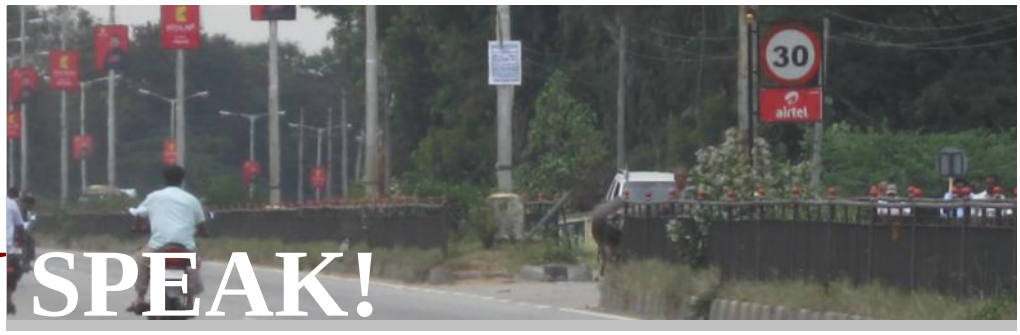
JP RESEARCH INDIA PVT LTD



SAFETY SPEAK!

Road and Traffic Safety Newsletter Volume 6, No. 2 November 2011

In this Issue:

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No. of Accident Vehicles investigated to date by JPR India researchers as part of our India Traffic Studies

From the Editor's Desk...

Hello, everyone! It has been a while since we sent out a newsletter but, happily, there is a good reason for that: We have been so busy with new contracts and company expansion that there simply hasn't been time to write.

The JPR India office has started growing at a pace far beyond my wildest dreams, both in terms of projects and employees. One reason for this welcome hum of activity is that we have established a consortium with Robert Bosch GmbH, Nissan, Mercedes-Benz, and Toyota TCRD to collect India crash data (see article in this issue for details). The database we are building is named **RASSI** (for **R**oad **A**ccident **S**ampling **S**ystem – **I**ndia). In Tamil (my mother tongue), RASSI means good luck, and we hope this database brings much good luck for automotive safety in India! In the last few months, there has been growing interest from other OEMS and component manufacturers to join the consortium. We have started doing investigations in Karnataka and are planning to expand the accident data collection, investigation and research project to other Indian states.

In other news, our office in Coimbatore is fully functional now and already involved in a project for **iRAP** (**I**nternational **R**oad **A**ssessment **P**rogramme) that entails collecting travel speed and volume information on selected highway stretches in Karnataka and Gujarat. We are also working with local ambulance services to do a **pilot study** of data collection/investigation using their notification process. Some of our staff are receiving training in injury scaling and PC Crash reconstruction techniques, both of which will help us better understand, code and analyze injury causation and accident causation factors for this and other projects. And don't miss the first announcement of JP Research's newest Road Safety seminar. In all, this is an exciting and productive time for road safety research in India, and we are thrilled to be a part of it and to share our progress with you.

-Jeya

Rules You Should Know...

Rules of the Road Regulations, 1989

Rule 16: Visibility of Lamps and Registration Marks

(1) No load or other goods shall be placed on any motor vehicle so as to mask or otherwise interrupt vision of any lamp, registration mark or other mark required to any lamp, registration mark or other mark required to be carried by or exhibited on any motor vehicle by or under the Act, unless a duplicate of the lamp or mark so marked or otherwise obscured is exhibited in the manner required by or under the Act for the exhibition of the marked or obscured lamp or mark.

(2) All registration and other marks required to be exhibited on a motor vehicle by or under the Act shall at all times be maintained in a clear and legible condition.

Rule 27: Speed to be Restricted

The driver of a motor vehicle shall, when passing or meeting a procession or a body of troops or police on the march or when passing workman engaged on road repair, drive at a speed not exceeding than 25 kilometers an hour.

