SPECIAL REPORT SR79/128

COLLISIONS WITH UTILITY POLES

by

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COLLISIONSWITH UTILITY POLES

BACKGROUND

It has long been known that utility poles provide problems for motorists, especially when placed near the kerbline and when constructed so as to resist impact by cars. The recent report from Melbourne University is the latest in a series of Australian research reports on the subject. The following is a brief review of these.

1975 - T.A.R.U. Report No. 3/75.

"The epidemiology of pole crashes" said that collisions with poles were particularly devastating. More than half of these crashes in 1973 involved casualties. In terms of fatalities, they were about three times as serious as the "average" crash. They were also serious in absolute terms, accounting for about one in sixteen traffic crash fatalities. The cost of pole crashes in New South Wales in 1973 was estimated at about $8 million, or about $9 for every roadside pole in the State.

The characteristics of these crashes were examined. They occurred disproportionately in the late night-early morning period and at weekends. Casualties were predominantly young occupants of motor cars or car-type vehicles. A disproportionate number of these crashes occurred in fine dry weather on dry bitumen, and on straight sections of road and bends in roads. Alcohol appeared to have played a strong causal role in the occurrence of pole crashes, with both routinely coded police data and specially coded sample data indicating the presence of alcohol in about one in six crashes. About two-thirds of the blood alcohol tests undertaken on persons killed in these crashes registered measurable amounts of alcohol. The characteristics indicated a relationship between pole crashes and "social driving".

Existing technology was such that poles could be modified, removed or replaced to provide greater impact protection. Most of the crashes occurred at times when pedestrian traffic was low. The removal or modification of poles would considerably reduce a known risk to vehicle occupants but might increase the risk to pedestrians by an unknown, but certainly small, amount. With the exception of trees, collisions with objects other than poles were less dangerous and thus the removal of poles was not likely to simply transfer casualties from one crash type to another.

A pilot program of pole modification was proposed to evaluate the cost-effectiveness of such modifications as a traffic crash countermeasure in the situation prevailing in New South Wales.

1975 - T.A.R.U. Report No. 5/75.

"Side impacts and lap/sash belts" emphasised the value of properly worn lap/sash belts in many pole crashes but excepted cases where the belt wearer sat in the path of the impacting pole. Side impacts with utility poles were a major problem to vehicle occupants, even for seat belt wearers, by producing impact of the head with the invading pole itself, or with unyielding parts of the occupant's car. When a fatality occurred in such crashes, it nearly always was at the seating position immediately at the point of impact. Death usually involved critical injury to the head.

Utility poles were the roadside objects most often involved in the death of seat belt wearers. In car-to-car side impacts which, like pole impacts, often arose from loss of control by the driver of the side-impacted car, head impact with the intruding door (especially the window ledge) appeared to be a relatively frequent mechanism of fatal injury.

It was pointed out that cars were not designed to resist or give protection against pole impacts. The proposed Australian Design Rule 29 - Side Door Strength (implemented in 1977), like its U.S.A. predecessor, was designed to limit intrusion in car-to-car corner impacts and would be unlikely, after implementation, to improve safety in pole impacts. It was suggested that broad padded surfaces would be required to line all structures beside and above the head, and that the structural members should be designed to yield progressively over several inches depth of penetration, if and when they impacted the head. It was noted that similar provision had already been made in instrument panels which, both in the U.S.A. and Australia, had to deform progressively in order to meet performance requirements for head impact.

In present cars the wearing of a crash helmet was obviously beneficial in spite of the fact that the then current helmets did not afford all the protection required by the head when stiff members were present nor when poles invaded head space. The provision of compact helmets having good energy absorption but less penetration resistance than provided for motorcyclists, was worthy of serious consideration.

Consideration was also given to the use of airbags and the performance of window glass, in side impacts with poles.

Emphasis was placed on continuing to improve the crash performance, convenience and wearing of lap/sash belts, in view of their contribution to injury mitigation in crashes where the occupant was not seated at the point of invasion of the pole.

1975-76. Stapp Car Crash Conference (T.A.R.U. paper) and T.A.R.U. Report No. 1/76.

"Occupant Head Space in Passenger Cars". In these reports, a method was described for predicting the location on the car's interior surface at which head impact would occur, given the geometry of the collision. The window sill and roof side rails were shown to be the most significant sites for head contacts in side impacts and angled impacts. Head impact of a wearer of a lap/sash belt did not occur in frontal impact within the deceleration range considered.

Larger head space and head protection by impact attenuation were recommended in the cars of the future.

1976. Australian Road Research Board 8th Conference (T.A.R.U. paper).

In this paper it was pointed out that the roadside not only provides many objects, impact with which leads to death or serious injury even when lap/sash belts are worn; it also contains hazards that prevent drivers recovering control of cars that stray from the road pavement. Side impacts - often more hazardous than frontal impacts to belt wearers - formed a large proportion of the more serious crashes with roadside objects. Possible countermeasures discussed included the use of some form of protective head-gear (such as the newly developed pedalcyclists' helmets), clearing selected sections of the roadside of obstacles and attempting to limit speeds on country roads.

