycle paths

The use of space by girls and boyslessons from traffic a cidents

Safety implications of electronic driving support systems

Papers of the Prague workshop Infrastructure design and road safety now available at SWOV

A mentor system for novice drivers employed by transport companies in the Netherlands is recommended

SWOV reports in brief

given some form of assistance by the medical team flown to the site of the accident by helicopter. These patients are then transported to hospital either by ambulance or by helicopter depending on their condition. The control group comprises patients with comparable severe injuries, who are assisted and transported by ambulance personnel in the standard manner

The experimental victim group is compared to the control group with respect to their probability of survival, degree of recovery, cost of medical consumption (such as transport duration of hospitalisation rehabilitation etc.) and other social costs. The basis of comparison is the condition of the patient nine months after the accident.

Criteria

The emergency room of the ambulance services decides whether the helicopter trauma team should be employed, based on a number of criteria. For example, the team is called on when the patient's condition demands it, e g. when there are open wounds to the skull, chest or abdomen, when the patient has sustained certain types of fracture, bullet wounds, severe wounds resulting from blows or stabs or severe burns, or if there is loss of consciousness. In some cases . if the condition of the patient(s) is not known, it is decided to use the helicopter trauma team where the nature of the accident demands it -This is the case with collisions between motor cycle, moped or power assisted bike versus a car or versus a rigid obstacle with head on collisions on roads outside the built up area, with tram train or aero plane accidents explosions. entrapment etc.

Collation of data

The data that need to be collated relate to four phases the phase preceding the accident (the state of health of the victum) and the phases of prechnical chinical and postclinical assistance Various organisations will be asked for assistance in providing data: helicopter and ambulance personnel, central stations for ambulance transport, hospitals, rehabilitation centres and the patients themselves or their family members.

Costs and benefits If utilisation of the helicopter is cost effective, the cost effectiveness analysis will investigate where the returns on this form of first aid should be channelled. Specifically, it will be considered whether such returns should mainly benefit the social medical insurance organisations (ZFW and ABWZ) or whether such returns should mainly benefit the health care and or disability insurance premiums.



An interim assessment of the effects of the helicopter trauma team on the probability of mortality and the degree of recovery of severely injured accident victims is anticipated at the end of 1996. The definitive report on the cost effectiveness of utilising accident helicopters is anticipated to be published in early 1998.



Proef met ongevalshulp per helikopter

Trial with accident he hcopter

M.P.M. Mathljssen, S. Harris MA & dr. A.W. van Biokland-Vogelesang R -94-74. 50 pp. (only available in Dutch)

Road accidents: worldwide a problem that can be tackled successfully!

Every year, worldwide about 500,000 people are killed and 2,500,000 are injured in road accidents it can reasonably be expected that this number is more likely to increase than to fall, particular in developing countries and probably also in countries in Central and Eastern Europe -But also in highly motorized countries where a considerable drop was registered in the 1970s there has been a less significant drop in recent years and sometimes even a 'rebound 'effect - A further drop in road accident statistics may be achieved through an effective road safety policy.

The anticipated growth of (motorized) mobility on a global scale will, without effective road saf sty management, lead to an increase in the numb st of fatal accidents and injured p stons. From experience we know that the problem of road accident sis not unassailable.

Effective measures from the past

In the past a lot of measures have been taken to prevent accidents and their severity.

For example prevention of drink driving, use of seat belts and crash h 4mets improvements to road infrastructure and improvement s of car design the maintenan ce of vehicles and proper assistance to road accident victim s.

Promising measures

But there are also promising new developments to improve road safety in future, such as the implementation of targeted road safety programmes. Another promising measure is the development of a long term concept for the implementation of a sustainably safe road traffic system. It can best be achieved by tackling the causes underlying accidents. by removing areas of conflict or by making these controllable by road users. Where accidents still occur,

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For many years, the police have played a prominent role in improving road safety. The general principles of effective police enforcement are rather well documented and have been applied to the major offences drink driving, speeding, red light safety; expectations which are not completely fulfilled - In addition, the developments in this area are barely steered by relevant social and policy making developments but rather by a technology push

These promising measures include realistic possibilities but it is not to be expected that one single



violation and insufficient seat belt use. To help the police to be as effective and efficient as possible, a manual on enforcement has be on issued recently. It now comes down to implementation with the better use of existing forces rather than more manpower and more equipment.

Other measures

Telematics is increasingly considered as a means to improve traffic and transport management as well as road safety. Road safety arguments turn out to be a good sales argument-High pitched expectations are created around telematic applications and their expected positive effect on road all embracing measure can be found to solve the road safety problems of today and the ones in the future. It is rather more the necessity to @arry out existing measures and activities in a better way based on syn ergy and permanent implementation

Better roads improve road safety

Furthermore preventive and explicit road safety considerations will have to include decision sconcerning the planning and investment in road infrastructure (construction and maintenance) in order to prevent road safety problems rather than solving them with hindsight. In making decisions on infrastructural projects, road safety arguments have to be already considered as explicitely as possible in the planning phase. An instrument has been developed with this aim: Road Safety Impact Assessment RIA - This instrument, including the audit technique has proven to be a useful instrument at an early stage and during all the subsequent phases of road design.

Road safety policies

Of importance is the setting of political priorities, adequate organization and sufficient budgets. The international exchange of know how on effective measures for example via meta-analyses and 'be^st practice' overviews, could be of help and to this end the international ro^ad safety community is encouraged to take initiatives to develop cooperation.

Road safety is a worldwide problem and has not been solved to satisfaction anywhere. But there are many recognized possibilities which have, and in the future can have, a visible positive effect. If this insight can be brought to bear upon politicians and policy makers, the number of road accidents can be tackled even more successfully-



Road accidents : worldwide a problem that can be tackied successfuliy!

Contribution to the PIAR C Conference Montreal, Canada. 4-8 September 1995

F.C.M. Wegman (with contributions from P. Hollo, S. Lundebye G. Smith & L. Werring) D.95-11-49 pp (in English)

Cognitive organization of roadway scenes

SWOV has published a report which describes a series of studies investigating the cognitive organization of road-way scenes. These scenes were represented by still photographs taken on a number of roads outside of built-up areas, which were used by Oei and Mulder, researchers at SWOV, in their study of driving speeds.

