

CUTTING THE ECONOMIC COST OF ROAD CRASHES

John RULLER
Road Accident Investigation Service Pty Ltd
121 Kangaroo Gully Road
Bellbowrie, Queensland 4070
+ 61 7 3202 7707
rjruller@eis.net.au

Steven McKINZIE
McKinzie & Associates LLC
15016 S. Rosehill Rd.
Olathe Kansas 66062-9478, USA
+001 913 851 5831
rsmck@rsmck.com

INTRODUCTION

There is now, more than ever, a movement underway to try to limit the time a major road is closed due to traffic crashes. From an investigator's point of view it is understandable that the longer a road is closed, the greater the congestion is going to be. While there is congestion, there is greater chance for conflict resulting in further delays. On the social front, for every minute a lane or lanes is closed on a major highway the overall cost to the community is considerable.

In recent months the Department of Main Roads and the Queensland Police Service undertook a project named *Operation Freeflow*ⁱ. Studies examined within the report revealed that in traffic off-peak periods alone, each additional minute taken to clear an unplanned incident results in an additional five (5) minutes of congestion delay. In peak periods this relationship is estimated to increase to 50:1. In Brisbane, Queensland, the adverse impacts of congestion due to unplanned incidents are estimated to cost approximately \$200 million per year.

In the last ten years within the USA there has been a tremendous increase in population. Along with the increased population come the problems of increased use of motor vehicles with one and two occupants competing with freight carriers for space on their road systems. Generally there are good public transport systems within the city limits but this does not extend out into the suburbs. As a direct result the USA highway system is becoming very overburdened. Traffic slows to 30 to 35 mph on highways that were designed for 55 to 65 mph. The result is more pollution, more frustrated commuters and a high cost of commuting due to increased fuel consumption.

In an average urban area such as Washington, D.C., and its suburbs, as many as 400 blockages lasting one hour or more will occur annually.ⁱⁱ Many more incidents will last less than one hour. The FHWA has translated the average 20-minute lane blockage into a monetary figure to show how freeway incidents directly affect the national economy. If one lane of a three-lane freeway is blocked for 20 minutes – assuming the freeway is running at capacity – the delay caused to motorists will exceed 1,200 vehicle hours. At the FHWA-assigned value of \$4.00 per hour for each vehicle hour of delay, the cost of the incident due to the delay alone is approximately \$5,000.00.

Australia is about the size of continental USA with a population about one-twelfth its size. Much of Australia's population is concentrated in the major cities of our east coast and Perth in our west. Australia does not have the resources to construct the much-needed infrastructure seen in other countries with much higher population.

There have been some advances in recent years with the construction of several major highways in Queensland. The eight-lane Pacific Highway is now completed between Brisbane and the Gold Coast. The four-lane Bruce Highway, north of Brisbane now extends past Nambour.

Although these roads alleviate major congestion they also bring with it the need of some drivers to see how fast they can drive. This invariably leads to road crashes, which may stretch over several hundred metres and require several hours to properly record.

A number of countries have recognised the need for a new approach to crash investigation. In the UK a new “*On the Spot*”ⁱⁱⁱ accident research project is underway. This project enables expert investigators to be on the scene of road crashes within 15 minutes of the incident occurring. Within the USA, the need for a different approach has been recognised for a number of years. Here within Australia, it is now being recognised and attempts are being made to refine procedures to enable a better approach.

The following paper outlines some of the difficulties now being experienced within Australia and an insight as to how a number of the States within the USA have attacked this problem.

THE LOCAL EXPERIENCE

Mid-winter 1999, on a major highway north of a major city in Australia the rain is falling, it is rush hour and traffic is starting to build, not only on the outbound lanes but also the inbound lanes as it is a Friday night and families are starting to come into town for shopping.

A young male driver in a hurry to get home to change for an evening of fun, rounds a curve to see the traffic before him slowing. He immediately brakes but is too close to the vehicle in front of him and impacts the vehicle at a high rate of speed. This impact results in the second vehicle being propelled across the unprotected median into the face of inbound traffic. Two vehicles impact this vehicle at speed. As a result of these initial impacts there are now several smaller impacts occurring on either side of the incident zone.