1977 - A.R.R.B. Fixed Roadside Hazards Symposium.

A T.A.R.U. paper presented to this symposium described briefly some laboratory studies of pole-to-car side impacts. The first step had been to map the space swept by the head of a lap/sash belted front seat occupant of a car subjected to a wide spectrum of front/side impacts. This work showed that the head could hit non-yielding internal parts of the car when the impact was about 20^0 or more off the longitudinal centre line. It had already been shown that death for seat belt wearers (as in the case of non-wearers) was more probable when it was the head that was hit, so head protection was an obvious advantage.

The alternative to head protection was seen to be eliminating or at least reducing the possibility of head impact. A short program of car side impacts was accordingly planned, in which an instrumented pole simulator was hit at right angles on the front side door by a typical 4-door sedan. The first impact, at 20 km/h, produced a permanent intrusion of 0.62 m of the outer skin, maximum intrusion at moment of impact being 0.69 m.

The second and third tests were performed on identical cars except that the side doors had been reinforced by the manufacturer to comply with the static car-to-car test requirements of Australian Design Rule No. 29. Speed was 23 km/h.

In the second test the pole was cushioned by means of a collapsible metal structure of 1 metre outside diameter, obviously much too bulky for practical application, but invaluable as a means of evaluating the maximum amount of cushioning that could possibly be applied. In this test the permanent intrusion was reduced to 0.50 m in spite of the greater speed, and instantaneous intrusion to 0.58 m.

The third test was identical to the second except for the omission of cushioning on the pole. The permanent intrusion was 0.68 m. (instantaneous 0.77 m) that is, the influence of the ADR 29 side door reinforcement was more than overcome by the slightly greater speed of 23 km/h compared with 20 km/h with the unmodified car. The pole cushioning could however be seen to have reduced the depth of intrusion, whilst increasing the breadth to include rear as well as front seating positions.

Other papers in this symposium served to reinforce the view that poles were a major problem. Professor Joubert presented an introduction to his work later reported in 1979.

The attitude of County Councils to any proposal for pole modification or replacement was exemplified by the remarks of Mr. Killela representing Sydney County Council, as recorded in the proceedings of the 1977 Symposium. Mr. Killela made it perfectly clear that his Council would not consider the use, for carriage of power lines, of breakaway poles such as are used by the Department of Main Roads as lighting standards. This view was expressed in spite of the evidence in T.A.R.U. report 3/75 which showed 40% of pole crashes, 38% of non fatal pole casualties, and 29% of pole fatalities to have occurred in the Sydney County Council area in 1973. The only comparable district was Prospect County Council with 20%, 21% and 31% respectively. The two areas covered 60 to 70% of the problem. There is no reason to expect it would now be very different.

One of the most interesting papers in this symposium was presented by Mr. Judd Epstein, Lecturer in Law, who considered the problem of injuries caused to motorists through roadside hazards which he said, had received little attention in the literature or practice of law. An important recent decision of the House of Lords, and a greater awareness by counsel of the possibility of recovery for their clients might result in further court activity.

The approach of the law in this area was to order public authorities or landowners adjoining the highway to compensate victims of roadside hazards. Adequate compensation for those least able to bear the consequences of injuries sustained was the primary aim of the law, but it would only shift liability when the person 'in charge' of the roadside hazard had acted unreasonably or invaded a legally protected interest of the motorist. The legal theories upon which litigation is based in roadside hazard cases are negligence and nuisance.

This paper examined the various legal elements which must be proved by an injured party to satisfy the requirements of negligence and nuisance and discussed the limitations that have discouraged a more widespread use of the law in regulating the placement of fixed roadside hazards.

STREETS OPENING CONFERENCE

The basis for public utilities, such as Sydney's electricity authorities, claiming the right to place power poles at the kerbside, appears to reside in a "Streets Opening Conference, Sydney Metropolitan Area, 1969", first convened by the Lord Mayor of Sydney in 1909. A later edition of the Information Bulletin, than the 1969 edition referenced here, does not seem to be available. In the 1969 edition, the names of a Technical Committee are given, including a representative of the Department of Main Roads. Nominated liaison officers include a traffic engineer of the Department of Motor Transport.

The 1969 Bulletin includes details of allocation of space for various utilities in the footway, including an alternative to kerbside location of power poles, set between footway and any tree-lined verge. Poles are not ruled out from the footway.

Reconstitution of this Conference and an examination of its legal obligations in view of Mr. Epstein's remarks, should prove a useful first step towards a solution of the hazard of power poles.