Sites were stratified by two regions (the Western and the South-Eastern regions of the Netherlands), three road situations (curves, intersections, and straight road sections), and the seven road classes used by Oei and Mulder:

- Class 1 dual carriageway highways (100 km/h speed limit);
- Class 2: single carriageway highways (100 km/h);
- Class 3: dual carriageway roads closed to all slow traffic (80 km/h);
- Class 4: single carriageway two-lane roads closed to all slow traffic (80 km/h);
- Class 5. single carriageway two-lane roads closed to bicyclists and pedestrians (80 km/h);
- Class 6: single carriageway two-lane roads open to all traffic (80 km/h):
- Class 7: single carriageway one-lane roads open to all traffic (80 km/h).

Six studies

Seventy-eight drivers, stratified by age and sex to mimic the Dutch driving population - participated Subjects were recruited from the population of readers of a local shopping newspaper - students, and administrative SWOV personnel. Six studies were conducted

In the first study subjects were ask ed to sort the photographs presented to them into piles of similar photographs. These piles were intended to be meaningful and useful to the subjects (as determined by the subjects themselves) in their roles as automobile drivers. The sorting data was then collected into similarity matrices, and analyzed by means of Multi-Dimen Sonal Scaling and Analysis of Variance In a second study, the same subjects were again asked to sort the same photographs into new piles on the basis of two new criteria."

- the different types of problems that inexperienced drivers might have;
 the other types of traffic that the subjects might have problems with.
- In other studies, other subjects."
- sorted homogenous subsets (as determined in the first two studies) of the same photographs;
- named differences in pairs of widely different photographs (as determined by the previous study);
- estimated a safe driving speed and the chance of encountering slow traffic for each of the above mentioned photographs,
- learned to classify each photograph in a predetermined category.
 Some subjects learned the seven classes mentioned above; others learned seven categories derived in the first two studies.

Results

The results of the first study were quite clear. When drivers (in their role as drivers) view a road scenethree factors (on average) are of primary importance:

- the presence of an intersection,
- the number (and breadth) of carriageways,

- the presence of a curve. The results of the other studies generally re-emphasized these three factors, while adding additional nuances.

In general, the distinctions mentioned above are very easy to learn and apply.

The categories based on the original seven road classes, on the other hand are much more difficult to



Gundy is 43 years old and studied psychology at the Universities of Florida and Leyden, where he obtained his BA and MSc degrees in 1974 and 1985, respectively He has been employed by SWOV since 1975 as computer programmerdata analyst, and behavioural scientist. His research activities have included the investigation of the behavioural im Pac's of enforcement and publicity, the application of neural networks to the prediction of highway flow characteristics, the construction of numerical taxonomies of traffic accidents, and the application of cognitive models to road user behaviour.

He is presently, in his spare time preparing his doctoral dissertation which investigates several models of human learning and memory as applied to category acquisition and diagnosis.

identify, to learn, and to apply, at least on the basis of local, roadside information. It is suggested that this problem could give rise to safety problems.

Finally, a number of suggestions for future research are made, and it is proposed that psychological models of road user behaviour will be explicitly studied



Cognitive organization of roadway scenes

An empirical study

C M Gundy R 94-86-65 pp (in English)



More drink drivers, while police enforcement is declining

The number of motorists who exceed the legal alcohol limit in the Netherlands is rising. In 1991, 3.9% of the motorists drove under the influence of alcohol during weekend nights (BAC ≥ 0.5). In 1992 and 1993, this figure had increased to 4% and 4.4%, respectively. Recent measurements have shown that this rate is continuing to rise. The positive development which started ⁱⁿ the middle of the 1980s is therefore not continuing into the 1990s.

These data have come out of measurements conducted by the SWOV in cooperation with the police in the autumn of 1994. In certain parts of the countrythe proportion of drink drivers rose more markedly than in other parts. For example, in the province of North Holland the number of offenders increased from 5.5% in 1993 to 7.7% in 1994. In another province, Utrecht the proportion of offenders remained about the same: about 5%.

200 fatalities and 1,500 severe injuries

For 1994 the number of fatalities at accidents where one of the patties involved had consumed alcohol is estimated at over 200. This is about 15% of the total number of fatalities in that year. The number of hospital admissions is estimated at about 1 500. about 13 % of the total number

A possible explanation for the increase in road hazard as a result of alcohol consumption is the drop in traffic enforcement during and after the reorganisation of the police in the Netherlands. Half of the police coordinators who participated in the SWOV study declared in a survey that alcohol enforcement in their region had dropped in 1993. 15% reported a (slight) increase-A relationship between the rise in the number of drink drivers and the drop in police enforcement cannot be scientifically demonstrated. but does seem likely. After allit has been shown repeatedly that improved enforcement and the accompanying information and publicity campaigns went hand in hand with a drop in drink driving. Now that the reorganisation of the police in the Netherlands is complete, the efforts to combat drink driving will hopefully be intensified once again

Danger of driving under the influence

How great is in fact the probability of an accident for those driving under the influence of alcohol? A motorist with an alcohol permillage of 1.5 has drunk about 15 glasses of alcoholic beverage For this person, the probability of an accident is about 10 times as great as for a sober driver. The probability of dying due to a road accident is even 200 times greater in this case

Measures

An effective policy aimed at reducing drink driving is supported by four principal cornerstones. For each of these cornerstones. SWOV has made proposals for the introduction of specific measures.

Legislation: introducing a lower alcohol limit for special risk groups, such as young motorists and young moped riders and for drivers with a special responsibility, such as bus, taxi and lorry drivers. To illustrate youth aged 15 to 24 represent 15% of the Dutch R e n é Mathijssen, 46 years old was working as an editor for a publisher from 1973 till 1975. Since 1975 he is employed by SWOV, at first as an scientific editor, later on as a researcher. His main topics are epidemiology of drinking and driving, effects of police enforcement on road user behaviour, cost-effectiveness of medical air services and analyses for road safety policypopulation, but over 30% of the alcohol fatalities and severely injured in traffic.

Police enforcement: Increase the probability of apprehension through both intensification and improvement in the efficiency of police enforcement. In addition, as an immediate preventative measure, impose a driving ban lasting several hours on light offenders (BAC = 0.5 to 0.8).

Information campaigns: Intensification of the nationwide information campaigns about the hazard associated with drink driving.

