7. Liu, C. C., Hosking, S. G., & Lenn, M. G. (2009). Hazard perception abilities of experienced and novice motorcyclists: An interactive simulator experiment. *Transportation Research Part F: Traffic Psychology and Behaviour, 12*(4), 325-334.

8. MAIDS In depth investigations of accidents involving powered two-wheelers Final Report (2004). Retrieved July, 2013, from http://MAIDS.acembike.org.

9. McKenna, F. P., Horswill, M. S., & Alexander, J. L., (2006). Does anticipatory training affect drivers' risk-taking? *Journal of Experimental Psychology:* Applied *12*, 1–10.

10. Musselwhite, C. B. A., Avineri, E., Susilo, Y. O., & Bhattachary, D. (2012). Public attitudes towards motorcyclists safety: A qualitative study from the United Kingdom. *Accident Analysis & Prevention, 49*, 105-113.

11. Rosenbloom, T., Perlman, A., & Pereg, A. (2011). Hazard perception of motorcyclists and car drivers. Accident Analysis & Prevention, 43(3), 601-604.

12. Tunnicliff, D., Watson, B., White, K. M., Lewis, I., & Wishart, D. (2011). The Social Context of Motorcycle Riding and the Key Determinants Influencing Rider Behavior: A Qualitative Investigation. *Traffic Injury Prevention, 12*(4), 363-376.

13. Veith, G., ARRB Group. (2009). *Guide to road design: part 6: roadside design, safety and barriers*. Sydney: Austroads.

14. Veith, G., ARRB Group, & Louis, L. (2009). *Guide to road design: part 6b: roadside environment.* Sydney: Austroads.

Computer modelling of a test device for investigating injury causes in vehicle rollovers

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Abstract

Vehicle rollovers account for a large percentage of the total fatalities in vehicle crashes. The high fatality rate related to vehicle rollovers clearly indicates the extent of the problem. In Australia's National Road Safety Strategy for the decade 2011-2020, one of the requirements for safer vehicles is the development of a dynamic rollover test protocol. Although the nature of the severe injuries occurring during vehicle rollovers is known, the actual causes are still mostly unknown. In this regard, the Jordan Rollover System (JRS) is a device that could be used to investigate in a testing environment what happens to occupants during a typical vehicle rollover.

This paper describes a modelling effort to simulate vehicle rollover dynamic testing using the JRS. A Finite Element (FE) model that accurately reproduces the geometry and functionality of the JRS testing rig was initially built. The model was then validated against an actual test involving a Sport Utility Vehicle (SUV). The FE model proved to be capable of replicating both the vehicle dynamics and deformation occurring during an actual rollover test with the JRS rig.

The developed FE model will be a valuable tool to investigate different crash scenarios by varying the initial vehicle roll, pitch, yaw angles and roll rate. In particular, simulations will be able to identify the ability of the rig to replicate crashes under initial conditions derived from real-world rollover crashes, which may be significantly more severe than the test rig has to date been used for.

Keywords

Vehicle rollover, Jordan Rollover System (JRS), Crashworthiness, Numerical simulations, LS-DYNA.

Introduction

Background

Although vehicle rollovers represent only a small percentage of the total road crashes in Australia, they account for a large percentage of the total fatalities. Australian rollover crashes account for: 12% of all Australian road fatalities; around 35% of all occupant fatalities occurring in a single vehicle crash injury event; around 17% of Australian spinal injuries; and are now greater in number than fatalities occurring in frontal or side impact vehicle crashes [6, 16]. The estimated cost of rollover crashes in Australia is around $3 billion per annum. Similar magnitude of the problem occurs also in the USA and Europe; one in every three occupant lives are lost in vehicle rollover crashes in the USA, whereas in Europe around 10% of road users are killed in such crashes.

To date, the measurement of the roof static strength is the only mandatory rating criterion adopted for assessing the rollover safety performance of new vehicle models. In particular, the quasi-static roof strength testing requirement presently introduced in Australia to address rollover crashes is based on the Insurance Institute for Highway Safety (IIHS) [10] rating system. In order to obtain a five-star rating under the Australian New Car Assessment Program (ANCAP) in the period 2014-2015, a minimum Strength-to-Weight Ratio (SWR) of 2.5 (i.e., marginal) with a single-sided roof crush will be required. The SWR requirement will rise to 3.25 starting from 2016 and, presumably, the intention is to further raise the minimum SWR requirement in following years [1].

