ACTIVITIES OF THE OECD RESEARCH GROUP ON ROAD SAFETY AT NIGHT

Contribution to Joint Meeting I of TC-1.6, 3.1, 4.6 and 4.7.
19th Session of Commission Internationale de l'Eclairage,
Kyoto, 1979

Proceedings 19th Session CIE. Publication CIE No. 50, pp. 472-473. Bureau Central de la CIE, Paris, 1980

R-79-54
Dr. D.A. Schreuder
Voorburg, 1979
Institute for Road Safety Research SWOV, The Netherlands

Since 1967 the Road Research Programme of the Organisation for Economic Co-ordination and Development OECD promotes research in many aspects of road safety. During these years, a number of Road Research Groups investigated specifically aspects that are directly of interest for CIE; in a number of cases informal co-operation and in one case formal participation of CIE was effected. The following reports, issued by OECD, should be mentioned:

1971: Lighting, visibility and accidents.
1972: Symposium on Road user perception and decision making.
1975: Road marking and delineation.
1975: Special Research Group on Pedestrian safety.
1976: Final report and conclusions of the OECD Initiated Group on Lighting, visibility and accidents.
1976: Polarized light for vehicle headlamps.
1976: Adverse weather, reduced visibility and road safety.

In 1977 a new OECD Road Research Group on Road safety at night has been established after discussion between the OECD Road Research Programme and the European Conference of Ministers of Transport (ECMT) who expressed a strong interest in countermeasures to improve road safety at night.
In this respect, it should be noted that road safety at night is a complex problem area. Apart from the fact that "day" and "night" might be quite differently defined in different countries, the main difficulty arises from the fact that the difference between day and night involves far more than just the fact that natural light is available or not. One may discern three groups of influences:

a. those directly related to the amount of light (vision, lighting);
b. those indirectly related to the amount of natural light (meteorological factors);
c. those related to the fact that humans (individual and social) use the night for sleep and leisure.

This does result in important differences between day and night traffic (traffic intensity and composition, purpose of travel,

usage of alcohol, distribution of age, sex, and mode of transportation).
Furthermore, most people work away from home. Therefore most traffic is concentrated in a few hours in the morning and in the evening (rush-hours), which in many countries at least for part of the year fall in the dark or in twilight.
Usually, all these different aspects were studies in isolation. The efforts of the OECD Group, however, have been focussed on those conditions where such effects do coincide, and on the interactions of countermeasures that in the past were considered separately.
The first task of the Group was the preparation of a preliminary report, which placed emphasis on those accident countermeasures which are aimed particularly at improving night-traffic safety, and for which scientific support exists. The report was presented to the ECMT Road Safety Committee in April 1978.
The Group's final report is ready to be presented to the Road Research Steering Committee of OECD in the fall of this year; publication may be expected in 1980. Tentatively, some important conclusions will be briefly indicated here.
1. It is a general observation that an important part - about 1/3 to 1/2 - of road accidents happen at night. The percentage, however, varies considerably from country to country. The reason for these differences is not known. One may suppose that matters such as the degree of motorisation, the state of the economy, the climate, the density of population and the extension of the road network play a role. Other factors like the accepted social behaviour or the current systems oc accident registration play a role.

2. Night-time accidents are more serious than day-time accidents. Four groups of causes for this effect are often mentioned, each with a number of hypotheses:
a. higher speeds at night
- differences in the driver population (age, motivation)
- usage of alcohol,
- higher traffic volume,

b. different types of accidents occur at night
- more single-vehicle accidents (little traffic, snow, ice);
- higher vehicle occupancy,
- lower seatbelt usage,

c. longer first-aid time at night
- more single-vehicle accident,
- less effective ambulance service,

d. differences in accident registration.

3. The long-term trend is towards more, and more severe, night-time accidents. The differences from year to year are, however, small in most OECD countries.

4. A major contributing factor to accidents is the influence of alcohol. Although data are missing, it can be assumed that this influence is primarily restricted to the night-time situation. It is well established that alcohol is the major or sole cause in a large percentage of night-time accidents. It is generally accepted that the police registration grossly underrates the real number as in many cases the actual direct cause of the accident is described in terms of speeding, skidding, etc. Tentatively, it may be concluded that there are no effective compensatory mechanisms that may counteract the influence of alcohol.