Creating attractive behavioural alternatives: extending the 'discobus' phenomenon and lowering taxes on alcoho l-free drinks. Rijden onder invloed in Nederland, 1993-1994

Ontwikkeling van het al coholgebruik van automobilisten in weekendnachten (Drink driving in The Netherlands . 1993-1994. Development of alcohol

use of motorists in weekend nights)

M.P.M. Mathijssen R-95-10. 55 pp. (only avallable in Dutch)

250,000 people a year injured in Dutch road traffic

The Transport Research Centre of the Ministry of Transport commissioned the SWOV to participate in the second 'Accidents in the Netherlands' survey. The telephone interviews of more than 25,000 households were carried out during the period from August 1992 to July 1993. The goal of this survey was to establish the total numbers of the victims of the four different sorts of accident (domestic, industrial, road and sport accidents) and to compare these with the first survey of 1986-1987. As far as the road accidents were concerned, an additional goal was to compare the results with othe r important road accident registrations, and especially the 'officia the gistration done by the police.

The survey was carried out togeth er with the Consumer Safety Institut e (domestic accidents), the Work and Health division of the Netherlands TNO Organization for Applied Scientific Research (industrial accidents), and the Medical Sociology faculty of Limburg University (sport accidents) SWOV was responsible for the re earch regarding road accidents An extensive joint report on this study has been published by the Consume r Safety In stitute. Although it is in Dutch it does have a 7 page Summary in English

Road Accidents

The number of road accident swas sub divided in two ways Firstly the distinction was made between those numbers of injur d as a result of accidents falling within the (international) definition for



van Kampen 53 years old studied Mechanical Engineering at the University of Delft. He has been working at SWOV since 1970, firstly as a resear ther in the field of vehicle safety later as a project manager in the same field as well as in the field of accident registration. His main field of interest is crash safety of vehicles

police registration, called record able accidents (circa 250 000 \pm 31 000); and those falling outside the definition for police registration (circa 390,000 \pm 40,000)





Those injured in recordable accidents consisted for the majority of non- motorized traffic: cyclists (54%) and pedestrians (5%)-Car occupants were 20% and mopedists 12%.

Secondly, the distinction was made between medically treated (circa 340,000 ± 36,000) and those



Stephen

Harris is 50 year old and studied Geography and Theology at the University of Cambridge. Since 1970 he has been working in the Netherlands, firstly in the field of Marketing Research. In 1975 he started to work for SWOV in different functions. His main field of study is the valid registration of road accidents.

not-medically treated (circa 310,000 ± 35,000). This distinction is only relevant for comparisons with accidents in other categories (i e. domestic accidents) -The difference between recordable injured and medically treated injured 's caused mainly by the large group of medically treated pedest tians. vi tims of accidents not invol Ving a moving vehicle (fall 5). These accidents do not comply with the international definition of recordable accidents

Comparison with previous research

In comparison to the result s of the previous survey (1986-1987). the number of those within the definition was not significantly changed.

The number of medically treated injured was almost 30% more than in the previous survey. This increase was mainly caused by the increase of the number of (not recordable) pedestrian accidents not involving a vehicle. The precise numbers of the not recordable and not medically

treated as well as their increase compared to the previous survey. are disputable. There is a chance that their numbers have been influenced by the survey method used, i.e. people being more prepared to talk about accidents than in 1986-1987.

Comparison with the official registration

A comparison with the accident data from the Traffic Accident Registration (based on police reports) of the Ministry of Transport. shows that the registration level of recordable accidents was only about 20%. Completeness of the registration appeared dependent on injury severity, age and modal split.

The most under recorded road users were cyclists (only 9%), while the best registered group was car occupants (37%). This phenomenon has not changed significantly since the first survey in 1986-1987. Neither has the modal split distribution changed.

Recommendations

Based on this survey, it was recommended to pay more attention to improving the safety (and the accident registration) of vulnerable road users. This survey has shown that these comprise an extremely large group, both the seriously and slightly injured. This concerns in particular the young and the elderly. More attention for mopedists and motorcyclists is also needed because of their high injury rate per distance travelled.



Verkeersongevallen in Nederland 1992 1993

Eindrapport (Traffic accident in the Netherlands 1992 -1993 Final report)

L.T.B. van Kampen & S. Harris MA R 95 8 - 60 pp (only available in Dutch)

Rules governing priority for cyclists on *roundabouts* with separate cycle paths



SWOV has conducted a study of rules governing pr br ty for cyc lists on roundabouts constructed after 1985, with separate cycle paths. At these relatively new roundabouts, approaching traffic has to give way to roundabout traffic. Until recently, cyclists in these traffic situations we to not given priority; but as of a few years ago roundabouts a to now being b 41t in which cyclists are given right-of-way over motor ked vehic is app to aching the roundabout.

Attention is also given to the right of-way rule at roundabouts dating from before 1985, on which traffic usually does not have right of-way.

Literature

A brief study was carried out on literature on the ubject, which indicated that not giving cyclists right of way was probably the safest option, but that the other priority rule was also a safe solution in certain situations

Survey

Subsequently, a survey was conducted among m mbers of the highways department. This showed that opinions were divided about the best right of way rule to apply. Some of those questioned gave preference to the 'old' priority rule, while others preferred priorit y to be given to cyclists, provided the roundabout was situated within a built-up area and two-way traffic for cyclists was not permitted All the respondents agreed on the importance of standardizing right ofway rules in the interests of safety

Observations

Additionally a number of traffic observation tests was carried out at roundabouts with separate cycle paths, some of which gave cyclists right of way. One of the findings was that even in situations where this was not formally permitted, some of the cyclists were cycling in the opposite direction. As expected it was found that cyclists experience more delays when they have to give way on the roundabout to motorized vehicles. These delays reach an average of six seconds or so for a traffic volume of 700 cars per hour.

The observations of right-of way behaviour in terms of 'taking rightof-way' and 'giving right of-way' show that cars tend to take right ofway in situations where priority is given to cyclists more often than cyclists take right-of-way in situations where motorized vehicles are given priority.

Accident study

Finally, a comparative stud yof accidents was carried out. This stud y was found to be too r estrict ed in scope to yield any definitive conclusions. However, it did suggest that the risk for cy lists can be considerably higher when they are given right of way ov er motorized traffic

The result salso appear to show that the design and con truction of roundabouts in such right of way situations could be of decisive importance

Older roundabouts

For older roundabouts dating from before 1985, it is recommended that priority be given to the traffic on the roundabout, as 't is on the newer roundabouts, in the inte ests of safet yand road capacity.

