Submission No 62

MOTOR VEHICLE REPAIR INDUSTRY

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INQUIRY INTO THE MOTOR VEHICLE REPAIR INDUSTRY IN NEW SOUTH WALES

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[redacted]

1. Introductory remarks

I provide a submission to the inquiry into the motor vehicle repair industry in New South Wales.

I am a research psychologist, and I have specialising in transportation safety matters for 25 years. I have particular expertise in issues associated with the motor vehicle repair industry, arising from my involvement in leading the research activities of the STAYSAFE Committee in 2005-2006 relating to inquiries into the industry in NSW. More broadly, I have published a number of research reports and papers relating to motor vehicle safety.

I am affiliated with the Centre for Accident Research and Road Safety – Queensland, Queensland University of Technology, and the Department of Psychology, Macquarie University, where I conduct research and teach on issues associated with the psychology of driving. This submission, however, relates to my personal views and does not necessarily reflect the views of the organisations to which I am affiliated.

2. Terms of Reference

I note the Terms of Reference for the inquiry:

Resolution passed 19 November 2013, Votes No 181, item 17

(1) A select committee, to be known as the Select Committee on the Motor Vehicle Repair Industry, be appointed to inquire into and report on the motor vehicle repair industry.

(2) The committee is to examine and report on:

(a) Smash repair work and whether it is being carried out to adequate safety and quality standards;
(b) The current Motor Vehicle Insurance and Repair Industry Code of Conduct, its governance structure and dispute resolution mechanisms and whether it is effective at regulating the relationship between repairers and insurers, and in serving consumer interests;
(c) Consumer choice, consumer protection and consumer knowledge in respect of contracts and repairs under insurance policies;

(d) The business practices of insurers and repairers, including vertical integration in the market, the transparency of those business practices and implications for consumers; and
(e) Alternative models of regulation, including in other jurisdictions.

(3) The committee consist of five members, as follows:
(a) Three government members, on of whom shall be Mr John Barilaro
(b) One opposition member, and
(c) One independent member, being Mr Greg Piper

(4) Mr John Barilaro shall be the Chair of the committee.

(5) The members shall be nominated in writing to the Clerk of the Legislative Assembly by the Government Whip and the Opposition Whip by 20 November 2013. Any changes in membership, including the independent member, shall also be so notified.

(6) The committee have leave to sit during the sitting or any adjournment of the House.

(7) The committee have leave to make visits of inspection within the State of New South Wales and other states and territories of Australia.

(8) The committee is to report by 30 May 2013.

3. The STAYSAFE Committee

As the then Director of the STAYSAFE Committee, I managed the inquiries conducted by the Gibson STAYSAFE Committee in the mid-2000s, and drafted reports at the direction of the Chairman. These inquiries resulted in the Tabling of three reports:

- STAYSAFE 66 (2005). Repairing to a price, not a standard: Report of an inquiry into motor vehicle smash repairs under the Insurance Australia Group (NRMA Insurance) Preferred Repairer Scheme and its implications for roadworthiness, crashworthiness, and road safety. STAYSAFE Committee, Parliament NSW Legislative Assembly. [Sydney, NSW]

- STAYSAFE 68. (2006). Improving the health of the motor vehicle insurance and smash repair industries: Shifting the focus to public safety—Report of a review of progress in implementing the findings and recommendations of an inquiry into motor vehicle smash repairs under the Insurance Australia Group (NRMA Insurance) Preferred Repairer Scheme. STAYSAFE Committee, Parliament NSW Legislative Assembly. [Sydney, NSW]

- STAYSAFE 71 (2006). The crash testing of repaired motor vehicles: Further report of an inquiry into motor vehicle smash repairs under the Insurance Australia Group (NRMA Insurance) Preferred Repairer Scheme and its implications for roadworthiness, crashworthiness, and road safety. STAYSAFE Committee, Parliament NSW Legislative Assembly. [Sydney, NSW]

I respectfully suggest that the Committee review the reports (with their findings and recommendations), transcripts of evidence and submissions received for these inquiries by the STSYSFAE Committee, as these documents provide an extensive and accessible history of the motor vehicle repair industry in New South Wales, with particular regard to the impacts of technological change, business practices and codes of conduct, relationships with insurers, and consumer protections and safety.

4. The crash testing of repaired motor vehicles

I wish to make particular reference to Chapter 3 of the STAYSAFE 71 (2006) report, which I authored. This chapter remains, as far as I can ascertain, the only discussion of the crashworthiness of repaired motor vehicles that has been published. The chapter provides an overview of research identified by STAYSAFE regarding the crash testing of repaired motor vehicles.