5. The combination of adverse weather and darkness turns out to be very unfavourable. In northerly countries this means primarily snow and ice; in other countries mainly rain and wet roads. From this it may be concluded that the underlying effect will presumably be different. Tentatively, it may be concluded that the compensatory mechanisms which are fairly effective in darkness, more or less break down in the case of darkness and adverse weather combined.

6. At night, and particularly well after midnight, there are periods where the traffic volume is very low. Precise data, however, are very rare; all that exists are some data for motorways. Although the accident rates may go up steeply at very low volumes, it does

not seem likely that this effect is enough to explain the higher night-time accident rates in general.

The final report of the Group will include a number of recommendations for accident countermeasures. The most interesting ones will include the following points:

1. To install good quality public lighting on all rural and urban traffic routes. The Recommendations issued by the International Lighting Commission (CIE) should be applied taking into account the fact that these recommendations are based on considerations of visibility and comfort.
2. To apply special lighting systems to individual high risk locations, such as pedestrian crossings, highly trafficked rural intersections, etc.
3. To extend the application of road markings and delineation systems to both rural roads with lower travel, and to hazardous locations.
4. To apply markings that are also visible at night during rain. Raised markers and ribbed markings are highly effective. In snow-bound areas the types that can withstand snow-ploughing should be selected.
5. To apply bright and rough road surfaces. In the respect the following remarks are made:
- light coloured surfaces (e.g. light-coloured aggregates or additives), increase the brightness of the road under artificial light;
- a coarse texture increases skidding resistance when wet;
- and open, porous texture ensures adequate drainage; in this way, the differences between wet and dry reflection are limited, and splash and spray are reduced.
6. To apply traffic signals (e.g. vehicle-activated signals) that are effective at night, and to consider their night-time operation. With regard to both signs and signals, the CIE publications in these areas should be followed.
7. To stimulate and if possible to prescribe the use of retro-reflective devices for pedestrians and cyclists. It is suggested

to follow the ISO and CIE recommendations in this area as regards photometric and colorimetric requirements.
8. To promote further international harmonisation regarding the regulations for headlamp design, operation, aiming and maintenance. Further it is recommended to establish means and systems that permit road-side control.
9. To promote functional separation of signalling lamps, notably to have separate signals, different in colour, location and intensity, for rear markings, braking lights and turn signals. Furthermore, it is recommended to incorporate the (obligatory one or two) rear fog lamps in the rear-lighting system of cars.
10. To promote the public acceptance of regulations for lights (and reflectors) for bicycles.
11. To adapt the existing international regulations for vehicle marking lights in such a way that the distinction between cars, trucks and slow moving vehicles will be unambiguously clear.
12. To make low-beam headlamps obligatory, day and night, for motor cycles. Further, it is recommended to require reflectors at front and at the rear of bicycles and mopeds, as well as reflectors in the wheels (spokes or tyres).
13. To improve low-beam patterns for vehicle headlamps.
14. To restrict the maximum admissible candlepower of high beams of vehicle headlamps. Furthermore, it is recommended to adopt special beams for use on lit roads (city beams). Finally, it is recommended to promote the use of polarised headlights for motor vehicles and to promote the application of vehicle headlamps cleaning and levelling systems.

Finally, several suggestions for further research are given:
1. Further research is required regarding visual guidance, road marking and delineation, in particular for adverse-weather conditions (e.g. rain or snow).
2. In the area of public (overhead lighting) a number of subjects require further research:
- the relation between lighting quality and accidents (particularly the cost/effectiveness aspects);

- the definitions, measurement and representation of the reflection properties of wet road surfaces;
- the applicability of light-coloured road surfaces, especially on unlit roads;
- the restriction of glare from areas adjacent the road;
- the application of transilluminated and reflectorised signs, and the systems of night-time operation of traffic signals.

3. Further research and development is urgently required regarding the application and the effectiveness of means of reflectorisation of road users (notably pedestrians).

4. Further development is recommended for the applicability of polarised headlights for motor vehicles taking into account the recommendations of the 1976 OECD report on Polarised headlights.

5. Further development of effective systems for the automatic adjustment of headlight beams is required.

6. Additional studies are useful regarding the influence of visual deficiencies on road safety at night. More in particular, further research on screening and diagnosis is recommended.