THE NEW REPORT FROM MELBOURNE

The report that triggered off this present review of the situation is entitled "Collisions with Utility Poles" by Fox, Good and Joubert of the University of Melbourne. It is best summarised in the Preface to the Summary Report:

> This study has shown that urban roadsides in Australia are made unnecessarily hazardous by the presence of badly located, unyielding utility poles. About one in ten urban road fatalities results from a collision with a pole. The cost to the community is enormous, both in terms of human suffering and wasted resources. Given the will to do it, cost-effective means are available to effect tangible reductions in this toll. A program of loss - reduction is made feasible by the fact that pole collisions do not occur randomly - the small proportion of poles involved in the majority of accidents can be identified from simple site measurements. Further, the particular factors contributing to a high accident risk can be determined and proven remedial measures are available for immediate implementation.
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> This situation confronts all users of the road reserve with their joint responsibilities. In particular, policy-makers concerned with pole utilization must acknowledge that their decisions affect public safety and well-being; they must take more account of the effect of their actions. The investment of funds by governments in remedial programs would yield economic and general welfare benefits far in excess of expenditure.

The report was of a study of 879 pole collisions occurring in Melbourne from July 1976 to March 1977. It contained seven recommendations referring to (a) the need for central government to establish a cost and benefit policy on remedial measures for crash risk, (b) action in each State to prepare inventories of poles and embark on benefit-cost analyses to determine the best treatments, (c) immediate investigation of poles known to be involved in crashes, (d) all replacement lighting standards to be 'breakaway' or 'wrap-around' designs, (e) in new installations, 'breakaway' or 'wrap-around' lighting standards to be mandatory, undergrounding of cables always to be considered, any poles to be offset 3 metres from pavement edge and not placed in hazardous locations, attention to be given to road curves and superelevation, four-lane roads to be divided, skid resistance to be maintained better than 50 on the pendulum scale, (f) legal

tyre tread depth should be 3 mm minimum, and (g) attention to be given to correct tyre pressures.

DISCUSSION

It will be seen from the preceding account of research findings that measures proposed, for handling the social problem of pole-crash casualties, have ranged from control of drink-driving to undergrounding power lines. There is little doubt however that no single measure will suffice. For example, the radical step of undergrounding existing power lines would largely remove the problem since lighting standards could readily be changed to frangible designs and few if any remaining poles would present difficulties; the cost and time-scale of such a measure would however rule it out except for the very distant future. A more acceptable approach would be to consider a range of measures since, not only should that reduce costs and the time span, but some measures (such as improved pavement skid resistance and tyre performance) would reduce the frequency of other crashes as well as those involving poles.

It is also the view of the present author that little if any further research is required. Indeed, the very writing of yet another report (this one) could be construed as a delaying tactic. What clearly is required is action by each of the appropriate authorities to improve the chances of avoiding death and injury in pole crashes, each authority accepting full responsibility for instituting significant improvements within their particular areas of responsibility.

This brief discussion can best end with a statement of the casualty situation in 1978.

In the year 1978 in New South Wales, 3923 utility poles were recorded by police as having been involved in crashes in which a casualty occurred or a vehicle had to be towed from the scene. Some 115 people died from injuries sustained in these crashes, that is, 8.3 per cent of all the 1384 road deaths in 1978 involved poles. Excluding the 281 pedestrian deaths, the figure is 10.4 per cent, so roughly speaking, one in ten "vehicle" (including motorcycle) deaths involved a pole.

In 1978 in the Sydney Metropolitan area there were 75 fatal crashes involving poles, and in which 79 people were killed.

SUMMARY OF PROPOSALS

DRIVERS

Vaughan (1975) and others have drawn attention to the association of many (but not the majority) of pole crashes with drink driving; hence the successful control of drink driving would be a valuable measure in reducing pole crash casualties. The only potentially effective means of achieving this, known to this author, is the fitment of breathalyzer - operated interlocks to car electrical systems, of cars operated by repeat offenders against the drink-driving laws. More effective enforcement of the laws is frequently proposed, but with, so far, little effective success.

Herbert et al. (1975) has pointed to the advantages of seat belt wearing, at least for occupants seated out of line of the pole. More effective enforcement of seat belt wearing laws, especially among drink - drivers, would clearly be beneficial. Herbert et al. (1975) also stressed the value of head protection; voluntary use of helmets should therefore be encouraged, as a presently available and known-to-be-effective safety measure; ridicule of helmet wearing should actively be discouraged.

VEHICLES.

Fox et al. (1979) have drawn attention to the need for 3 mm minimum tread depth (compared with N.S.W. requirement of 1.5 mm) and for close control of tyre pressures to the car manufacturers' requirements. These appear matters for the Department of Motor Transport to consider.

Herbert et al. (1975, 1976 and 1977) have suggested that cars should be made without sharp, hard edges in the space swept by the heads of belt wearers in crashes. Completion of their work of producing a draft Australian Design Rule seems to a pressing need.

POLES.

As first proposed by Vaughan (1975), a pilot programme of pole replacement or modification is required, possibly in Windsor whose Municipal Council has shown much concern and interest. Following the suggestions of Fox et al. (1979), this should be preceded by identification of the poles in that Council's area that already have been hit, followed by a more detailed inventory of poles. The attitude of the local County Council to such work might also be ascertained by the Traffic Authority, and the legal position, both of the Streets Opening Conference and of the County Council, in relation to any likely claims for damages in relation to crashes with the present poles.

ROADS.

Fox et.al. (1979) claimed that attention should be given to road curves and superelevation, and to skid resistance. These appear to be matters for report by the Department of Main Roads.

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