Vehicle Size/Mass and Safety Relationships Receive Increased Attention in Search for Fuel Efficiency

CAFÉ WORKSHOP

As we reported in the last issue of *SafetySpeak!*, Jeya Padmanaban was invited to take part in a recent US National Highway Traffic Safety Administration (NHTSA) workshop on the influence of vehicle size, mass, and other parameters on fleet safety. Jeya presented a distillation of numerous JP Research study findings on the subject in a CAFÉ (Corporate Average Fuel Economy) symposium focused on the safety issues involved in reducing mass for model year 2017 and later light duty vehicles.

NHTSA's stated purpose for the February 2011 meeting was to "bring together experts in the field to discuss some of the overarching questions that NHTSA must grapple with in our upcoming CAFE rulemaking" and to "help kick off the dialogue process between the agency and stakeholders and to set a good baseline for further discussions."

The resulting CAFÉ report on the analysis was released by NHTSA in mid November. A brief description is given below. For those wanting more information, NHTSA's Preliminary Report: "Relationships Between Fatality Risk, Mass, and Footprint in Model Year 2000-2007 Passenger Cars and LTVs," is available online at:

http://www.regulations.gov/#!documentDetail;D=NHTSA-2010-0152-0023

Jeya's CAFÉ presentation can be viewed at:

http://www.nhtsa.gov/staticfiles/rulemaking/pdf/MSS/MSSworkshop_Padmanaban.pdf

SUMMARY OF PRELIMINARY REPORT FOR FUTURE CAFÉ STANDARDS

CAFÉ standards and greenhouse-gas emission standards for passenger cars and light trucks manufactured in model years 2012-2016 were published by NHTSA and the US Environmental Protection Agency (EPA) in May 2010. These standards discourage reducing current vehicle "footprints" for smaller-to-average cars (NHTSA defines footprint as "a measure of a vehicle's size, roughly equal to the wheelbase times the average of the front and rear track widths"). NHTSA reasoned that, to improve fuel economy, vehicles would need to be lighter but not necessarily smaller (since a reduced footprint, particularly in vehicles that were already small and light, would likely increase fatalities). In fact, in supporting analyses in 2010, NHTSA concluded that "any *reasonable* combination of mass reductions that held footprint constant in MY 2012-2016 vehicles – concentrated, at least to some extent, in the heavier LTVs and limited in the lighter cars – would likely be approximately safety-neutral; it would not significantly increase fatalities and might well decrease them."

The new NHTSA studies are based on a later vehicle fleet (MY 2000-2007, versus the MY 1991-1999 dataset used for the 2010 standards). This fleet includes more crossover utility vehicles (CUVs), and the vehicles are, on the whole, heavier, larger, and equipped with more/improved occupant safety devices. Using the same basic methodology, with refinements to address the new vehicle classes and other changes in the fleet, the 2011 study is based on analyses of the *societal* fatality rate, which includes fatalities of all vehicle occupants and pedestrians involved in collisions.

The preliminary report for rulemaking on 2017+ model year vehicles finds "societal fatality risk increases by 1.44 percent if mass is reduced by 100 pounds in the lighter cars," and NHTSA states that "this is the only statistically significant effect found in the current analysis." However, non-significant increases in societal fatality risk were found "for mass reduction in the heavier cars and the lighter truck-based LTVs", and non-significant societal benefits were found "for mass reduction in CUVs, minivans, and the heavier truck-based LTVs."

The report concludes:

> When two vehicles of unequal mass collide, the delta V is higher in the lighter vehicle, in the same proportion as the mass ratio. As a result, the fatality risk is also higher. Removing some mass from the heavy vehicle reduces delta V in the lighter vehicle, where fatality risk is high, resulting in a large benefit ... adding up to a net societal benefit. Removing some mass from the lighter vehicle results in a large penalty offset ... adding up to net harm. These considerations drive the overall result: fatality increase in the lighter cars, reduction in the heavier LTVs, and little effect in the intermediate groups. However, in some types of crashes that do not involve collisions between cars and LTVs, especially 1st-event rollovers and impacts with fixed objects, mass reduction is usually not harmful and often beneficial, because the lighter vehicles respond more quickly to braking and steering and are often more stable because their center of gravity is lower.