It is soon established that four persons are now dead and a further five have received severe injuries. The first police unit on scene calls for immediate backup. Soon a number of emergency vehicles are on scene. Traffic is now backed up for kilometres and Police operations are attempting to get some form of detour into place. It is now about three quarters of an hour into the incident when someone asks the location and time of arrival of the Accident Investigation Squad. It is realised they have yet to be called.

A call goes out and the Accident Investigation Squad moves out to the crash site. By now the traffic is grid locked around the crash site. It takes the Squad half an hour to reach the scene. It is now one and one quarter hours after the start of the incident.

On arrival at the scene, the two-member Squad see that it will require further assistance to gather the immediate information. Further members of the Squad are recalled to duty and arrive two and one half hours after the start of the incident.

To gather the at-scene information it takes a further two and one half hours. Once the information is gathered it is now time for the cleanup. This process takes a further one and a half hours, as it is difficult to get a road crew to the scene.

In total, this factious scene takes six and one half hours from the start of the event to its final clearance. The time does not account for the time necessary to clear the backlog of traffic in both directions. Although the above scenario is factious, it is typical of what now occurs.

Investigators are continually being asked, “Why do you need to have the road closed for so long when you are investigating major crashes.” There are a number of reasons that come to mind.

Some of these are:

- a. The crash scene is a workplace under present legislation. As the investigator or supervisor, they are in charge of that workplace. In today’s society there are many responsibilities placed upon us with respect to the workplace. Failure to make it safe can lead to prosecution or worse; death or injury to one of the many workers found at such sites. It is

very difficult to make a workplace safe if you have traffic, with very inattentive drivers, travelling at speed in the lane next to where you are working.

- b. In recent years the education of the crash investigator has increased. The result of this is that the investigator now collects much more information than ever before.
- c. A further indirect cause of delay is the delayed arrival of other specialists, whether they are the crash investigators, undertakers or road workers that need to clean the site before it can be reopened. These delays are in part the result of the higher concentration of traffic and the natural build-up of traffic after the impact occurs.

How can we, as investigators, limit this delay to the public and thereby limit the cost of such crashes, bearing in mind that the required evidence still needs to be gathered. There are a number of ways that this can be accomplished.

Some of these are:

- a. Early notification of the crash so that the specialist can get underway as soon as possible.
- b. Instead of sending one or two investigators, police need to send a *well-trained* team to the scene. This team would need to number at least four investigators, preferably five. The team should be made up of one recorder, two site mappers, one photographer and one supervisor who would assist where needed and also be the scene manager.
- c. Local authorities would need to have ready, road crews at a moments call both day and night, who can attend the scene and repair or clean the site and/or redirect traffic around the site, thereby releasing police personnel for other duties.
- d. Both the police and the local authorities need to devise plans to redirect traffic around major crash sites before the crashes occur. This would assist in limiting the congestion now being experienced today. Today a crash occurs on our major highway and it requires some time before traffic can be re-routed over other roads. Preventing this delay is possible with a little forethought and the use of known data.

For these procedures to work there must be change. Much of this change needs to occur in management but also from the investigators, themselves. There must be a greater commitment to training. A well-trained investigator can get through the workload much quicker than an investigator who is poorly trained.

When stating that training needs to take a greater role, it should also be stated that it is very unfair for police agencies to expect their investigators to pay for their own training as now occurs on a regular basis in most states within Australia. The cost of training can be high, as in most cases it requires travel overseas, but when compared to the cost of closing only one lane on a major highway during rush hour, this cost recedes into insignificance.

There are thoughts afoot that if the police were provided with “*star war*” type equipment the job would be completed quicker. It does not matter how up to date the equipment is, if you are not properly trained it is no better than a 50-metre tape. The equipment now used by investigators, is, for the most part adequate for the job. Training is the key to working faster not necessarily the latest and greatest equipment.

Training is not the only limiting factor. It is interesting to note that when a major crime is committed whereby one or more persons may be killed, it is not unusual for the full resources of the investigating department to come into play to help solve that crime.