For roundabouts with separat e cycle path s it is recomm end ed that cyclists are not given right- of-way. in the interests of the local safety

situation and in the interests of safety on roundabouts in general (standardization).

SWOV thinks it would be useful to repeat the accident study on a larger scale in order to more precisely assess the difference in degrees of safety in each situation. An investigation, which is carried out at the moment .



De voorrangsregeling voor fietsers op rotondes met fietspaden

Een studie naar de meest ges chikte voorrangsregelingen voor rotondes. met speciale aandacht voor de fietsers op vijliggende fietspad en (Rules governing priority for cyclists on roundabouts with separate cycle paths)

J. van Minnen & dr. L. Bralmaister R-94-73. 55 pp. (only available in Dutch)

The use of space by girls and boys: lessons from traffic accidents

In many countries, girls are less at risk in traffic than boys. From 1989 till 1993 In the Netherlands 185 girls from 0-19 years were killed in traffic . 2,854 were treated in hospital en 10,005 were slightly injured. The figures for boys are: 298 killed, 4,404 hospitalized and 11,805 slightly injured. In other words : 39% of all ser bus victims are girls, 61% boys. The difference between slightly injured girls and boys is smaller.

An explanation for differences in traffic accidents between girls and boys can be sought in a difference in their use of public space, but also in factors related to biological or psychological differences factors pos ably underlying the us of space

Different ac 4dent involvement o fboys and girls could be related to diff gences in traffic participation, in exposure. Mostly boys ar emore at ri & But an int faction between gender, age and traffic task is probable.

Other explanations

Another explanation might be the differences in choice of traffic mode and independent mobility. This certainly concerns the use of mopeds and perhaps the use of bicycles. The fact that many pedestrian accidents also occur when the child is accompanied suggests still other explanations like biological and psychological differences -

Differences are not only found in traffic accidents. Girls are less in volved in nearly all kinds of accidents, with the exception of horse riding accidents An explanation can be sought in differences in vulnerability, in differences in skills of handling the space and objects in space, or in differences in risk taking

When girls are involved in a traffic accident, 1.4% are fatal -21 9% serious, and 76.7% not serious For the boys the percentages respectively are 1 8%, 26 7% and 71 5% This Guld mean that the outcome of accidents is less serious with girls than with boy 5 This suggests a greater vulnerability for boys-It could also mean that girls avoid extreme situations relatively more often than boys. Girls are ahead of boys in developments in many respects The intellectual development is faster and higher intelligence is related to less accidents It was also stated that girls score better in

reaction time. This has been measured on computer simulated road crossing 5 and girls have been consistently better than boys with more complex tests. There are also studie 5that relate the higher accident involvement of boys to their higher level of physical activity and aggressivene %.

Conclusion

Gender emancipation, increased involvement in society, could decrease a more careful use of space by women -A first indic tion is found in a UK study. Young Emale drivers drive faster than all other drivers, when they are alon 9 So, the emancipation will diminish the diff Gence caused by socialisation On the other hard, ma ssmedi astill offer a traffic world full of risks and populated by m en taking them There still applie s traffic i sto ysfor boys.



The use of space by girls and boys. lessons from traffic accidents

Contribution to the Conference Building Identitie S. Am Sterdam. 11 13 Ap 11 1995

Dr.P.B.M. Levell D 95 8 9 pp (in English)

Safety implications of electronic driving support systems

Research concerning road transport telematics is big business.

In 1994 the United States Government was planning to investabout \$250 million per year in research and development in the Intelligent Vehicle and Highway System program during the next fiscal year.

This volume has ballooned from a paltry \$4 million in 1990. The Commission of the European Communities reports a more modest investment of about \$40 million a year in the present version of DRIVE (Dedicated Road Infrastructure for Vehicle safety in Europe).

It is evident that citizens, in their roles of taxpayers and consumers, are going to have to pay for this. An essential question for the producers and financiers of telematica-related good and services is: why should these citizens wish to do so?

Two answers are offered: the technological push and social benefits. SWOV thinks the technological push is largely a creation of the pushers. Social benefit on the other hand. is a valid argument. The primary, long-te im goal of governmental funding of transportation telematics research is the one of fostering political stability and economic growth. the implications of telematic systems, intended to support the driving task, are discussed and reviewed.

Contents of the study The report consists of two parts First of all, a number of topics, relevant for the implementation and evaluation of driving support systems, are discussed.



This goal is a worthy one the only question being whether the means are adequate

SWOV has published a report in which the traffic safety prospects and

These topics include, safety research into driving support systems, the importance of r esearch into driver models and the driving task, horizontal and vertical integration of driving support systems, task allocation, and problems of standardization.

Secondly, a general description of currently investigated driving support systems is provided in the appendices.

Conclusions

It is concluded that the market for telematic products is potentially enormous. Glowing promises are easily made, substantiating them is another matter.

Two aspects of the R&D world were surprising: the enormous amount of material being produced and the difficulty in accessing it

Recommendations

Whatever the reason for these insularities, the first recommendation is rather straightforward: interested parties should invest in systematic reconnaissance and appraisal of the field.

The second recommendation is that before digging into their pockets, governments and consumers demand some form of proof that said systems actually can deliver what they promise. Furthermore, governments do have a responsibility to ensure that the possibility of undesirable side effects is investigated. The scenario of legions of drivers. distracted by the bells and whistles of unregulated electronic systems is all too real-National and international agencies should proceed with due speed to establish norms. and multi-phase testing and licensing procedures.

Future developments

It is speculated that a number of systems will achieve some measure of wide spread implementation in the near future. traffic management and control systems in densely populated areas electronic toll systems,



An example of a system which features distance radar fog sensor na vigation and suidance systems

fleet management, in-car diagnostic systems and in-car navigation systems. Of course, these systems are primarily intended to increase revenues, or to better utilize limited resources. It is suspected that safety benefits in the near future will be minimal. all protestations to the contrary. SWOV thinks it is necessary to encourage all parties to take this possibility into account.

The American versus the European efforts

Finally it has been pointed out that the American IVHS effort is not only better funded and more commercially organized than the European DRIVE, but it is also more oriented towards producing useable products in the near future.

