SINTRA
ENGINEERING INC

WINTER EDITION NEWSLETTER

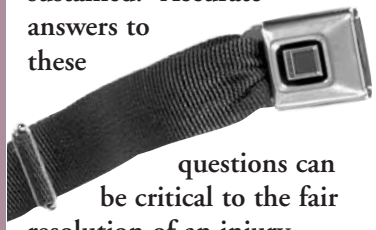
2003

IN THIS ISSUE

RESEARCH

Sintra Publishes Seat Belt Paper

Was she wearing her seat belt? If not, would a seat belt have made a difference to the nature and severity of the injuries that she sustained? Accurate answers to these questions can be critical to the fair resolution of an injury claim.



The approach traditionally taken by reconstructionists has been twofold: examine the seat belt components for signs of loading, and inspect the interior of the vehicle for evidence of occupant contact. While effective in most situations, there are cases where the results of this analysis technique are inconclusive. For example, there are instances where seat belt loading marks are not visible even though the occupant of a vehicle involved in a collision was wearing a seat belt.

Similarly, evidence that the occupant made contact with the vehicle interior does not necessarily indicate that he or she was not wearing a seat belt. Thus, there are limits to the traditional approach.

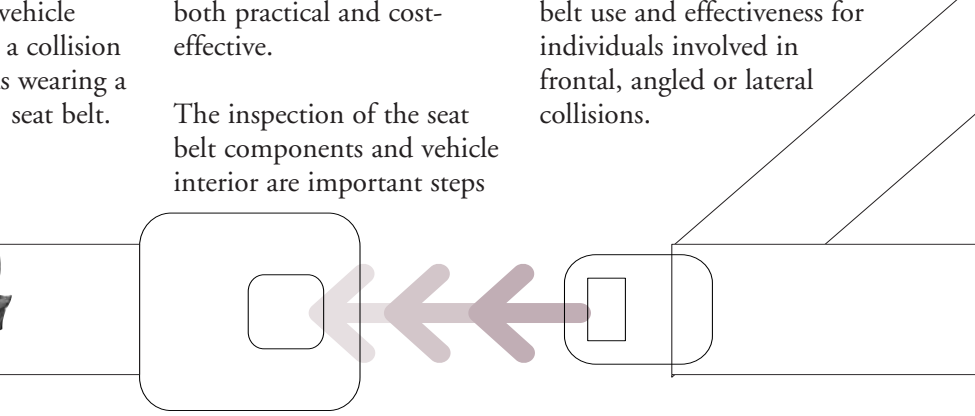
It is also possible to take a different approach and use commercially available software packages that predict occupant motion. Unfortunately, the high cost of these applications has prohibited their use in most accident reconstructions.

A third alternative is now available. At the 2003 Canadian Multidisciplinary Road Safety Conference, Sintra Engineering presented a paper that outlines a method for assessing seat belt usage and effectiveness that represents a significant improvement over traditional seat belt analysis techniques. This improved method is both practical and cost-effective.

The inspection of the seat belt components and vehicle interior are important steps in this method, as are thorough examinations of the vehicle exterior and the scene of the collision, which are used to establish the direction of impact and collision severity. Finally, occupant measurements and information about occupant injuries are collected.

These data are then combined with existing experimental research and used in a mathematical model that describes how a restrained occupant would have moved in the occupant compartment for the calculated collision conditions. The results are compared with the interior contact marks, seat belt loading marks, and reported injuries, to determine seat belt use and effectiveness.

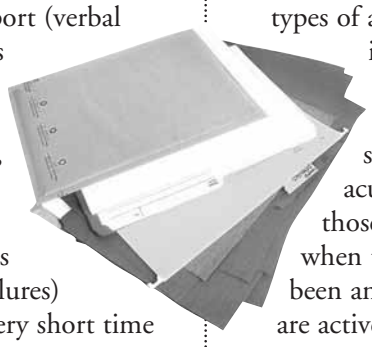
This technique represents a practical, affordable and accurate way of assessing seat belt use and effectiveness for individuals involved in frontal, angled or lateral collisions.



REPORTING

File Turn Around:
The Struggle to Improve Timeliness

For many years, Sintra Engineering has been acutely aware of the urgent need to turn around assignments as quickly as possible. Beyond ensuring that investigations are done thoroughly and correctly, the single biggest issue to our clients is how quickly a report (verbal or written) is produced.