So what is the report's last word on the subject? "NHTSA believes that only limited conclusions can be drawn from the statistical analysis. …. Further research, combined with this analysis, will better help inform the agency's decision." To that end, JP Research-USA is working on a project, sponsored by the **Alliance of Automobile Manufacturers**, to estimate the societal effect of reducing mass under several scenarios that the automotive industry is currently contemplating to comply with CAFÉ standards for future cars.

JP Research *Road Safety* Seminar for 2012

In March 2012, JP Research-USA and JPR India will be presenting a new seminar in their **Road Safety** series. Current plans for the 3-day event include sessions led by a former NHTSA director (Dr. Tom Hollowell) and a speaker from George Washington University.

The focus will be on RASSI Consortium activities, including **Data Collection and Crash Investigation in India**. Some of the topics that will be addressed include:

- How data collection/investigation is used by NHTSA for policy issues.
- How manufacturers use crash data and reconstruction tools for design changes.
- The role crash injury data plays in establishing safety standards in the US.

Broken Headlamp Can Still Shine Light on Crash

ADVENTURES IN DETERMINING 'WHAT REALLY HAPPENED'

Being a crash researcher is something like being a detective. And who doesn't want to solve the big mysteries, know the unknowable, and answer those nagging questions concerning what really *did* happen just before the lights went out? Well, here is a chance to try your hand at one. In the case in question, a car collides head-on with a small truck. The car driver argues that the truck had its headlights off, so the car driver could not see the vehicle coming. But the truck driver says his headlights were on. Do you think you can prove the truck driver right? Let's look carefully at the clues the truck's headlamps might provide.

CLUES # 1 AND 2 : DEFORMATION OR MELTING

A light bulb is basically a filament which is housed in an airtight envelope with an inert gas inside. The filament material is usually tungsten, which has a melting point of 3410°C and electrical resistivity of 5.5μΩ-cm at 20°C. When electricity flows, the resistance in the filament causes its temperature to rise, making it glow. This is the same principle as that by which a dark, lusterless iron rod becomes bright red when heated, but it takes place at much higher temperatures. The temperature at which the filament turns bright and emits light is called 'incandescent temperature', and the phenomenon is called 'incandescence'. The longer the length of the filament, or thicker the diameter, the higher the resistance and brighter the light emitted.

So what does this mean to you as a crash detective? When there is a crash, a shock wave is produced that can affect the bulb filament. If, at the time of crash, the filament was at incandescent temperature, it can easily suffer a deformation (much like an iron rod becomes malleable in a blacksmith's flame). This deformation is called 'Hot Shock'.

If you look at a new bulb filament (*right*), you can see it is shiny and wound tightly, with one loop parallel to the next one. This filament would be hard and brittle when it is cold; however, when it is at an incandescent temperature, the filament would be smooth and susceptible to shape changes. So when there is a shock at the time of crash, the filament would be likely to uncoil (*left*), showing deformation at one or several points.

Filament deformed due to Hot Shock

New filament, without deformation

Another clue to look for:
If the shock during the collision is high, it could cause the filament of even a glowing bulb to break. Just a fraction of a second after such a break in the filament, the two broken ends would be so close that an electrical arc could easily cross the gap between them. During this process, the temperature of the filament would increase so much at the ends that it would cause the ends to melt. So when the filament ends are examined under a microscope, you would see two tiny ball-like structures at the ends caused by the melting of the filament itself.