On the other hand, it remains to be seen whether commercial success actually translates into improved safety. It could be recommended that the European efforts spend more attention towards developing blueprints for concerted action for system development - Failure to do so result in a incoherent collection of electronic systems.

Furthermore it is recommended that research groups working on driver support functions invest much more time and energy into developing and evaluating driver models.



Safely implications of electronic driving support systems

An orientation

C.M. Gundy (with contributions by F. Steyvers (Traffic Research Centre) & N. Kaptein (TNO Institute for Perception Research) R-94-85. 80 pp. (in English with appendices in Dutch)

Papers of the Prague workshop 'Infrastructure design and road safety' now available at SWOV

On October 12-14, 1994 the workshop Infrastructure design and road safety was held in Prague. The workshop was one of the initiatives which the OE CD Steering Committee for Road Transport Research developed with the aim of exchanging information in the road transport sector, in order to respond to the urgent needs expressed by Central and Eastern European Countries. Road safety was indicated as one of the priory areas. The workshop was attended by some 45 participants from 11 CEE countries and 4 from the West. Presentations were given on all major issues in the field of infrastructure design and road safety. Statement ⁸ on road safety problems were given by 8 CEE countries.

The organisation was a cooperation of the SWOV Institute for Road Safety Research and the Czech Ministry of Transport The papers of this workshop are now available free of charge for people living in foreign countries. They consist of two volumes Part 1. Summary report conclusions and recommendations (D-94-141) Part 11. Lectures of the workshop (D-94-1411)

Papers can be ordered by writing a letter or sending a telefax to the public information department of the SWOV Institute for Road Safety Research.

SWOV RESEARCH ACTIVITIES 4 1 OCTOBER 1995

A mentor system for novice drivers

According to various researchers, the road hazard associated with lorries is largely attributable to the youth and inexperience of lorry drivers. This situation could be improved by enabling young lorry drivers to gain experience more rapidly under safe conditions. One possible formula in this regard is to offer novice drivers practical supervision by older drivers during their probationary period.

employed by transport companies in the Netherlands is recommended



SWOV has published a report which offers an interim exploration of how such practical supervision could be effected in the Netherlands through a formalized mentor system

Based on a literature study, an inventory was made of the information available regarding the operation of a mentor system. In addition the experiences gained with practical supervision in the Netherlands are described. To this end interviews were conducted with representatives from five small and medium-sized transport companies in the Netherlands.

Conclusions

The practical guidance of novice drivers is considered useful and essential - not only to improve their insight into the traffic situation, but also to enable the driver to properly familiarize himself with the company and to gain experience with unique tasks (e g driving a new vehicle, operating a tailboard or performing the procedure at the client's premises).

At the same time, the introduction of a mentor system should correspond with a company's efficiency considerations. A more specific formalization of such practical supervision through the appointment of a mentor driv & with a specific task description is not considered v & attractive, due to the assumed increase in coss in relation to the marginal improvement in safety when compared to the current form of supervision.

A formalized mentor system could become more attractive for transport companies under the following conditions:

- 1. The turnover amongst drivers is suffigently high.
- 2. The job of mentor driver can be coordinated without too much difficulty or realized within the existing activities of the company, and will not detract from the performance of other jobs.
- 3 The job of mentor not only involves the optimization of safety, but also benefits the efficiency of the company-



Een mentorsysteem voor beginnende chauffeurs bij vervoersbedrijven in Nederland

Een verkenning van de mogelijk heden

(A mentor system for novice drivers employed by transport companies in the Netherlands An investigation of the possibilities)

Dr. Ch. Goldenbeid & D.A.M. Twisk R 94-79-41 pp -(only available in Dutch)

Amsterdam Fa

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IN BRIEF

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

Point processes in traffic safety analysis

F.D. Bijleveld. R-94-51-61 pp

Presently, the usual method of analysing accident data in time is through the analysis of the sequence of accident counts. Usually, the number of accidents per month or even per annum is used. Results of this kind of analysis are influenced by the starting point of such a sequence and by the length of the intervals used. The aim of this study is to investigate the possibilities for analysing accident data independently of the choice of the starting point-This seems to be possible using the original points of time as record ed It is assumed that the accident process has an intensity process. Under certain regularity conditions it is found that such an intensity function exists. It is attempted to build a model based on an exponential variant of a Fourier system that estimates that intensity

function. It is found that the current implementation suffers from a non-optimal goodness-of-fit criterion and lacks the ability of inclusion of exogenous variables. Apart from this, the Fourier system may be extended, possibly by wavelets.

Influencing speeding behaviour through preventative police enforcement

Paper presented at the VIth PRI World Congress 'Marketing Traffic Safety' 3-6 October 1994, Cape Town, South Africa-P. Wesemann. D-94-21, 11 pp

By lowering driving speeds, a great contribution to road safety can be made. In the short term this can be achieved through intensive enforcement of speed limit compliance. Studies have offered clear indications about the most efficient organisation of police enforcement. While this may require a clear additional input of police resources as manpower and funding, the saving in road accident victims and damages weighs up against the costs. Through information to management and personnel in the field within the police organisation, knowledge about effective methods of enforcement can be efficiently transferred.

SARTRE: Social Attitudes to Road Safety Risk in Europe

Towards a new policy-relevant understanding of Europe's drivers P.E. Barjonet (INRETS) T. Benjamin (IDBRA), R.D. Huegenin (BPA) & R.D. Wittink (SWOV) R-94-57. 28 pp

The European Union's Directorate General VII made a request for the writing and presentation of a policy document on the SARTRE project The project itself was described in SWOV Research Activities 2 pp 5 8. The following subjects are dealt with: the SARTRE project participants; the objectives and background of the survey; the main results, conclusions and recommendations for each of the European Union's for Working Parties on road safety and the potential use of the survey as a monitoring instrument for the development and evaluation of road safety policy in EU and member countries.

Safety standards based on road type

1.0-

Paper presented at The Third International Conference on Safety and the Environment in the 21st Century: Lessons from the Past, shaping the Future. Tel Aviv, Israel November 7-10-1994 S.T.M.C. Janssen D-94-27 12 pp.

This paper intend^s to examine whether, in the process of assessing road safety, it is useful and feasible to locate measures which can be used as 'standards' for the variou^s road types and their intersections. The comparison is restricted between road types. The number of injury accidents per kilometre of road length, given the average number of motor vehicles which use the road type per day is used as a measure of comparison.