STAYSAFE published the first full report of a crash test of a repaired motor vehicle: a frontal barrier offset test of a previously crashed and repaired Ford Fairmont Ghia AU III.

STAYSAFE noted that there was a limited, but nonetheless significant, research literature on on 'crash repair tests' of motor vehicles, including:

- crash repair tests—a series of crash tests of repaired motor vehicles (Volkswagen, Audi) conducted at the Allianz Centre for Technology (AZT) facility in Germany; and
- low speed crash testing.

STAYSAFE explored the issue of the crash testing of repaired motor vehicles with representatives of Insurance Australia Group in a public hearing on 27 March 2006:

> Hon. RICK COLLESS (STAYSAFE): Regarding your comments about deciding on whether a deformed vehicle has the part replaced or repaired, what sort of research has gone into making that decision? Is there any crash testing done, for example?
>
> Mr McDONALD: To crash test a repaired vehicle is a simplified solution because you have to decide first of all what is a representative car to crash test. Every car's damage is different. You cannot say you have 100 Camrys all with front-end structural damage; every one of them will be different in some way. So which one do you use as being the most representative one that has gone another half an inch or half an inch less or that sort of thing?
>
> Mr GIBSON (CHAIRMAN): But the outcome should be the same though, should it not?
>
> Mr McDONALD: The outcome should be the same and manufacturers generally—people like Toyota and Ford and Holden publish body repair manuals where they recommend where structural repairs are to take place and they will produce a cutting point, and there is obviously a logical point on the structural part so that it can be replaced. Or the option is to replace the whole structural component back to the car.

Hon. RICK COLLESS (STAYSAFE): Are you aware of a crash test that was done by Autoliv (Australia) Pty Limited where the test result summary stated,

> "Vehicle crush data measurements and crash dummy response data indicate that the repaired vehicle demonstrated an increased risk of injury to the occupants due to reduced energy absorption characteristics caused by the failure of the instrument panel", et cetera.

That is pretty worrying stuff.

Mr McDONALD: I have never seen that report, I only know what I have seen on television, and it was made quite public that that was an Allianz repair in Melbourne where it was a choice of repairer in that program. I have not seen anything definitively released in the public domain to enable us to make any calculations. I would point out to the Committee that that particular model Falcon did not do particularly well in the original Australian New Car Assessment Program [ANCAP] test when it was a new complete car and it had a relatively low ANCAP score. I do not know what the actual results are, only a fairly generalised, rather sensationalist couple of *Today Tonight* stories about it that I have seen on television.

And later:

Hon. RICK COLLESS (STAYSAFE): I refer to your comments a few moments ago regarding the deformation characteristics of new cars versus repaired cars. I think you said that it is very difficult to ensure that the precise deformation characteristics exist on the car that has been repaired, compared to a new car. Am I correct?

Mr McDONALD: Without physically crashing every car that is repaired, yes.

Hon. RICK COLLESS (STAYSAFE): Would not make sense, then, for buyers of second-hand cars to know that the car that they are buying may not have the same crash characteristics as a new car?

Mr McDONALD: Do you mean have some sort of notation?

Hon. RICK COLLESS (STAYSAFE): In the Committee's recommendations there was a suggestion that a register should be kept of vehicles that have had major structural repairs done to them so that people could determine whether or not that might be a safe car to drive.

Mr McDONALD: Again, we are relying on the integrity and the skills of the repair industry. In the example of, say, wrecks returning to the road, there is already a process in place where written-off—

Hon. RICK COLLESS (STAYSAFE): These cars may drive very well on the road but they just do not have the same crash characteristics as the original vehicle.

Mr HAWKER: As the Hon. Rick Colless said, a very large percentage of those cars will be repaired appropriately and be just as safe as a new car. If a small

proportion of them have inadvertently been poorly repaired and a car involved in an accident has been structurally repaired, you are going to change the perception to a view that they are all substandard. I think that would create a public relations issue for the used-car market, which would be a significant problem and would force up dramatically a lot of prices. I understand where you are coming from. What I would be looking [for is] to try to find another solution to that problem if we could.

Mr GIBSON (CHAIRMAN): Crash testing would do that, would it not, show the way?

Mr HAWKER: No, because the majority of repairs will meet all crash test outcomes. A huge amount of testing of repaired motorcars internationally has demonstrated that a repaired motorcar is just as roadworthy as a brand new car.