So far, no mandatory standard dynamic testing procedure has been defined for assessing the safety performance of vehicles during a rollover event. Australian authorities and consumer groups such as ANCAP have been reluctant to implement any specific rollover dynamic testing procedures until a number of research issues have been resolved. The main issue is whether it is possible to create a dynamic rollover test rig that, in combination with a suitable Anthropomorphic Test Dummy (ATD), can replicate the injury occurring in a rollover crash in a consistent repeatable manner. Such successful combination of a dynamic test rig and ATD could become a powerful tool to help identify the precise causes of severe injuries occurring during vehicle rollovers. An accurate knowledge of rollover injury causes may lead to the development of effective technological countermeasures for mitigating injuries related to rollover crashes.

The Dynamic Rollover Occupant Protection (DROP) project, funded by the Australian Research Council (ARC) in cooperation with industry partners at TARS - UNSW, aims to address the issue of rollover injury causes [7]. In particular, the main goal of the DROP project will be to establish which combination of crash severity, roll kinematics, biomechanical injury criteria, crash test dummy, and restraint systems are capable to address the major proportion of fatalities and serious injuries occurring to seat-belted and restrained occupants involved in rollover crashes.

Dynamic rollover testing rigs

A review of various rollover crashworthiness tests and dynamic test rigs conducted by [5] indicated the Jordan Rollover System (JRS) as the best candidate to date. The original JRS test rig was designed by the Center for Injury Research (CfIR) [4] as a tool used by forensic engineers to evaluate the potential for occupant injury due to ejection and roof crush as well as the effectiveness of side curtain airbags and seat belts during rollovers [11]. Previous tests conducted with the JRS system have shown a good degree of repeatability [3].

An improved version of the original JRS test rig has been recently developed as part of an Australian Research Council (ARC) LIEF Project grants scheme and the DROP Project, as described by Grzebieta [8]. This improved version of the JRS, which will be referred to as UNSW JRS in the rest of this paper, is a device that could be used in a testing environment to investigate what happens to occupants during a vehicle rollover in a consistently repeatable manner. However, before the UNSW JRS can be implemented into a formal rollover dynamic test protocol, various issues need to be solved. Primarily, it has to be assessed whether this type of rig can replicate the same type and level of injuries occurring in real-world rollover crashes.

In particular, in most rollover crashes the reconstruction of initial conditions is inevitably affected by some level of uncertainty intrinsic in the process of investigation and reconstruction of real-world crash events. As such, in an attempt to replicate the same injury levels in a testing environment it may be necessary to perform multiple tests, each under a different set of potential initial configurations (i.e., initial vehicle velocities angles and rotational rates). Since testing all the potential scenarios of interest would be practically unaffordable, computer simulations represent the only viable method to perform this preliminary sensitivity analysis regarding the effect of uncertain initial rollover conditions. The use of simulations would allow researchers to investigate in great detail what happens during vehicle rollovers, such as the kinematics of occupants and, most importantly, their interaction with vehicle interior. Further, simulations would allow an assessment of the testing rig structural limits under extreme testing conditions, thus preventing any risk to overload the rig.

Objective and methods

The objective of this research was to simulate vehicle rollover dynamic testing with the UNSW JRS rig. To accomplish this objective, a Finite Element (FE) model that accurately reproduces the geometry and functionality of the UNSW JRS test rig was developed. The model was then validated against the results from an actual crash test involving a Sport Utility Vehicle (SUV).

Methodology

JRS rig and test setup with an SUV vehicle

The design of the UNSW JRS rig focused on functionality for research purposes while at the same time ensuring operational flexibility within a regulatory and commercial crash test facility. Figure 1 shows a schematic of the UNSW JRS rig as well as a picture of the actual fully-operational rig that was installed at the Roads and Maritime Services (RMS) CrashLab near Sydney, in New South Wales. The JRS testing attempts to replicate real-world vehicle rollover events by dropping a spinning vehicle onto an approaching sled that moves at an initially-set velocity. Initial impact conditions can be assigned choosing within a broad range of values. In the case of the UNSW JRS test rig, the roadbed and vehicle roll motions are decoupled, as shown in the schematic of Figure 1. This decoupling allows for flexibility in the operational management of the test rig as well as ease of rig mobility (i.e., the possibility to move and store the rig elsewhere in the laboratory when it is not in use).