In particular, property related investigations (fires and failures) often have very short time frames in which decisions hinge upon the results of our investigations. Long delays can result in awkward circumstances and poor decisions made because of a lack of information. Similarly, with incidents involving minor collisions, often a quick response will assist in the settlement of the issue at hand. Sintra Engineering is well suited to handling these types of assignments and indeed this is our specialty. That being said, we are acutely aware of those instances when timeliness has been an issue and we are actively striving to improve the turnaround on all our assignments.

To address the issue of timeliness of reporting, Sintra Engineering has been implementing a program to improve turnaround on assignments.

THESE IMPROVEMENTS INCLUDE:

- Confirmation letters that are sent out within 48 hours confirming administrative details of the assignment and identifying the technical personnel responsible for ensuring the completion of the assignment.
- Rapid response for the inspection of the relevant materials regarding the assignment (e.g. a vehicle scene or burned out house).
- Increased number of staff dealing with assignments (we have hired three new technical staff in the last six months).
- Active monitoring of each technical personnel's assignments to review the progress of files.
- If you have suggestions regarding improvements to turnaround times, please let us know. In addition, if you have a specific assignment that has critical timeframes, please ensure we are aware of the constraints of the assignments as soon as possible.

BIOMECHANIST AT SINTRA

Rebecca Moss is an Engineer in Training at Sintra Engineering who specializes in accident reconstruction and biomechanical analyses. In school, Rebecca was fascinated by both physics and biology. She decided to combine the two by first studying mechanical engineering at the University of Alberta, and followed it up with a Masters degree in Biomechanical Engineering at the University of Calgary where she worked in the Human Performance Laboratory. Rebecca loves to solve problems and figure out how things work; a friend remarked recently, "Must you take everything apart?" Rebecca worked briefly in a research and design capacity for a biomedical device manufacturer before joining Sintra Engineering in July of 2002. When she's not taking things apart, she enjoys reading, hiking, cycling, cross-country skiing and fixing things around the house.

FIRE INVESTIGATION

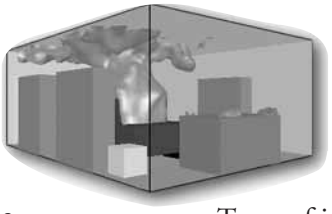
Fire Modeling

Fire Modeling is an engineering tool used to estimate fire and smoke spread for specific fire situations. Fire models can be either physical scale models or computer generated mathematical models using the properties of fires. Construction of scale models (physical models) can often provide insight into the properties of fire, but may not provide the detail required and often are limited by size, cost and geometry. Computer models allow for full scale simulations that cannot be cost effectively performed using physical models and can often answer the question "what if....?".

First developed in the 1960's, the primary focus of these computer analytical models was to describe in mathematical language the various phenomenon associated with fire growth and spread. In isolation, the mathematical representations in these models are not particularly useful to investigators. However, when combined with information regarding the physical conditions present at a particular fire, computer mathematical fire models can provide insight into the expected course of the fire. These models are now at a level of accuracy suitable for most engineering applications.

Depending on the level of detail required, models divide the subject building into a number of separate control volumes. Sintra Engineering is currently working with the most common type of fire model, the zone model. Zone models use two control volumes: the upper layer and the lower layer. This two-layer scenario is commonly observed under real-scale experimental conditions, indicating that the zone fire model can create a close approximation under most conditions.

Zone fire models can determine the distribution of smoke, fire gases and temperatures throughout the defined compartments.



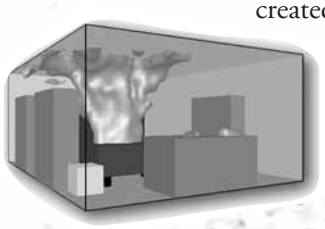
They use mathematical equations derived from the conservation of mass, the conservation of energy, the ideal gas law, and relations for density and internal energy to calculate pressures, temperatures and layer heights as functions of time.