Mr GIBSON (CHAIRMAN): Sorry to interrupt, but here is the first report and it is supposed to be a world first. It says that that is not the case. That was on a new car that was repaired.

Mr HAWKER: There is quite a lot of information out of the United States of America about cars that have been crashed by the Highway Safety Institute over there. They have a whole a lot of information on that.

Mr McDONALD: Various people have conducted crash tests on previously repaired cars.

Mr GIBSON (CHAIRMAN): If you have that, will you provide that information to the Committee?

Mr McDONALD: I may be able to obtain some information from one of other overseas counterparts. But the question remains that you cannot pick a representative damage.

Mr GIBSON (CHAIRMAN): We understand that.

Mr McDONALD: It is virtually impossible. Even doing an ANCAP-type test, which is certainly not repairable, into a fixed barrier at 64 km/h you will get dramatic differences sometimes between the way individual components behave. This happens in every accident with two cars, just because they might have a couple of spot welds a little bit different to the other car, or the metal fitness might vary from one supplier to another.

The major source of information regarding crash tests of repaired motor vehicles comes from crash repair tests conducted by Allianz Zentrum für Technik (Allianz Centre for Technology, AZT). A promotional video discussing these crash repair tests was released by Allianz in March 2000. The text of the commentary to the video is reproduced below:

COMMENTATOR: Everyday, thousands of cars are brought into repair shops after being damaged in an accident. While this damage looks pretty dramatic to the driver, it's hardly ever a problem for the expert.

The Allianz Centre for Technology (AZT)—just like the car repair business—demonstrated a good 25 years ago that a specialised repair shop can do an excellent job in fixing damage of this kind, both technically and visually. The advent of new materials and modern safety systems such as air bags and belt pretensioners has prompted the AZT to take another look at the effects of accident damage repair.

We asked ourselves the question: "How do vehicles behave in terms of deformation, triggering of restraint systems, and repair costs, after repairs following one accidents when they're involved in a second accident?"

Reproducible damage was caused to a new vehicle in an AZT crash repair test at a collision speed of 15 km/h. Accidents of this degree of severity not only result in external damage but also deformation of longitudinal engine members, which have a vital effect on the safety of a vehicle. To obtain a technically flawless repair the vehicle was placed on a straightening bench and the longitudinal member was straightened out. Following this, the badly deformed tip of the member was removed and replaced with a new part.

When the repair was finished, the same vehicle was put through another AZT crash repair test. The second time round the outward appearance of the damage was identical to that of the damage sustained by the vehicle when it was new. The previously repaired longitudinal member had the same deformation profile as after the first crash test in its original condition. As in the first repair, the longitudinal member was again straightened out on the straightening bench and its buckled tip was replaced with an original part.

The test results prove that there is no difference between the deformation and damage absorption of the new vehicle and those of the same vehicle when repaired. The minimal fluctuations are within the normal range for series production. The same holds true for the repair work. The working time for the first repair was 22.5 hours, and for the second repair 21.1 hours. The repair costs were DM 4,900 after the first, and DM 5,100 after the second, crash.

The test series was complemented by crash repair tests on a Golf TDI and a VW Bora, and with these the deviations between the original condition and the condition after professional repairs were also marginal, as they were in a further test carried out on a Mercedes C180. This not only applied to the deformation behaviour but also to the repair cost.

High speed crash tests with the twice repaired VW Golf and Bora, carried out at 56 km/h in accordance with the EU directive, showed no deviations compared with series vehicles, either in deformation characteristics or the triggering of air bags.

The following conclusion can then be drawn from the tests. Even in a second accident, the professional repair of accident damage does not affect deformation behaviour, repair costs, and (a crucial point) passive safety. Professionally repaired is as safe as new.

For over thirty years the Allianz Center for Technology has worked on a crash repair test to assess the safety performance of crash-damaged motor vehicles after repair, as well as contributing to work such as the sectional repair technique, the partial painting and touch-up system, proposals on spare-part design and repair methods, and encouragement for the automobile industry to design, among other things, energy-absorbing and more repair-friendly bumper systems and longitudinal members.

However, despite the methodology being available for three decades or more, relatively few motor vehicles have been subjected to a crash repair test.

There have been, however, a number of related statements issued over the period 1999-2004 regarding crash testing to assess the safety of repaired motor vehicles following crash damage.