The front and rear ends of the tested vehicle are connected to separate arms that are free to rotate and allow the vehicle to drop from an assigned initial height. An initial roll speed is assigned to the hinged vehicle while it drops vertically. Synchronisation between the vehicle roll motion and the translational speed of the approaching roadbed sled is established through calibration runs prior to the actual crash test. It is possible to precisely set the values of the vehicle roll angle and roll rate at which the initial impact has to occur. A constant vehicle yaw angle is set by rotating the entire rig to the desired angle with respect to the direction of motion of the roadbed sled. Also, an initial vehicle pitch angle can be assigned by setting the front and rear ends of the vehicle at appropriate different drop heights.

The experimental test setup with the UNSW JRS and a 1994 Toyota Land Cruiser was replicated using the developed computer model. An overview of the test setup is shown in Figure 1 and a summary of the actual initial test conditions is provided in Table 1.

Table 1: Test with Toyota Land Cruiser – vehicle properties and initial conditions

Test Vehicle	
Make/Model	*1994 Toyota LandCruiser*
Mass (including cradle)	*2,300 kg*
Test Initial Conditions	
Drop Height	*117 mm*
Vehicle Angles (@ Beginning of Impact)	
Roll	*153 deg*
Pitch	*5.1 deg*
Yaw	*80 deg*
Vehicle Roll Rate (@ Beginning of Impact)	*181 deg/sec*
Roadbed	
Mass	*1,865 kg*
Initial Speed (@ Beginning of Impact)	*24 km/h*

Computer Modelling

Vehicle rollover testing with the UNSW JRS rig was simulated using LS-DYNA, which is an FE solver specialised in modelling non-linear transient events such as crashes [9]. The developed JRS model reproduced in detail the geometry of the different components of the actual test rig as well as all the relevant kinematical joints that connect these components together. The appropriate modelling of all the joint connections of the actual test rig was crucial to reproduce all the degrees of freedom allowed to the vehicle during the test. Also, suitable material models were used to characterise the mechanical strength of the various components. As for the vehicle, unfortunately, a model replicating the Toyota Land Cruiser was not available. To overcome this problem, an existing and validated model of

Schematics of JRS Rollover Testing (CfIR, 2013) | Example of Test Setup (with a Toyota Land Cruiser)

Figure 1. Schematic of JRS rollover testing rig and example of an actual test setup

a 2003 Ford Explorer originally developed by the National Crash Analysis Center (NCAC) [13] was used instead. The Explorer vehicle has similar mass and dimensions to the Toyota Land Cruiser used in the actual test, as shown in Table 2. As far as the differences between the experimental test and the simulation could be justified based on the intrinsic variances between the vehicles, the comparison of these results were considered to be a reasonable way to assess the predictive capability of the FE model for this vehicle type. Nevertheless, a future test is planned where the same vehicle type modelled in this paper (i.e., Ford Explorer) will be tested. Moreover, the reliability of the roof deformation predicted by this vehicle model, under both static and dynamic loading conditions, was assessed in previous research studies [12, 14]. Although in the experimental test an Anthropomorphic Test Device (ATD) was placed into the vehicle, the FE model did not include any ATD. At this stage of the project, the focus was to assess the ability to simulate the vehicle kinematics and roof deformation occurring in tests with the JRS rig.

Table 2: Toyota Land Cruiser and Ford Explorer – mass and dimensions

	2003 Ford Explorer	**Toyota LandCruiser series 80**
Weight (kg)	2,240	2,220
Overall length (mm)	4,813	4,970
Max Height (mm)	1,814	1,900
Width (mm)	1,831	1,900

An overview of the modelled JRS rig combined with the Ford Explorer vehicle model is shown in Figure 2. To reduce the computational time required to simulate a complete rollover test, the model replicated the initial conditions at the instant the vehicle started contacting the roadbed. The values of the initial conditions assigned to the model were the same as those measured at the beginning of the impact in the experimental test, which are summarised in Table 1. It was thus possible to avoid simulating the first transitional phase of the test during which the vehicle is accelerated until it reaches the desired roll rate and dropped from the initial vertical height, and the roadbed is accelerated to the desired initial velocity. In particular, the effect of the initial drop height was included in the model by assigning to the vehicle an equivalent initial vertical drop velocity.