Safety constructions in a sustainably safe traffic system

Proposals for policy and research regarding safety constructions T. Heijer, W H M. van de Pol J van der Sluis & F.C. M. Wegman. R 94-60. 19 pp.

The development of the concept of a sustainably safe traffic system has ensured that, in recent years, 80 km/h roads, the so called non-motorways, have been subjected to greater attention. Traditionally, this type of road is hardly provided with road side safety devices such as the grash barrier. As part of the efforts to make non motorways safer, it is fitting that specific consideration should be given to the modes of application of these highly effective safety devices. The construction currently in place on the motorway scannot simply be transposed to non motorways, however. In view of this SWOV has discussed the specific requirements which safety construction⁵ for non-motorways should satisfy-It is considered what type of adapted

constructions would meet these requirements. Particular attention is paid to the application of new materials in this field Aside from offering good protection, these can also help to reduce associated vehicle damage.

A sustainably safe traffic system for pedestrians and bicyclists

Further details of the concept of a sustainably safe traffic system from the perspective of pedestrians and bicyclists. M. Slop & J. van Minnen. R-94-67. 35 pp.

Up to now, the concept of a sustainably safe traffic system was mainly elaborated from the perspective of car traffic. Policy aims such as more concern for vulnerable road users and promoting bicycle use call for proportional attention being paid to pedestrian and bicycle traffic. To that end, the principles of 'sustainable safety' are successively elaborated from the perspective of these two categories of road users.

It is especially examined to which extent these elaborations may lead to incompatibilities with the elaboration from the perspective of car traffic. Subsequently, the general considerations are concretized by implementing them, on paper, in a trial area located in the centre of the Dutch town Gouda. The mutual contradictions between the elaborations for all three categories of road users in this trial area appear to be less severe than the problems brought along by the concept of sustainable safety as such.

Sustainably safe traffic in rural areas

J van Minnen R 94 83 37 pp

When applying the concept of a sustainably safe traffic in rural areas, one is confronted by problems which are in part unique to these locations-These specific problems relat e, for example, to the nature of the road structure, the size and distribution of the population and the built up areas and sometimes also to tourist traffic. SWOV has studied this problem, whereby not only the optimization of the infrastructure was examined, but also various other aspects such as measures to influence behaviour and facilities for public transport.

The first step was to define the typical problems, where the experiences with sustainably safe plans for several pilot areas were also considered. With regard to the approach for the infrastructure, the standard sustainably safe classification and optimization of the road network, both for motorized and cycle traffic, was used as a basis.

Solutions are proposed for those problems specific to rural areas which largely result from the relatively high incidence of long and narrow roads with low intensities of use. It is also considered how provisions can be made - without employing excessively radical measures - to cater to local traffic which is not able to use the regional distribution roads

With regard to distribution roads for the core areas, this study investigates when and to what degree, distribution roads are also required inside the built up area.

For the subject of 'speed control' an approach by means of infrastructural measures, such as roundabouts and traffic humps and via police enforcement and information campaigns is discussed. Future possibilities of speed control devices are also considered

Finally, a number of conclusions are formulated which demonstrate that suitable solutions are also feasible for rural areas to enable the introduction of a sustainable, safe tr affic and transport system

Monitoring of the demonstration project 'sustainably safe Western Zea and Flanders': a definition study

JWD Catshoek & S.T.M.C. Jan sen R 95-14-102 pp

Western Zealand Flanders is a part of the province of Zealand located in the South Western part of The Netherlands. This part has been allocated as a pilot area for a fundamental approach towards road safety problems. The project has been given the status of a demonstration project by the state, as part of a plan to stimulate the 'sustainably safe approach'.

The Netherlands Transport Research Centre AVV of the Ministry of Transport and Public Works has asked the SWOV to supply the monitoring system for the demonstration project, together with a scenario and a time plan. It should also serve as a manual with which a project office can set out and supervise the monitoring activities.

This definition study includes an explanation of the monitoring system. The monitoring system contains activities to describe de velopments in road hazard in Western Zealand Flanders and to establish how the planned set of measures could influence this factor. The monitoring system therefore consists of two main sections: process

monitoring and effect measurements.

The measurements concern changes to the infrastructure, changes in behaviour in traffic, particularly the speed of motor vehicles and whether attitudes have changed and the base of support increased through information campaigns, education and other communication activities In addition, the progress of the preparatory activities and implementation of sub projects should be determined, so that these can be adjusted in time if necessary-The effect measurements are distinguished into short term and long term measurements. The short term effect measurements are performed periodically and are subdivided into measurements for the entire demonstration area and measurements for sub-projects-With the measurements for the subprojects the effects are distinguished depending on the type of measure.

There are three types, infrastructural measures speed influencing measures and communication projects

The infrastructural measur is are tested as supplement to the sustainably safe design principles. This requires a (zero) measurement before implementation of the measures has commenced . A second measurement is held some time later, in any case after implementation of the package of measures has been initiated. These long term effect measurements are distinguished on the basis of design principles relating to functionality, design and recognisability of the road network in Western Zealand Flanders. The scenario in principle offers the following information for each effect measurement: objective, anticipated effects (a task setting is only formulated for the effects measured overall), indicators (the measurement variables for the effects), the measurement setup with measurement instruments, source data and method of analysis, a product description, the planning with efforts involved (rough estimation of number of man months and costs), moments of decision making and relationships with other monitoring activities and the associated factors such as potential attractive forces, implementors and other influencing parties.

Electronic applications in heavy goods vehicles

J van der Sluis R-94 62 24 pp.

SWOV has investigated the use of electronics in heavy goods vehicles, today and in the future. In particular the road safety consequences and the means the government has to stimulate (safe) electronic devices have been studied.

Electronic applications can be divided into two groups telematics and in car electronics. In car electronic systems operate in and around the vehicle

An important aspect of telematics

is the communication between the vehicle and the environment.

At the moment telematics is used in international transport It is expected that the possibilities provided by satellite communication and Global Positioning Systems, will increase the efficiency of heavy goods transport. The government has to play an important role in providing information and installing communication infrastructure. Another promising area for the government in the field of telematics is automated traffic control. However, some juridical problems have to be resolved here.