On 2 November 1999, under the title 'Expertly repaired- As safe as new', Volkswagon AG stated:

> Volkswagen carried out crash tests at 56 km/h on Golf and Bora vehicles which had been repaired at the Allianz Zentrum Technik (AZT) in Munich. The tests were carried out at the Research and Development department in Wolfsburg according to the conditions of the EU guideline. These conditions are also applied for monitoring during vehicle production. All legal stipulations were met. There were no differences in the injury criteria for vehicle occupants or in the vehicle measured values between the vehicles repaired by AZT and vehicles from the production line. The vehicle occupant protection systems also function perfectly after expert repair. The airbags and belt tensioners are activated at the same time even when welding work has been carried out on important components which could affect safety levels.
>
> The correct repairs carried out by the institute workshop according to VW stipulations using VW genuine parts were decisive for the result of this test. With this procedure, the Allianz Zentrum tests the characteristics of all vehicles on offer in Germany with regard to deformation, ease of repair, spare parts management and the repair procedure detailed by the manufacturer as well as the workshop equipment required. This is done for the insurance industry'.

Similarly, on 15 November 1999, under the title 'Safety is still guaranteed after a second repair carried out correctly: New research results from Allianz Zentrum für Technik', Allianz Versicherungs-AG stated:

> "A repair carried out correctly following the guidelines of the automobile manufacturer has no effect on body stiffness and deformation response. Repair costs do not increase as a result of further damage. Occupant safety is not affected in any way."
>
> This is the conclusion of Dr Dieter Anselm, head of the Allianz Zentrum für Technik (AZT), from the tests of his institute on the safety and economics of repairs on passenger vehicles carried out for the second time.
>
> New tests by the AZT institute "Vehicle Technology" with the Volkswagen Golf IV, Bora and Mercedes C180 prove that components repaired after an accident,

such as cross members, longitudinal members and wheel housings fulfilled all load requirements in a second crash. The costs of the repair with genuine spare parts stays within the scale of maintenance costs following the first accident. Occupant safety is not influenced by repairs carried out correctly. Similar results are, according to Dieter Anselm, to be expected from other vehicle types.

All tests at the AZT were carried out with an approx. 15 km/h frontal crash and demonstrated only minimal differences in deformation response, deceleration and repair costs following both crashes. The damage, for example, to the cross members, longitudinal members and wheel housing extension were virtually identical.

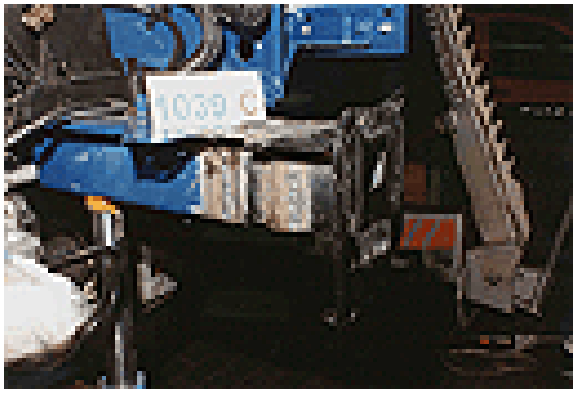
If repairs are not carried out correctly, however, negative results can be expected from body stiffness and deformation response during a second accident. Vehicle occupants could be subject to major risks, for example, if the airbag and belt tensioners are activated too late or do not activate at all.

According to the accident researcher Mr Anselm, the criteria for proper repairs are:

- Repair by qualified personnel in a recognised workshop.
- Repair following the guidelines of the vehicle manufacturer and the recognised methods of body repair.
- Sharp-edged deformations on structure body parts (bends, folds) may not be corrected.
- The stipulations of the manufacturer must be kept to if a part is replaced in the structural area.
- Use of genuine spare parts.

The statement included several images, which are shown below:

VW Golf IV—Identical deformations following AZT crash repair test on passenger vehicle in original condition (above) and following correct repairs (below).



VW Golf IV—Following first crash with passenger vehicle crash in original condition. Replacement of lonitudinal member (left weld) and deformation element (right weld) correctly welded.

VW Golf IV—Following second crash in repaired vehicle. Replaced part weld on longitudinal member from previous repair is completely undamaged.