The computer model developed during this study would be used to investigate the occupant-vehicle interaction under a variety of different initial rollover conditions. As such, specific adjustments to both the vehicle and the UNSW JRS rig models will need to be made for modelling each of the many desired initial impact scenarios. In order to facilitate the model setup for each different testing scenario, specific parameters were used to define the relative position of the vehicle and the UNSW JRS rig as well as the initial testing conditions, such as the initial roadbed speed, vehicle rotational rate and vertical velocity, and so on. This parameterisation allows for an automatic adjustment of the developed baseline model to any desired testing scenario by simply assigning the specific values of the initial conditions to the appropriate parameters.

Results

A comparison of the actual test and the corresponding simulation results is shown in Figure 3. Both the simulated vehicle kinematics and deformation are in good agreement with the experimental test throughout the entire duration of the event. A comparison of the permanent vehicle deformation, which was mostly localised to the roof, front fender and hood, is shown in Figure 4.

A further confirmation of the good agreement between the simulation and the test is provided by the comparison of the curves for the two most relevant physical quantities measured during the test: (a) the vehicle roll rate and (b) the force transferred to the roadbed. Comparisons of the experimental and simulated curves for the vehicle roll rate vs. the roll angle and the time history of the roadbed load are shown in Figures 5 and 6, respectively.

Discussion

Simulation outcomes confirmed that the developed FE model is capable of reproducing in a reliable manner rollover testing with the UNSW JRS rig and a SUV vehicle. The model simulates in detail both vehicle kinematics and deformation throughout the entire duration of the test. Good and acceptable correlations were found for the vehicle roll rate and roadbed force, respectively.

Although the magnitude of the simulated permanent vehicle roof crush was smaller than what was observed in the experimental test, as indicated by the values of the roof deformation summarised in Table 3, the model was able to reproduce the same failure mode (i.e., buckling of the roof

Table 3: Roof crush measurements – actual test and simulation

Target Roof Location		
		
Roof Crush Measurements		
	Test	Simulation
Horizontal component (mm)	*220*	*200*
Vertical component (mm)	*395*	*239*