CLUES # 3 AND 4 : DISCOLORATION OR FUSED GLASS

Now if there is a break in the lamp's glass envelope during the crash, look at the filament very carefully. Tungsten is a stable metal and does not oxidize with air when at room temperature. However, when at its incandescent temperature, tungsten will oxidize when exposed to open air. This oxidization can be seen as a layer of whitish powder (tungsten oxide) on the bulb filament. Also the stems holding the filament would experience some heat effects which would give their surfaces a bluish tint.

Glass fuses at around 700° C, which is much lower than the temperature the tungsten would be at if the lamp was on. So if the glass envelope of a glowing bulb breaks during collision, the glass pieces might come in contact with the hot filament; if so, the glass shards would likely melt and fuse. This result would show up as tiny droplets or very thin glass fibers of fused glass on the filament.

Note: Although existence of the above evidence can demonstrate that a lamp was **on**, the *absence* of any of the above DOES NOT necessarily mean that the lamp was **off**.

Oxidized filament with tungsten oxide on the surface

Glass pieces fused to a previously hot filament

RASSI Consortium — An Adventure Begins

Over the past year, JP Research India (JPRI) has helped bring together some major players in the automotive manufacturing industry to form a high-powered consortium aimed at improving safety on India's roads. The consortium's primary objective is to support creation of a detailed database of real-world traffic accidents that have occurred on Indian roadways. The database, which contains in-depth data about crashes that have been examined and reconstructed by JPRI engineers, is called **Road Accident Sampling System – India** (**RASSI**).

RASSI MEMBERS AND GOALS

In addition to JPRI and JP Research-USA, the consortium consists of a number of automobile manufacturers and component / original-equipment manufacturers (OEMs). The crash data collected under this program will be shared by the consortium members, and could be used not only for analysis of the type and severity of accidents currently seen on Indian roads, but also for application to improving road safety in the future. RASSI data could be invaluable for developing innovations in vehicle and component designs to address problems specific to India, solutions which could mitigate road accidents and decrease injury severity.

Progress to date includes development of a SQL (structured query language) database by the JPR-USA team to facilitate efficient data entry/retrieval and review. The database schema follows the general guidelines of the German In-Depth Accident Study (GIDAS) and the US National Highway Traffic Safety Administration's (NHTSA's) fatal accident and in-depth accident sample investigation (FARS/NASS) data files.

The first RASSI consortium meeting was recently held at JPRI's office in Coimbatore. The meeting was attended by representatives of all founding members, including the manufacturing giants Robert Bosch GmbH, Nissan and Mercedes-Benz. [Since that initial meeting, Toyota TCRD has also joined RASSI.] The initial data gathering efforts were limited to Tamil Nadu, but expansion of the data collection projects to other states is in progress. It was also agreed that the members would be involved in a steering committee that could provide more expertise and guidance to the team about data collection and analysis. Once again, the goal is to ensure data quality, accuracy, and completeness in order to assure the database's ultimate usefulness.

JPRI thanks all the present and aspiring consortium members for the fruitful discussions and for joining hands in helping India's roads safer.

RASSI PROJECT: CRASH RECONSTRUCTIONS

The following is an example of a case investigated by JP Research teams under the RASSI project. The crash was reconstructed by JP Research engineers using PC-Crash accident reconstruction software.