(Website: http://www.allianz-zt.de/azt.allianz.de/Kraftfahrzeugtechnik/Content/Seiten/English/Press/bis_1999/safety_still_guaranteed.html , accessed 8 May 2006)

On 16 March 2000, under the title 'Professional repairs - as safe as new: And no increased costs for future repair work', Allianz Versicherungs-AG stated:

"Only repairs that are carried out professionally and comply with the guidelines of automobile manufacturers have no negative effects on the body's rigidity and the deformation behaviour of accident vehicles. If this condition is satisfied, the safety of passengers is not affected as a result of repair work, even if another accident should occur."

This is the conclusion drawn by Dieter Anselm, head of the Allianz Center for Technology (AZT), on the basis of tests in connection with the safety and cost-effectiveness of repair work following a second accident. Tests carried out by AZT-Institut Kfz-Technik, the automotive testing division of the Allianz Center for Technology, on several vehicle types showed that in a second crash, safety-relevant vehicle components such as cross members, longitudinal engine

beams and wheel houses withstood all prescribed stress situations if they had been professionally repaired after the first accident.

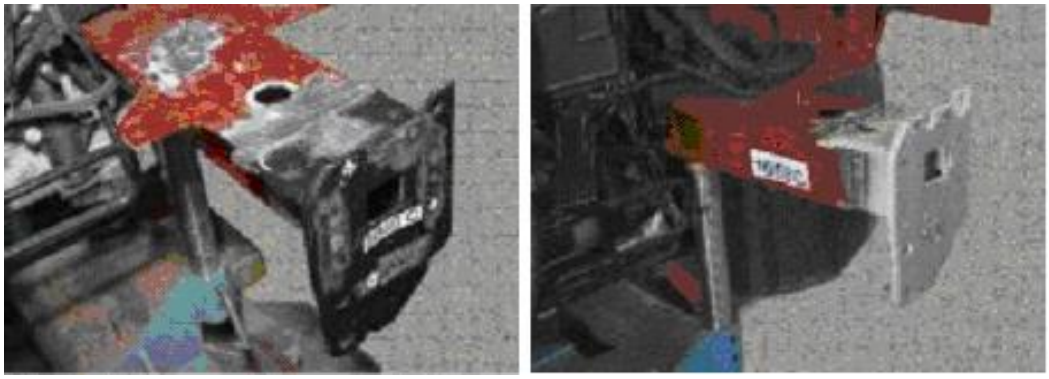
The two crashes showed only slight differences in deformation behaviour, in deceleration, in the safety of passengers and in repair costs. According to Anselm, this is the reason why the insurance industry justifiably attaches a lot of importance to professional repair work that takes into account the guidelines of automobile manufacturers and the approved work methods of the panel beating trade. For partial replacements in the structural area, the specifications of the manufacturer must be complied with. In the event of sharp-edged deformations, e.g. bending or buckling, the affected structural parts would have to be replaced; for safety reasons these elements should not be repaired.

If claimants do not have their vehicles repaired, or at least not by a professional, because they want to save money or cash in on an accident for which they bear no responsibility by using a "fictitious invoice", i.e. indemnification without proof of repair, they risk considerable negative consequences in case of a second accident, according to the manager of AZT. Occupants could be greatly endangered as a result of a less rigid body and deteriorated deformation behaviour of the car that could, for example, lead to the belt tightener being delayed or not triggered at all.

"Auto insurers are first and foremost concerned about road safety, alone out of self interest", emphasised Dieter Anselm. "That's why we have always campaigned for professional, safe repairs, and never for cheap repairs." The so-called "fictitious invoice" bears the risk that the damage is not repaired at all, or at least not professionally, making the vehicle less safe for the road. Moreover, Allianz accident researches found that repairs, as opposed to replacements, may and should only be carried out on those body areas or for those types of damage that can be fixed without loss of rigidity and deterioration of the deformation behaviour.

The statement include several images, which are shown below:

After the AZT crash repair test: Identical deformation of the vehicle, original (above) and after professional repair (below). Photo: Allianz Versicherung



Identical extent of repair: Partial replacement of the deformation element at the chassis rail after the first crash (above) and after the second crash (below). Photo: Allianz Versicherung

(Website: http://www.allianz-azt.de/azt.allianz.de/Kraftfahrzeugtechnik/Content/Seiten/English/Press/ab_2000/professional_repairs.html
accessed 8 May 2006)

In March 2002, in a series of media commentaries discussing the anniversary of thirty years of automotive research at the Allianz Center for Technology, the contribution of the organisation to road safety and cost cutting was emphasised:

Prof. Anselm: "We have highlighted the risks as well as potentials for improvement."