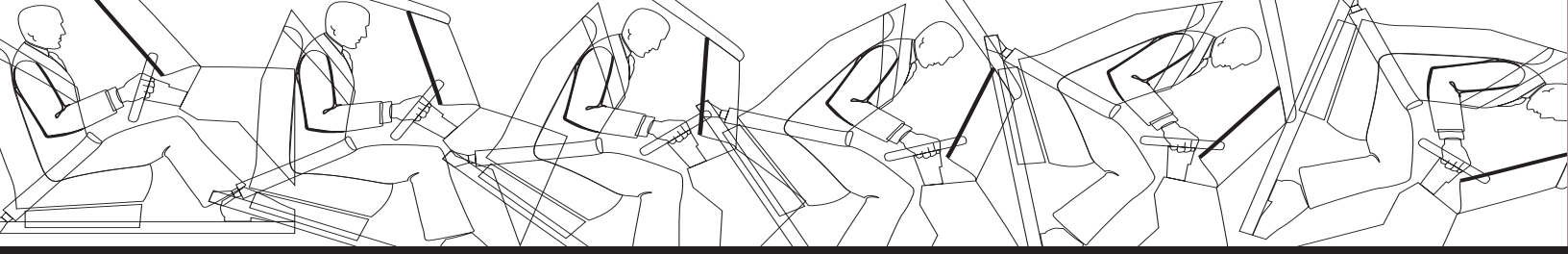
The computer fire model allows a user to enter a number of different inputs, such as the duration of the fire, the number of compartments involved, inputs relating to the main fire, the internal and external weather conditions, the thermal properties of the compartments and of any relevant items located in the compartment, to name a few. The simulation scenario is then run and produces a number of outputs, all functions of time, such as the upper and lower layer temperatures, volumes, heights, the main fire plume flow, pyrolysis rate and size, as well as data for the other items in the compartment or in any defined target areas created by the user. These data can then be used to analyze the particular facets of the fire that are critical to the assignment.

Types of information derived include fire spread, fire breech, fire detection, sprinkler activation and evacuation options.

Fire modeling allows technical personnel to simulate a particular fire without having to undertake an expensive and potentially dangerous full-scale recreation of the fire. It also allows the user to alter various input conditions in order to determine the effect that the variations would have had on the fire in question. Fire modeling is a safe and cost-effective alternative to full-scale fire experiments.

Few forensic engineering firms have the resources or technical expertise to create a computer fire model to simulate a fire. Sintra Engineering has the training and expertise to develop and analyze the development and spread of fires using computer models.





ACCIDENT RECONSTRUCTION

Rollovers and Occupant Restraints

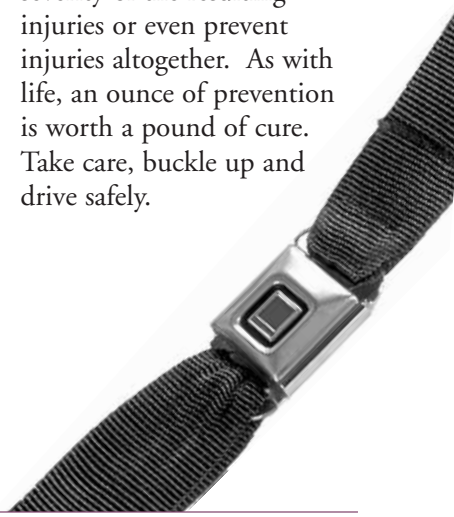
Vehicle rollovers are among the most devastating events to occur on our roadways. These incidents are more likely to result in fatalities than are other types of collisions, and most fatal rollovers only involve a single vehicle. A typical rollover occurs when a vehicle leaves the roadway surface and starts to yaw (travel in a direction different from the direction the wheels are headed) and travel sideways. As the vehicle is travelling sideways, the tires begin to furrow and the vehicle trips, initiating the roll. Once the roll has started, there is nothing the driver can do to reduce the severity or duration of the rollover event.

While the benefits of seat belt usage in frontal automotive collisions are widely acknowledged and accepted, somehow there is a surviving mythology that seat belt benefits in a rollover collisions are marginal. This is just not the case: nearly 75% of occupants killed in rollover events were not using restraints.

There is also a dangerous belief that survivability in a rollover collision is higher if the occupant is thrown clear of the vehicle. Let's examine this myth. If a person is thrown from the vehicle, there will be a secondary impact. This could be with any of the surrounding terrain, the ground or even with the rolling vehicle itself. As you can imagine, an unprotected individual will not fair well in these secondary impacts, and serious or fatal injuries can and often do result. Of course, this is assuming that the occupant is ejected cleanly. A more common event is a partial ejection: the results are often devastating. As the vehicle rolls, a partially ejected occupant can be trapped and subsequently crushed between the vehicle and the ground. Once outside of the vehicle's protective envelope, the risk of serious and fatal injuries rises significantly.

The best place to be during a a rollover collision is safely restrained within the vehicle's interior. A structure of metal and glass will stand up to abuse far better than our fragile bodies will.

So there we have it, another myth debunked. Seat belt usage in a rollover accident is just as beneficial as it is in other more typically observed collision events. In most situations, by keeping occupants restrained in the relative safety of the occupant compartment, seat belts can decrease the severity of the resulting injuries or even prevent injuries altogether. As with life, an ounce of prevention is worth a pound of cure. Take care, buckle up and drive safely.



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