Safety of Elderly Motor Vehicle Occupants

Résumé

Dans les deux prochaines décennies, les personnes âgées deviendront une part de plus en plus importante des passagers impliqués dans des collisions sur la route au Canada. Pendant cette période, le nombre de Canadiens âgés de 65 ans et plus devrait doubler, passant d'environ cinq millions à près de dix millions. Il sera donc de plus en plus important d'assurer la protection des passagers plus âgés afin de réduire le nombre total de Canadiens tués ou blessés sérieusement lors de collisions.

Over the next two decades, the representation of elderly occupants in motor vehicle crashes in Canada can be expected to increase dramatically. The number of Canadians 65 years of age or older is expected to double, increasing from some 5 million to close to 10 million. By 2031, individuals 65 years of age or older will account for close to 27 % of adult Canadians. Precisely what proportion of all vehicle travel will be accounted by the elderly in the future is difficult to project accurately. With increasing age, some degree of loss in visual and auditory acuity can be expected as is a reduced tolerance to trauma. Increasingly, the protection requirements of the elderly will need to be considered if future efforts to reduce the total number of Canadians seriously injured or killed annually in traffic collisions are to be successful.

Side impact crash testing

Image courtesy of the Insurance Institute for Highway Safety

As the mean age of the Canadian driving population increases, chest injuries can be expected to overtake head injuries as the leading cause of death in motor vehicle crashes. This shift, in part, reflects the increasing risk of chest injury with increasing age, and also the reduced risk of head injury now that all vehicles are fitted with both frontal and side airbags. In frontal crashes, limiting the seat belt forces exerted on the chest is of paramount importance among elderly occupants. Typically, this is accomplished with seat belt retractors which incorporate load-limiting technology. Load thresholds have steadily decreased with time. Currently, most load thresholds fall between 3,500 and 4,500 Newtons with an increasing number of vehicle models offering thresholds between 2,500 and 3,500 Newtons. The latter load limits are consistent with the tolerance thresholds of the majority of elderly occupants. Inflatable seat belts are another promising technology for improving frontal crash protection for the elderly, both for front seat and rear seat occupants. They provide

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a means of better distributing the belt forces across the chest thereby minimizing the risk of rib injury. In addition, they provide greater containment of the head and upper torso for an extended period of time than do conventional seat belts. As such, they provide spin-off benefits in near side and far side impacts, in rollovers, and in multiple impacts.

Inflatable seat belts
Image courtesy of the Ford Motor Company

The introduction of a side impact consumer test by the Insurance Institute for Highway Safety (IIHS) is generally acknowledged to have greatly improved side impact safety by promoting the fitment of side airbags and improved side structures. Recent amendments to FMVSS 214 (Side Impact Protection), and the introduction of FMVSS 226 (Ejection Mitigation), are expected to further improve side impact protection as well as reduce the incidence of partial and complete ejections in both side crashes and rollovers. Elderly occupants are particularly vulnerable to injuries to the knee-thigh-hip complex in side impacts. Supplementary seat-mounted pelvic airbags may be needed to address such injuries. Similarly, the provision of centrally-mounted airbag systems may prove a practical means of improving side impact protection in far-side impacts.

The next two decades will see a steadily increasing variety of collision-avoidance technologies being fitted to vehicles. To what extent such systems may need to be "tuned" to improve their performance for the elderly remains to be seen. For example, in the case of lane-keeping and blind-spot detection technologies, one could envisage seat bases which vibrate on one side or the other, mimicking the stimulus provided by roadside rumble strips. Such a warning protocol may prove more effective than purely a visual or an auditory warning.

The elderly are over-represented in intersection collisions, with cross-traffic left-turning manoeuvres being particularly lethal. In the short term, the increased use of roundabouts affords one means of addressing such collisions. In the longer term, infrastructure-to-vehicle communication technologies may greatly reduce the incidence and /or severity of intersection interactions for both vehicle occupants and pedestrians.

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