However, on the flip side of the coin, a fully laden bus can roll off the hillside resulting in a large number of dead and injured and the investigating police service will commit one investigator to investigate the incident. Why, because the incident is seen as a simple single vehicle rollover. To this author and surely to the next-of-kin, whether a person is shot or is crushed by a motor vehicle, the death still has the same effect and therefore should be given equal priority.

Police services must also recognize the high cost on the lone investigator. Without some form of backup or assistance the investigator is at high risk of suffering psychological problems during or after the investigation. This could well leave the Police service at high risk of litigation should the investigator have to retire from service before his/her time.

It stands to reason that a traffic crash on a highway may only be a traffic crash but it is also a major crime scene until proven otherwise and therefore the investigation should be conducted accordingly. There is a very high need to have a qualified team of specialist to attend to such incidents.

THE OVERSEAS EXPERIENCE

Mid-Summer 1988, a five-fatality crash had just occurred on Interstate 35 southwest of Kansas City. A dump truck pulling a flatbed trailer loaded with a backhoe had traversed the Interstate median. During its' decent from being airborne a midsize passenger car had driven under it. The dump truck now atop the car was ablaze as the fuel tank had ruptured and both vehicles slid northbound in the southbound lanes. Before stopping, another vehicle was struck and sent spinning off the roadway.

The backhoe was sliding on its side toward traffic. The backhoe bucket struck an approaching van head-on. Five dead, the highway ablaze and traffic blocked for miles in each direction. Because of the traffic diversion, six subsequent crashes occurred. One being an overturned tractor semi trailer avoiding stopped traffic, and several resulted in injuries from crashes as the multitude of vehicles were diverted to alternate routes.

Upon my arrival, I directed the work of several state investigators. A relatively new crash investigator was first on seen. As such, he would normally be making the initial report. This was obviously not the type of crash to indoctrinate a new trooper. He had completed the basic crash courses and was thought of as a conscientious worker, I assigned him to the task of beginning the basic crash diagram for scene evidence. The methodology applied here would be no different that any other crash he had investigated. One piece of physical evidence documented at a time from a known reference point.

Some forty-five minutes had passed when I returned to check on his progress. I asked to see the field sketch and much to my surprise, it was illegible. I quickly dismissed poor penmanship, as none of the line work depicting the pavement edges was straight or parallel. Calmly, another reconstructionist and I offered our help toward the completion of the assigned task.

After the completion of the reconstruction, our focus was determining why such a highly trained investigator however inexperienced had failed at his assigned mission. The help of Dr. John Allen, a renowned police psychologist from Wichita Kansas was solicited. After careful review of the case and study of the manpower at the scene, the cause was simple. A human operates at peak performance up to a personal peak stress level. Once peak stress is reached the performance of an individual drops dramatically. The human had simply been overwhelmed by the sheer catastrophic nature of the event and was shutting down to protect himself.

We identified several possible solutions to prevent a recurrence. One was to expose every investigator to such events on a repeated basis. Obviously, this was neither practicable from an occurrence standpoint nor realistic based on logistics. Our only choice was to divide the tasks required during such events to multiple investigators. Thereby reducing the stress level and maintaining peak performance. From this and related investigative events arose the Critical Highway Accident Response Team, (CHART).

The Kansas Highway Patrol initiated the team concept of crash investigation in 1991. Today the program has grown into three major crash response teams located east, central and west. The primary unit consist of nine sergeants all being ACTAR^{iv} rated. Supplemental support personnel are supplied from local commands. This secondary level consists of either advanced trained investigators or reconstructionists, all having proven a proficiency at forensic mapping.

Being able to maintain peak performance requires training and the proper equipment. His or her level of training speaks for itself as each individual has attained ACTAR status. The proper equipment did not come without substantial fiscal commitment from the agency. Each region has a fully equipped emergency response vehicle as seen in figure one.

Kansas was not the first in the US to move to this concept. Other states applying the team concept of investigation are Washington, Missouri, Florida, Texas, California, Georgia, South Carolina and others. Each seems to have its own reason for exploring this concept. The transition to this multidisciplinary team clearly benefits the investigative agency by returning to normal duties those employees that would otherwise be assigned the investigation.