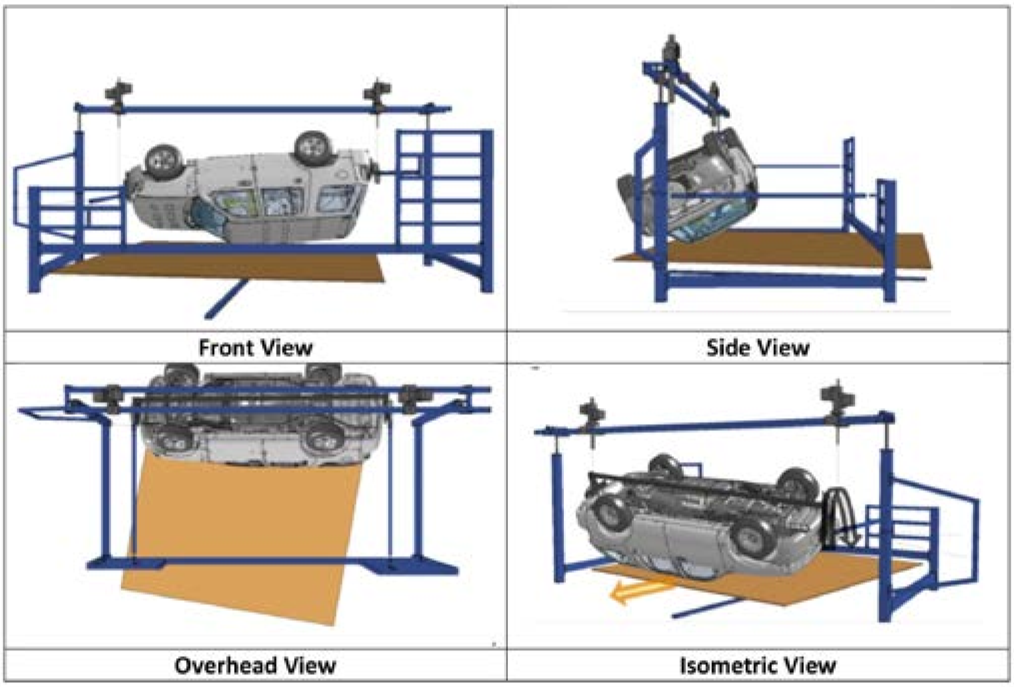

Figure 2. Modelled JRS test setup with Ford Explorer

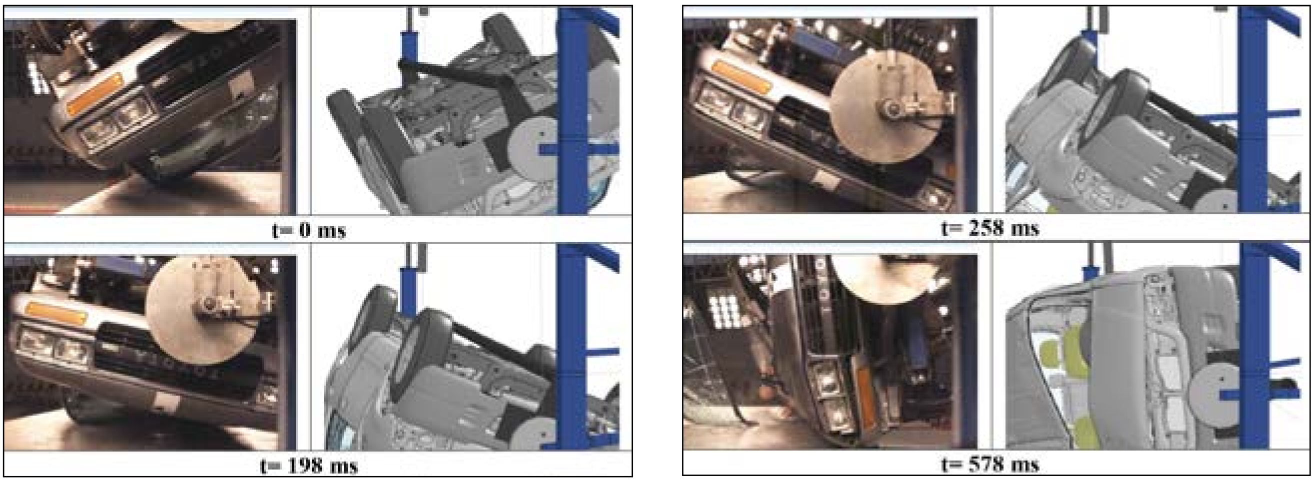

Figure 3. Sequence of test with SUV vehicle - comparison between test (left) and simulation (right)

Figure 4. Vehicle permanent deformation - comparison between experimental test (left) and simulation (right)

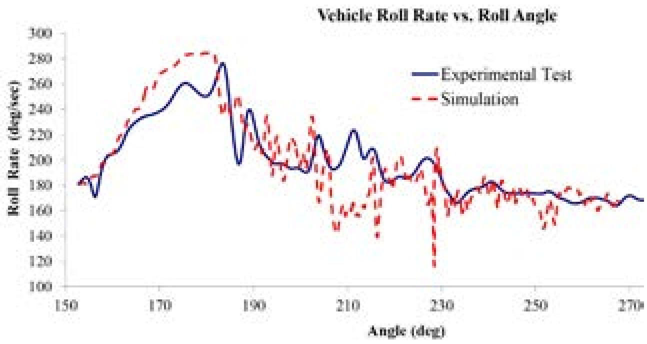

Figure 5. Vehicle roll rate - comparison between experimental test and simulation

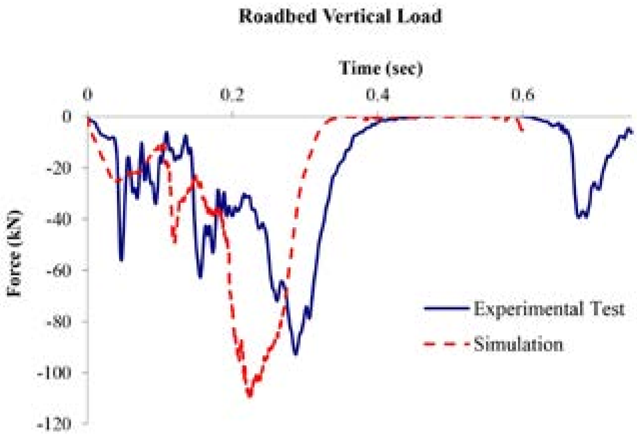

Figure 6. Roadbed vertical load - comparison between experimental test and simulation

with a plastic hinge occurring close to the intersection of the roof and the A-pillar). The smaller magnitude of the simulated roof crush can be likely attributed to a stronger roof of the 2003 Ford Explorer model as compared to the actual tested vehicle (i.e. a 1994 Toyota Land Cruiser). The SWR provides a direct indication of the resistance of the vehicle roof to deform under compressive loading; hence, smaller values of this index imply that a larger magnitude of the vehicle roof crush is expected during a rollover. The actual 2003 Ford Explorer vehicle, which was reproduced in detail in model used for this research, has an SWR of 2.2, as measured according to a FMVSS216 static roof crush test. Although no SWR value was available for the 1994 Toyota Land Cruiser, it is believed that the SWR for this specific version would be in the range of 1.5-1.8, which was a typical performance for SUV's produced during the 1990's.