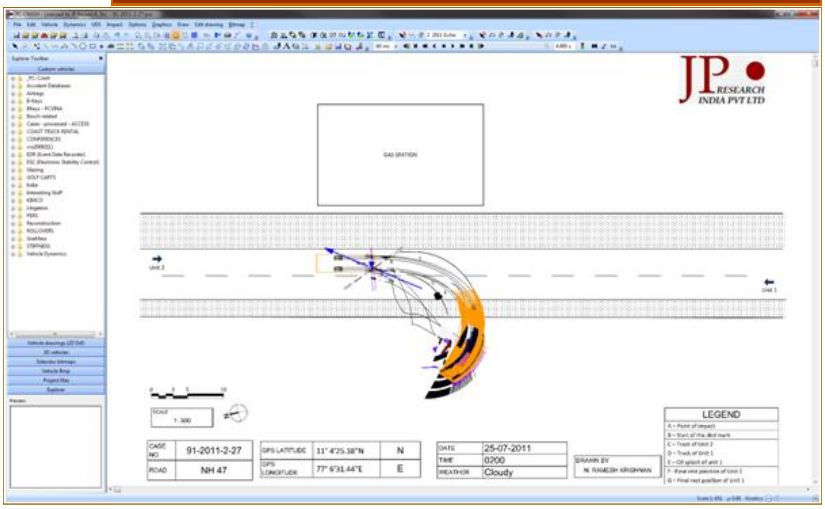
This head-on case involved a passenger car whose front right tire burst, causing the driver to lose control and head into the oncoming lane of traffic, where it collided with a truck.

The detailed accident data acquired by JPRI's team of accident investigators included measurements of tire and brake marks, scene photos of vehicle damage, points of impact and final rest positions of the vehicles, and detailed diagrams of the accident scene. With the complete set of detailed case data made available by our accident researchers, our engineers were able to reconstruct this head-on collision and extract even more valuable data for addition to the database.

JPRI's engineers are able to reconstruct collisions so that important variables, including travel speeds, impact speeds and angles, and crash severity values such as Delta-V and EES, can be confidently estimated.

The addition of these key and often overlooked or unavailable data variables adds tremendous value to the RASSI accident database.

Reconstruction of this crash for RASSI database was accomplished using detailed data and measurements and PC-Crash software.



How *Fast Were You Travelling?*

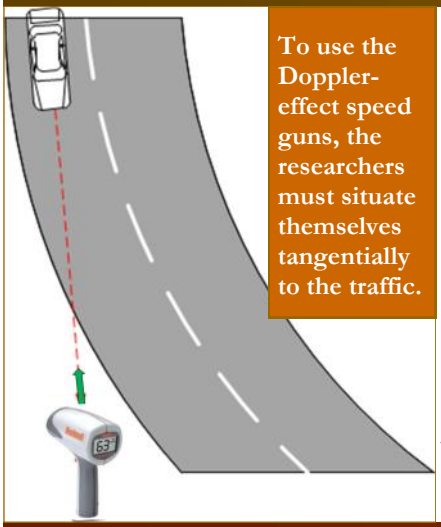
JP RESEARCH INDIA KNOWS!

How fast are you and your neighbors *really* driving on your local highways, and are your speeds safe given the volume of traffic? You may have your own opinions on this, but JPRI researchers have been spending many long hours since early September coming up with some definitive data.

As part of a project undertaken for the International Road Assessment Programme (iRAP) and supported by the Karnataka State Highways Improvement Project (KSHIP) and the Gujarat Engineering Research Institute (GERI), JPRI is collecting travel speed and volume information on selected stretches of highway in Karnataka and Gujarat.

In a 5-year collaborative effort with the World Bank, iRAP has been developing road risk mapping and road audit protocols to address road design issues. The program's goal is to reduce injury by identifying dangerous driving practices and sections of road and offering solutions to mitigate the dangers.

THE STEALTH APPROACH



To use the Doppler-effect speed guns, the researchers must situate themselves tangentially to the traffic.

So, in the interest of world safety, two-person research teams from JPRI, armed only with a speed gun, a GPS unit, a camera, a hatchback car, and a bunch of forms, parked on sections of highway and began to record the speeds of passing vehicles and to count their numbers. The first step is to make sure that drivers are not aware of the speed gun — it would not do to have them modify their speed in response to being tracked. One way to accomplish this stealth maneuver is to tuck the vehicle around a curve. *Surprise!*

Data is taken on weekdays for a fixed amount of time. Counts and speeds are noted for various vehicle types (motorized 2-wheeler, cars/jeeps, trucks, etc.), and counts alone are made for pedestrians, bicycles, and other non-motorized road users. Speed/counts are taken at each of the identified locations during several time periods (daylight hours only). For the Karnataka portion of the study, data was collected on nearly 8,500 vehicles.