"In the past 30 years our research has made a decisive contribution to improving the deformation behavior and repair-friendliness of motor vehicles, to cutting repair costs and to greater active and passive safety of motor vehicles. The consumer has also benefited from lower auto insurance premiums as a result." This is the way Prof. Dieter Anselm, head of the Allianz Center for Technology (ACT), summed up the Center's record.

When the cost of repairing damage to automobiles shot up dramatically in the early 70s, Allianz Versicherungs AG decided to give its Center for Technology, founded in Berlin in 1932 and relocated to Ismaning near Munich in 1962, its own Institute of Automotive Engineering. The initiator and first chief, Prof. Max Danner, and his team began to do systematic research into accident damage and to describe ways of preventing such damage or of limiting its repercussions.

For example, over the years the ACT has developed the sectional repair technique, fostered the partial painting and touch-up system, put forward proposals on spare-part design and repair methods and encouraged the automobile industry to design, among other things, energy-absorbing and more repair-friendly bumper systems and longitudinal members. According to Dieter Anselm, Max Danner's successor since 1993, these were all "decisive steps toward cutting the cost of accident repairs without diminishing safety, quality or appearance." As an additional effect the accident researcher

> mentions the benefit to the environment by reducing the consumption of materials such as metal and paint as well as the benefit to the consumer. "We succeeded in curbing the increase in auto-insurance premiums", he explains.
>
> The ACT's scientific research into safety belts, airbags, child retention systems, the transportation of children on bicycles and dogs in cars, motorcycle accidents, car seats and head rests have highlighted risks for road users. As Anselm emphasizes, "Not only have we pinpointed the dangers, we have also always proposed specific improvements and developed guidelines or recommendations that have been adopted and implemented by industry. This has improved road safety and benefited all of us as road users".
>
> The Automotive Engineering Department he heads at the ACT has created further benefit for the consumer by drawing up the requirements for the electronic car immobilizer. In the years since the device was launched the number of stolen cars has plunged, falling from more than 144,000 in 1993 to fewer than 70,000 in 2000 (approx. 62,300 in 2001). "This has improved auto insurers' loss experience and has had a beneficial impact on premiums for auto physical damage insurance."

It was noted that at the Allianz Center for Technology other research areas have been added to the original accident repair research. New materials are being tested, new tools tried out. The development of the AZT crash repair test for the first time created the basis for comparing different vehicles with regard to their repair-friendliness. The results are already taken into account in the design of new cars today. With increasing traffic density and accident frequency, safety issues are becoming more and more the focus of our attention. Do safety systems life up to their promises? How can safety systems be optimized? What must be observed when children are taken along in cars or on bicycles? These are only a few of the questions that have arisen out of practical claims experience and are being looked into in numerous research projects.

Allianz Versicherungs-AG, in a statement 'Electronic components in motor accident repairs', on 6 September 1999, commented that motor vehicle manufacturers should act to remove expensive electronic components or batteries from the most frequently affected shock-absorbing zones.

> The use of electronic components in motor vehicles has rapidly increased over the past 20 years in line with the development of the electronics industry. Today's cars all have an electronic engine management, including an electronic exhaust regulator. A multitude of electronic systems are deployed to enhance safety and driving comfort.
>
> Despite their various modes of operation, electronic control systems are designed according to a basic pattern.
>
> Sensors, control units and servo components - the main elements of every electronic control system - are electrically wired with each other for data transmission and power supply. The possibility exists that these components become damaged as a result of a motor accident or other loss event, such as fire or flood.

AZT's demands on motor vehicle manufacturers to remove expensive electronic components or batteries from the most frequently affected shock-absorbing zones, such as the front cross member and front end of the wheel house, and to locate these components more cost-efficiently between the spring strut dome and the front wall are still justified today.

When determining the scope of damage to a vehicle and, subsequently, the appropriate repair procedure, the following points must be clarified:

Has the system broken down completely, are there malfunctions or does optically recognisable damage exist? The majority of electronic control systems today are self-monitoring. Any errors that occur are recognised and stored. For safety-related systems such as ABS or airbags any errors are indicated by means of warning lights or displays inside the vehicle. However, errors in non-safety-related control systems, e.g. air-conditioning, are not indicated but simply stored in the control unit. These errors can only be detected through a suitable diagnostic test and by carrying out an error-memory scan. Visible damage must be recorded.