The accident data recorder and the anti-lock braking systems are examples of in-car electronic devices. In the future in-car electronics will be used to support the driver. It is expected that the price of sensors will be the key factor in further developments of in-car electronics

It is concluded that electronics can enhance road safety, but caution should be exercised. Things lik e risk compensation and man machine interface have to be investigated on safety aspects thoroughly.

Telematics: vulnerable road users

Dr. P.B.M. Levell R 94-64. 33 pp

The Dutch Ministry of Transport, Public Works and Water Management was interested in the achievability of utilizing telematics for the benefit of vulnerable road users: pedestrians, bicyclists, children disabled and elderly people. SWOV has carried out a survey in which the different systems are reviewed. A number of systems have been collected from literature and international correspondence. All these systems are in different stage of development Some are being developed specially for vulnerable road users, others have a somewhat broader targ q group but are useful for vuln crable groups as well-

Intelligent pedestrian crossings are

being developed and electronic mobility aids for visually impaired people Multi functional transponders are thought to be helpful for bicyclists. Access to public transport is improved by the use of telematics in route choice, trip planning, and booking. Elderly and visually impaired can be assisted with information through displays in the windscreen.

Elderly people in traffic

P1.J. Woute's. R 94-75. 19 pp.

The intention of the Dutch government is to create a 'sustainable safe' transport and traffic system. Starting point of the concept of sustainable safety is to reduce dra tically the probability of accidents in advance, by means of the infrast luctural design. And where accidents still oc ur, to influence the plocess which



determines the severity of these accidents such that serious injuries are virtually excluded. This development is in particular important for the elderly, who constitute a major traffic safety problem.

In this respect, the question arises wether elderly road users have specific properties making them vulnerable in traffic, to which attention has to be paid in developing the design of the traffic infrastructure. SWOV report R-94 75 is devoted to that subject.

Therefore, it deals with the kind of relevant properties and with defining the targ q group. Furthermore, these properties are elaborated and discussed in relation to the performance of traffic tasks.

Greater use of aluminium in passenger cars

Possible consequences for road safety J. van der Slüis & F.C.M. Wegman, R-94-76-16 pp.

The SWOV was asked by the Ministry of Transport and Public Works to study the consequences of applying a greater proportion of aluminium to passenger cars. Car manufacturers have been incorporating aluminium in their products for many years. Interest in aluminium has grown in the past year, this is because a reduction in weight and hence fuel consumption can be achieved through the application of aluminium.

The study considered the influence of a reduction in weight on the dynamics of the vehicle and howin the event of a collision, this would affect the safety of both oc upant and collision partner

Based on mechanical prin oplesit was shown that the maximum acceleration and deceleration which can be attained by a vehicle are not dependent on its weight

The material used for the panelling of cars influences the outcome of a collision for vulnerable road users. The material properties of aluminium are in this respect more favourable than those of steel. The considerable energy-absorbing capacity of aluminium also has a positive effect on the safety of the occupant. This applies in particular to single party collisions; with twoparty collision \$ the outcome is also determined to a considerable degree by the mass of the collision partner.

Whilst the government would applaud the introduction of lighter vehicles, due to their positive effects on the environment, such a change should not be associated with a negative effect on road safety. The government has various instruments at its disposal to control the car manufacturing industry and maintain standard s of safety. In this cont CN, the government should also monitor whether changes in the overall Composition of cars on the road will hav consequenc s for the infra Tructure.

The predicted reduction in weight if mor e aluminium is incorporated in motor vehicles is ten percent. It is anticipated that such a reduction will not have any negative consequences for road safety, provided the distribution in vehicle mass does not increase. Not only a reduction in vehicle weight, but also a smaller distribution in vehicle weight is beneficial for overall road safety.

The alcohol lock

A study about experiences in other countries and possibilities in the Netherlands

J van der Sluis R 94 77 19 pp

The Dutch Ministry of Transport and Public Works ask of the SWOV to perform a study into alcohol lock s breathalysers which are fitted between the ignition and the starting motor of a car. Although the idea of fitting an alcohol lock originated in the carly 1960s, the equipment has been technically perfected since that time

Initially-it was easy for driv es to circum vent the aleohol lock, but the present generation of al ohol locks is equipped with ad van ced devices in o der to prevent deception. Some countries have already imposed quality Mandard son alcohol locks.

Experience abroad has taught that alcohol locks are effective in the short term. The literature reports extensively about various alcohol lock programmes conducted in the United States, Canada and Australia. In the Netherlands, there is a need for an alternative method to tackle drink driving. The notorious offend er should not only have an alcohol lock fitted in his car, but should also be intensively supervised by a social worker.

It is concluded that it would be of benefit to conduct an experiment with alcohol locks in the Netherlands. Sufficient knowledge is available to set up a sound experiment linked to an effectivity study. Such an experiment will only be useful, however, if the user is also subjected to intensive supervision

Traffic killer number one

An overview of the road safely problem of young motorized road users D A M. Twisk & A A L van der Vor St R 94-8² 68 pp

Youth aged between 16 and 24 represent a special case in traffic They are allowed to participate in motorised traffic for the first time and are then in principle entitled to drive in or on any type of vehicle This age group runs a high risk of becoming in volved in a road accident. In 1993, they represented no less than 18% of the total number of road accident victims in the Netherlands while forming only 9% of the population overall.

The study considers the road ha and to which youth are exposed classified according to the manner of traffic participation. For example 10% of all traffic fatalities are drivers aged 18 to 25. The fatality risk for moped riders is greater than for any other mode of transport about three times greater than that



for cyclists and even ten times greater than the risk to which drivers are exposed. 40% of all registered motor cycle victims is aged between 18 and 25, while virtually no road accident victims are found amongst drivers of lorries and buses. In the latter category, the collision partner tends to be the victim.

The study also considers, per category of road user, the possible causes of road hazard; for each category, an approach to the problem is proposed. In general, the behaviour of youth in traffic can be typified as follows:

- lack of driving experience,
- insufficient recognition of danger,
- greater mental effort needed to drive a vehicle;
- likely to make errors in complex situations;
- overestimation of their own ability;
- a greater willingness to take risks.