The vehicle computer model's roof being stronger (SWR = 2.2) than the tested vehicle (SWR ≈ 1.5-1.8) ultimately resulted in a higher peak value and a slight phase shift between the experimental and simulated curves of the roadbed load, which are shown in Figure 6. A smaller deformation of the vehicle model's front-right fender during the third quarter of the rollover rotation could have contributed to this phase shift as well.

Summary and Conclusions

This paper described the development of an FE computer model to be used for simulating in detail the kinematics and deformation of a vehicle during a rollover crash test using the UNSW JRS rig. The main application of this computer model would be that of supporting researchers in assessing whether the UNSW JRS test rig can effectively replicate what happens during real-world rollover crashes, in terms of vehicle kinematics, occupant-vehicle interaction, and occupant injuries.

The reconstructed rollover conditions for real-world crashes are inevitably affected by some level of uncertainty. As such, a thorough assessment of the UNSW JRS rig's capability to replicate typical rollover injury mechanisms would require extensive testing under various initial conditions (i.e., initial vehicle angles, roll rate and drop height). Computer simulations represent a viable method to assess the outcomes of rollover tests using the UNSW JRS rig under the many different scenarios of interest, which would otherwise be impractical to test overall. Once the most representative conditions have been identified from the simulations, then limited experimental testing would be carried out to confirm the simulated results.

A detailed FE model of the UNSW JRS rig was developed and coupled with an existing model of a Ford Explorer. This assembled model was then validated against an experimental rollover test conducted using the actual UNSW JRS rig and a vehicle similar to the modelled Ford Explorer. The developed FE model proved to be capable of reproducing in a reliable manner the vehicle kinematics and deformation during the rollover test. The main differences between the simulation and the actual test were (a) a smaller simulated roof crush and (b) a slight phase shift and peak load of the simulated and experimental roadbed load curves. Both these two differences could be attributed to a stronger roof structure of the modelled vehicle with respect to the actual vehicle used in the test.

A similar modelling effort will be carried out to validate the developed JRS model when coupled with a small passenger car. These validated configurations of the JRS model with the SUV and the car models, in conjunction with already existing validated models of Anthropomorphic Test Devices (ATD), will provide engineers with an affordable way to comprehensively assess the capability of this test rig. In particular, simulations will help researchers to assess whether the UNSW JRS can effectively replicate injuries occurring in real-world rollover crashes. The developed numerical model would eventually represent a useful tool to assist in the investigation of the still-unknown causes of rollover occupant injuries.

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References

1. ANCAP (2012). *ANCAP Rating Road Map 2011-2017*. http://www.ancap.com.au/admin/uploadfiles/RoadMap2017.pdf. (Last accessed: Jul. 5, 2013.)
2. Australian Government (2010). *Vehicle Standard (Australian Design Rule 31/02 –Brake Systems for Passenger Cars)* 2009. http://www.comlaw.gov.au/Details/F2010C00151 (Last accessed: Jul. 5, 2013.)
3. Bish, J., Caplinger, J., Friedman, D., Jordan, A., Nash, C.E. (2008). *Repeatability of a Dynamic Rollover Test System*. In Proceedings of ICRASH - International Crashworthiness Conference, Kyoto, Japan.
4. Center for Injury Research (CfIR) (2013), http://www.centerforinjuryresearch.org (Last accessed: Aug. 1, 2013.)
5. Chirwa E.C., Stephenson R.R., Batzer S.A., and Grzebieta R.H. (2010). Review of the Jordan Rollover System (JRS) Vis-a-Vis Other Dynamic Crash Test Devices. *International Journal of Crashworthiness*, 15 (5), 553-569.
6. Fréchède B., McIntosh A., Grzebieta R.H., and Bambach M., (2011). Characteristics of Single Vehicle Rollover Fatalities in three Australian States (2000–2007), *Accident Analysis & Prevention*, 43 (3), 804-812.
7. Grzebieta, R., Bambach M., McIntosh, A., Digges, K., Job, S., Friedman, D., Simmons, K., Chirwa, E.C., Zou, R., Pintar, F., and Mattos, G. (2012). *The Dynamic Rollover Protection (DROP) Research Program*. In Proceedings of ICRASH - International Crashworthiness Conference, Milan, Italy.