The project is ongoing, and the locations are, obviously, not available for identification, but JPRI foresees that the issue of speed and its effect on safety (and crash injury reduction) on India's roads will be a point of focus and interest for years to come. We are proud to be adding to the discussion.

- *RECENT JPRI MILESTONES* -

April - May 2011

- JPR India opens a new office in Coimbatore.
- Presentation to Coimbatore police on how JPRI conducts crash investigations and why such data gathering is important.
- First RASSI Consortium meets, and RASSI projects get off the ground.

June 2011

- Ten (10) new engineers join the JPRI crash investigation team.
- JPRI plans a new **Road Safety Seminar** to be presented in March 2012 in Coimbatore.

July 2011

- Training for JPRI staff from Dr. Ali Hassan, Professor, Birmingham University, U.K., and head of the Birmingham Automotive Safety Centre.

New JPRI office opens in Coimbatore

September - October 2011

- Pilot project with 108 ambulances in Coimbatore city. JPRI researchers traveled along with an ambulance crews and examined accidents on the spot while the paramedics were shifting crash victims to hospital.
- Traffic volume and speed data collection project and basic crash investigations are ongoing in Mandya, Maddur Belgaum and Bagalkot districts of Karnataka State. Preparations are underway for doing the same in Gujarat state.

Conferences to Catch

AAAM, 56th Annual Conference
Association for the Advancement of Automotive Medicine
(October 2012)
http://www.aaam.org
Held every year. Call for Papers not published yet, but abstracts likely due in January 2012, with conference held in October.

ARC-CSI Crash Conference
June 4-7, 2012
Las Vegas, Nevada (USA), Palace Station Hotel
http://www.arccsi.com/
Held every year. Focus on accident reconstruction and instrumented tests.

Australasian Road Safety Research, Policing and Education Conference
November 6-9, 2011
Perth, Western Australia
http://www.roadsafetyconference2011.com.au/
Held every year. Focus: Traffic safety issues in Asia and Australia. Call for Papers for 2012 should be out by December 2011.

5th ESAR Conference
Expert Symposium on Accident Research
(September 2012)
http://www.esar-hannover.de/
Held every 2 years. Focus is on crash studies for European Union member countries. Call for Papers should be out by the end of the year. Abstracts expected to be due by the end of February 2012.

JP Research Road Safety Seminar
March 2012 *** See p. 2 of this newsletter. *** *More details very soon!*

SAE 2012 World Congress & Exhibition
Society of Automotive Engineers, International
April 24-26, 2012
Detroit, Michigan (USA)
http://www.sae.org/congress/
Held every year. Focus for 2012 conference is to *Get Connected* "from OEMs to suppliers, across academia and governments." 2012 conference already closed to new papers, but Call for Papers expected by April for 2013 World Congress, with Abstracts likely due in May. Check at: http://www.sae.org/events/calls.htm

2012 IRCOBI Conference
International Research Council on Biomechanics of Injury
September 12-14, 2012
Trinity College, Dublin, Ireland
http://www.ircobi.org/conference.php
Held every year. Focus on injury biomechanics. Call for Papers available at: http://www.ircobi.org/abstract_submission.php . Abstracts due by December 19, 2011. New category this year: Short Communication, designed to showcase incomplete research for which "methodologies or initial findings can be presented for feedback and discussion" (submission due by April 1, 2012).

JPR India's New Office

JPR India has opened a new office in Coimbatore, "The Manchester of South India". If you have some time when you happen to be in Coimbatore, please feel free to visit –

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JPR India Mission Statement

To mitigate accidents and injuries to road users in India by helping local automotive safety organizations, government agencies, and manufacturers through accident and safety research and training, and creating public awareness of automotive safety issues.

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