Clearly, we have met two goals considering this single issue. First, within usually one day we return the local patrol trooper to his assigned duties, second we have met our agencies objective by performing at an expected performance level.



Figure One

Missouri for example operates on a similar basis to Kansas. Five teams of three investigators strategically located based upon population and traffic flow. Some differences exists only in appearance, see figure 2.



Figure Two

In the State of Washington, the State Patrol is assisted by the Department of Transportation. Fifteen total station teams are located within the state for rapid response to highway crashes. See figure three.



Figure Three

The state of South Carolina has utilized an accident reconstruction team for several years, (see figure four).

Most states have some type of minimum criteria to activate a response team. The Kansas model is well respected as meeting the states needs. A mandatory notification is made to the CHART Coordinator when a crash occurs and the first agency responder determines the crash involves:

1. Three or more or likely to be three or more fatalities
2. A commercial vehicle involving or likely to involve a fatality
3. A governmental vehicle involved in a serious injury of fatal crash.
4. A hazardous material spill that substantially threatens life or property
5. Or when deemed necessary by the Superintendent or his designee.



Figure Four

The Kansas Highway Patrol initial investment included three reconstructionists and the state coordinator. A drug forfeiture program provided initial funding for \$60,000.00. Within two years, the benefits of the program had far outweighed the initial investment. In the three subsequent years, funding totalled nearly \$350,000.00.

One of the beginning goals was the expedient clean up of the scene and return traffic flow to normal. The reconstruction teams did not initially meet that goal. While total station technology allowed the documentation of physical evidence in a more expeditious manner, the equipment needed to arrive first. The typical crash scene usually encompasses 250 to 300 points, being documented at a rate of one point every 30 to 45 seconds. This gap has been met from several directions. One method is to mark the final rest of pertinent evidence with a semi permanent paint, to be mapped later.

The major modification to the plan in Kansas was to utilize additional personnel that were located logistically to respond with the equipment. Usually not all documentation was completed by the mapping team when the CHART team arrived. The timely return to normal traffic flow is a critical element in traffic crash investigation. All investigators appreciate the governments' need for smooth traffic movement. Economics and safety clearly dictate this arena. The economic impact of a major artery being closed for a few hours far exceeds the cost of purchasing a total station and maintaining the efficiency of the operating personnel.

Another benefit to expeditiously investigate the scene is the lower exposure to traffic by the investigator. We should never forget however, the investigators need to fulfil their mission of determining how and why, prosecuting an offender or protecting the innocent. For should we fail to identify the causative factors of this crash, we shall surely fail in preventing the next one.

CONCLUSION

Both local and state authorities need to understand that they too have a responsibility. They also must be prepared when such crashes occur. They can greatly assist investigators by providing support in the way of traffic control and direction. In order to do this they must have in place procedures whereby as

soon as a crash occurs they are underway to the site with appropriate equipment and personnel. This relieves the scene manager to assist the investigators and thereby complete the investigation sooner.

As an association, perhaps it is now time for ASPACI to foster greater understanding between the investigator and the engineer by opening our doors to other related associations such as the Australian Institute of Engineers, to name but one. The greater one understands another's need, the greater the chance of the situation improving.

In closing, the public also needs to understand that we as law enforcement officers have been charged with the duty to properly and fully investigate road crashes. In order for us to do this task to the best of our ability, we must have their understanding and cooperation when such crashes occur on major roadways.

REFERENCES

ⁱ Operation Freeflow Evaluation Report, November 2001, prepared by Cooperative Road Management Project – CRMP, Traffic & Road Use Management Division, Department of Main Roads and the Queensland Police Service.

ⁱⁱ The Highway Safety Desk Book, National Transportation Library, Bureau of Transportation Statistics, USA, <http://www.bts.gov/nti>

ⁱⁱⁱ The New “On The Spot” Crash Investigation Project In The UK, Paul Forman & Julian Hill, Proceedings, The Fourth International Conference on Accident Investigation, Reconstruction, Interpretation and the Law, 13 –16 August, 2001, Vancouver, British Columbia,

^{iv} ACTAR, Accreditation Commission for Traffic Accident Reconstruction