8. Grzebieta, R., McIntosh, A., Mattos, G., Simmons, K., Rechnitzer, G., Mongiardini, M, Dal Nevo, R., and Jackson, C. (2013), *Implementation of the UNSW Jordan Rollover System at Sydney's Crashlab Test Facility*. In Proceeding of the International Technical Conference on the Enhanced Safety of Vehicles (ESV), Paper Number 13-0120, Seoul, South Korea.
9. Hallquist, J.O., (2013). LS-DYNA - *Keyword User's Manual (revision: 3374)*. Livermore Software Technology Corporation (LSTC), Livermore, CA.
10. Insurance Institute for Highway Safety (IIHS) (2013). *Procedures for rating roof strength*. http://www.iihs.org/ratings/roof/information.html. (Last accessed: Jul. 5, 2013.)
11. Jordan, A., Bish, J. (2005). *Repeatability Testing of a Dynamic Rollover Test Fixture*. In Proceeding of the International Technical Conference on the Enhanced Safety of Vehicles (ESV), Paper Number 05-0362, Washington D.C., USA.
12. Mohan, P., Nagabhushana, V., Kan, C.D., and Riley, J. (2006). I*nnovative Approach for Improving Roof Crush Resistance*. In proceedings of the 5th LS-DYNA German Forum, Ulm, Germany.
13. National Crash Analysis Center (NCAC) (2013). Finite Element Model Archive: http://www.ncac.gwu.edu/vml/models.html. (Last accessed: Jul. 5, 2013.)
14. Tahan, F. J., Digges, K., Reichert, R., & Kan, C.S. (2013). *Assessing Vehicle Damage Patterns with Chest Injuries in Far Side Rollovers*. Report No. 2013-R-001, George Washington University.
15. United Nations (2008). *Electronic Stability Control Systems*. Global technical regulation No. 8, ECE/TRANS/180/Add. 8. Geneva.
16. Young, D., (2010). *Protecting Occupants During Passenger Vehicle Rollover Crashes*. PhD Thesis, Dept. of Civil Engineering, Monash University.

Strapped for life or trapped: survey of drivers' knowledge levels and attitudes towards seatbelts and seatbelt law in Zimbabwe

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Abstract

The study sought to assess drivers' level of knowledge of seatbelts, seatbelt law and attitudes to the seatbelt law using a descriptive survey design. Data were collected from a convenient sample of 180 drivers using a structured interview schedule. The research findings revealed 53.30% correct responses on seatbelt knowledge, 36.94% on seatbelt law and that 47.96% of drivers had negative attitudes towards the law on seatbelts. The findings indicated that there existed some knowledge gaps and that almost 50% of the drivers harboured negative attitudes. The research recommends that the government, using the Traffic Safety Council of Zimbabwe, should increase driver education programmes on seatbelts and seatbelt law following a review of the Defensive Driving Course curriculum. In doing so, this may assist to develop a culture of being 'strapped for life' instead of being 'trapped to death' by ignorance.

Keywords

Attitudes, Defensive driving course, Knowledge level, Seatbelt

Background

Road accidents are a major cause of death and injury around the world [1]. In Zimbabwe, close to 2000 deaths and 15,300 injuries result from road accidents annually. Of these deaths, about 1000 are drivers and passengers while pedestrians and cyclists account for the other 1000 fatalities [2].

In order to curb this carnage on the roads, Zimbabwe launched the Decade of Action for Road Safety Campaign on improving road safety in May 2011. This road safety campaign is a clear indication that the government is committed to 'applying brakes' to the careless loss of valuable life, limb and property due to unsafe motoring habits such as the failure to be 'strapped'. It is recorded that seatbelts reduce the risk of death for a front seat car occupant by approximately fifty-percent [3]. Statistics in favour of seatbelts indicate that in America, over 135,000 lives were saved by seat belt use between 1975 and 2 000 [4]. By contrast, Zimbabwe is not in the habit of capturing such seatbelt use statistics either due to technological ineptitude or a lack of political will. Positively however,