The accident liability of young/novice drivers and the effectiveness of driver licensing systems

D A M Twisk D 95 5 29 pp

The Forum of European Road Safety Institutes (FERSI) surveys current knowledge and experience with driver training and licensing systems and their effects on road safety in a range of European countries The work will provide an overview of driver licensing systems in oper ation in EU and related countries, with more in-depth studies of the way in which these systems are put into practice in four countries. SWOV has made a report (in English) which presents the results from the literature survey which is part of a larger project undertaken by FERSI and supported by the Transport Directorate of the European Union (DG7), on car driver licensing and training systems.

It is concluded that driving performance of young/novice drivers falls short in many aspects, such as adequate speed choice, visual search and safety margins. These limitations may account for the high accident risk of this group. There are many factors that are contributing to inadequate performance on the one hand and accident risk on the other hand. Despite the facts that studies have failed to show its effectiveness, driver training is important, and improvements may be found in the field of the training of cognitive skills, the emotional meaning of driving and the social responsibility of youngsters. But only driver training will be suffigent. In addition to the improved driver training, in the post exam period safe driving circumstances should be created m order to enable young drivers to gain experience in a safe manner and to stimulate a safety oriented attitude.

Factors contributing to the high accident liability of novice drivers and the role or driver training

D A M Twisk 0 95-9. 14 pp

The nature of accidents involving novice drivers is continually debated. No single answer has yet been found to the question of what causes these high accident figures SWOV has carried out a study which aims to review the literature on research into novice driver behaviour to describe the known contributing factors and to discuss the results with particular reference how driver training may contribute to greater safety. The report is structured as follows-Starting of with the magnitude and nature of driving accidents, it then discusses how well novice drivers actually drive. Secondly, the question is addressed what factors might contribute to their poor performance. Finally the role of driver training and how inherent limitations of driver training can be over come, is discussed

Side reflectors on bicycles

An inventory to assess the level of compliance regarding legally prescribed side reflectors G A. Varkevis Ser & A.A. Vis R -94-87.38 pp.

Since Janu ary 1, 1987, side reflection in the form of wheel circles fitted to both wheels has been compulsory for all bicycles in the Netherlands From this initial date until 1994, SWOV has made a general inventory to assess the level of compliance regarding these legally prescribed side reflectors. This assessment was carried out by means of observations at bicycle sheds in three types of location secondary schools, Dutch railway stations (the NS) and the Ministry of the Interior (BiZa).

Observations, made in February 1994 showed that about 72% of cycles stored in the sheds of secondaly schools and about 77% of cycles stored in company bicycle sheds (NS and BiZa) were fitted with

Proportion cycles with side reflection



side reflectors to both wheels. The illustration shows the figure s for the years 1986, 1988, 1993 and 1994. The slight drop in the presence of side reflectors amongst cycles in school bicycle sheds compared with 1993 relates to the increased number of ATBs (all terrain bikes), a cycle type which is far less often equipped with side reflectors than ordinary bicycles.

ATBs represented about 20% of the cycles in school sheds in 1993 and about 26% in 1994. About 90% of the mountain bikes seen lacked side reflectors entirely. These figures are confirmed by data collected in 1994 from several retailers and from the

RAI Bicycle Fair: about 80% of ATBs displayed there still did not have the legally prescribed side reflectors.

SWOV believes that these figures offer grounds to take action. The government, in consultation with industry, should formulate equipment requirements for all cycle types. Any bicycle introduced onto the market should be asses sed on the basis of these standards. If it does not satisfy the requirements, it should not be permitted onto the market. A positive assessment result can be demonstrated to the consumer by awarding a hallmark or another type of product approval.



Automated speed enforcement

Evaluation of the long term effect Oei Hway-llem J Van Minnen & dr Ch Goldenbeld R-95-9 54 pp.

Four road stretches in four Dutch provinces having a speed limit of 80 km h were equipped with an electronic speed management system, consisting of a fixed warning sign, a switchable sign only showing when cars were speeding and automatic speed enforcement using radar and camera from road side mounted posts. This system was accompanied by an information campaign just before and periodically during the operation -

The evaluation that was conducted in 1991 showed a substantial reduction in speeders, from 40% to 11%. The number of accidents was reduced with 35%. Since this evaluation in 1991 the radar and camera was out of ord er for a long period and in 1994 this system was put in operation for a very limited part of the time-The fixed and switchable signs were operational all the time.

In the fall of 1994 a long term evaluation was conducted on one of the road stretches in the province of Noord-Brabant The result of this study showed that the effects found in 1991 were almost the same in 1994: the percentage of speeders increased somewhat from 11% to 16% and the reduction in accidents found in 1991 remained at the same level

The survey among drivers showed that 75% of the drivers' accepted the automatic speed management system Also 75% of the drivers did not notice that the radar and camera was out of order for a long period of time

This continuation of the effect on speed and accidents can possibly be explained by the continuation of the operation of the fixed and switchable signs and by not being noticed by a large part of the drivers that the radar and camera was out of order during a long period.

It is recommended to apply this type of system on other road stretches having similar safety and speed problems.

Full scale test results of the RIMOB Crash Cushion

Description of tests and results conform standard CEN/TC 226/WG1 C.C. Schoon & P. Broertjes. R-95-16. 52 pp.

In 1981 and 1982 SWOV has carried out final tests with the RIMOB crash cushion. The RIMOB consists of a composition of box-like segments. Each segment is one metre long and contains aluminium tubes which are placed in axial direction. The tubes serve to be compressed in a violent head-on collision to a maximum of about 20% of their initial length. The RIMOB also has side protection that consists of 2m long guide railelements. In case of a collision with the side of a RIMOB, it functions like a regular barrier.

Only a Dutch report was available of these test results-SWOV was asked to make a

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'translation' of the test procedures and results into the new EU standard CEN/TC 226/WG1

In the early eighties there were no test conditions for crash cushions available. In accordance with some of the experiences carried out in the United States, chosen is for relevant tests. central impact, frontal off set impacts and side impacts; the same tests as nowadays described in the CEN standard.

After the tests the RIMOB was and is applied in practice. After seven years about 170 impact attenuators have been installed on the medians and shoulders of motorways in the Netherlands. At that time an evaluation and has been carried out. Analyzed are 38 accidents registered by police. From the accident figures it was concluded that the RIMOB functions effectively. Even though collision speeds have been found of over 100 km h no fatal accident was registered. Of the 38 collisions six resulted in injuries of which one or two were taken to hospital and four or five only were slight injuries.



Frample of a crish custion (impact attenuator) Dutch RIMOB syst of