Which components cause errors? The exact location of a faulty component can only be found by a qualified expert with an appropriate diagnostic tester in conjunction with a well-documented test manual. Modern testing equipment is not only able to test electronic functions, but can also simulate operations. Not many years ago repair shops still used to replace the individual components of a system one after the other for as long as it took for the whole system to function again. This method of locating the fault, which smaller repair shops are practising to this day, on the one hand is very expensive for the customer (many working hours, many fully functioning components exchanged for test purposes are not replaced) and on the other hand is no longer able to be carried out given more and more complex systems with only sporadic malfunctions. As a result of all systems being networked, damaged components can cause errors in different individual systems.

In how far can these shortcomings be attributed to the loss event? While damage to wire and plug connections can quite easily be attributed to a loss event, this becomes much more difficult in the case of malfunctions of sensors, control units and servo components. Until the mid-80s automobile manufacturers provided repair shops with no instructions as to when and when not to replace electronic components following an accident. As a result of this unclear situation many expensive electronic modules were replaced as a precautionary measure, according to the motto:

> "Given the extent of this damage the electronic system must also have been affected".

This reaction is clearly based on a wrong assessment of the acceleration and forces at work in a typical accident, because in their component specifications, car manufacturers presuppose that these parts are able to withstand a so-called shock test. The strain during these shock tests is approximately twice that of an accident with average severity. To find a way out of this unacceptable situation, as early as 1987 AZT, in co-operation with all German automobile

manufacturers, developed a guideline for the post-accident treatment of electronic components which is still valid today:

> Damage to electronic components
> Replacement if at least one of the following applies:
> - the case is deformed or damaged
> - supporting surface or console is deformed (electronic unit is intact)
> - plug connection of the module is damaged or corroded

Doing responsible research, at the start of the new millenium, also means that the needs of the environment must be given due consideration. Therefore the basic idea of "repairing instead of replacing" is just as important today as the testing of new environment-friendly materials such as water-based paints. New technologies, high-tech materials as well as growing quality and safety standards are making more and more demands on repair and processing technologies. Thus, here too it is a question of saving costs by means of new repair methods, without sacrificing safety. This theme has been reflected on other statements by Allianz Versicherungs-AG. For example, in 23 March 1999, a statement headed 'Car repairs with used spare parts: Technically sound, ecologically friendly, saves costs' indicated that:

> Repairing vehicles with used original spare parts is not only technically feasible, but also makes ecological sense and saves costs. This was the outcome of a large-scale study conducted by the Allianz Center for Technology (AZT). But before this so called "actual cash value" method of repair is recognized by the insurance industry, repair shops, consumers and legislators and launched market-wide, a number of structural and logistic pre-requisites have to be met.
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> According to Dieter Anselm, chief executive of the Allianz Center for Technology, one of these pre-requisites is a supply of high-quality used parts for all vehicle types and the networking of recyclers and insurers' data processing systems. In addition, used spares would have to bear a seal of quality, be listed in an intelligent numerical system and be available within one to two days. A catalog of allowed times for painting work would be needed so that repairs can be assessed for cost effectiveness.
>
> But as the AZT accident expert pointed out, the most important pre-requisite would be to establish which used parts can in fact be used in repair work. Screw-on body parts could be employed without any problems, while weld-on parts would have to fulfill certain conditions. On the other hand Anselm rejects the use of safety-relevant parts such as steering systems, brakes, airbags and safety belts, "unless they are reworked and guaranteed by the car manufacturers or suppliers."
>
> As the AZT study shows, this method only results in a single-digit percentage cost advantage against the total volume of comparable repairs using new parts. But in absolute terms it represents a considerable saving for the insurance industry of around 500 million marks. According to Anselm "this would cut the insurer´s claims expenses and therefore also insurance premiums without diminishing the quality of the repair work".

Several years later, Allianz Versicherungs-AG reported a further crash repair test. On 1 December 2004, under the title 'Top marks for the bestseller', Allianz Versicherungs-AG stated:

> How safe is a repaired vehicle? The Allianz Centre for Technology (AZT) answered this question in a scientific study of repair costs following a crash.
>
> "Repaired correctly, it is just as safe as when it was new". This summarises the results of the study. A new Golf was subjected to a frontal impact with an impact speed of 15 km/h and an overlap of 40% against a fixed barrier in the Allianz Insurance technology centre. After the simulated accident, the vehicle was repaired by the AZT in accordance with Volkswagen guidelines and using genuine replacement parts.
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> A new frontal impact was then carried out with the Golf. The results of both impacts were the same, which proved that a correctly repaired Golf offers the same level of safety as a new vehicle.
>
> This so-called "crash repair test" offers the opportunity to examine a vehicle for its ability to be repaired and is therefore an important factor in insurance classifications for new vehicles. Something that takes high priority at Volkswagen.
>
> However, the tests carried out as part of this study did not stop there. Having now passed both the "low speed frontal impact" tests with flying colours, the Golf was then subjected to a "high speed frontal impact" to verify occupant safety. The Golf was driven into a deformable barrier (tested in accordance with ECE-R94) with an impact speed of 56 km/h and an overlap of 40%. The results of this showed that all safety equipment such as airbags and belt tensioners worked in the same way as they would in a new vehicle and that all occupant protection criteria and occupant loading were identical to those in a new vehicle.
>
> The Golf had already performed well in June, when it achieved excellent Euro NCAP impact test results. It was awarded a total of 5 stars for frontal and side impact, 4 stars for child safety and 3 stars for pedestrian safety.
>
> (Website: http://media.vw.com/article_display.cfm?article_id=9494 , accessed 8 May 2006)

On 6 December 2004, under the title 'Damage control - is your car still safe after a crash?', Allianz Versicherungs-AG stated:

> Wolfsburg, Germany - Ever been in a crash, had your car repaired and then headed off into the traffic again wondering if your vehicle still has the same integrity and safety as when it was new?
>
> The Allianz Centre for Technology in Germany also wondered about this so set out to answer the question in a scientific study of repair costs after a crash.

> "Repaired correctly, a car is just as safe as when it was new," was the consensus after deliberately crashing a new VW Golf, repairing it, and then crashing it again. And again.
>
> AZT took a new Golf and rammed it into a concrete barrier at 15km/h in the Allianz Insurance technology centre with what the industry calls "an overlap of 40 percent" – which means just less than half the front of the car hit the barrier.
>
> AZT repaired the car the in accordance with VW guidelines and using genuine replacement parts – then went and crashed it again.
>
> The result of each impact was the same, "proving that a correctly repaired Golf gives the same level of safety as a new vehicle".
>
> This "crash repair test" allows a car to be examined for its ability to be repaired - an important factor in the classification of new vehicles for insurance loadings.
>
> The Golf was repaired again after passing both "low-speed frontal impact" tests with flying colours then crashed for a third time, but much faster – 56km/h into the same barrier with the same overlap of 40 percent.
>
> That's a serious speed for a crash test but all safety equipment such as crash bags and belt tensioners worked as they would have in a new vehicle and all passenger protection criteria and loadings were identical to those of a new vehicle.
>
> (Website: http://www.motoring.co.za/index.php?fArticleId=2335373, accessed 8 May 2006)

A very good summary of the issues associated with the crash repair test, and of the relationships between motor vehicle design, the characteristics of deformation of the vehicle body and components during a crash, and the safe repair of a crash motor vehicle were examined in a review monograph published in 2000:

> Anselm, D. (2000). The passenger car body: Design, deformation characteristics, accident repair. Warrendale, PA: Society of Automotive Engineers (SAE) International. 336 pp.

I do note that there has been use of low speed crash testing methodologies – or bumper tests – by motoring organisations to assess the cost and ease of repair of low impact crashes involving new motor vehicles and to promote the development of more compatible bumper structures that have better energy absorption characteristics and which allow less aggressivity in vehicle-vehicle crashes. The aggressivity of a motor vehicle is defined as the fatality or injury risk for occupants of other vehicles with which it collides. For crashes involving between two vehicles, aggressivity is affected by such factors as the mass of the vehicle, bumper height, and whether the vehicle is 'overweight' (i.e., is heavier than the average weight for vehicles of the same wheelbase).

There are a number of low speed crash testing methodologies. The RCAR barrier tests typically consists of four tests: a full front impact test, a full rear impact test, a front corner

impact test, and a rear corner impact test. The tests involve an impact at 10 km/h (for full frontal and rear tests) and 5 km/h (for corner impact tests) with a contoured bumper-like barrier with an energy-absorbing element. The evaluation of crash performance usually involves an assessment of damage repair costs and a scale rating of performance (good, acceptable, marginal or poor). Some low speed crash tests involve speeds of 5 mph (8 km/h) and 10 mph (16 km/h).

In Australia, NRMA Insurance conducts a low speed crash test that determines the cost of repair after a motor vehicle is subjected to a pendulum crash, replicating a 15 km/h collision with a solid barrier or a 30 km/h collision into the rear of another vehicle. The NRMA Insurance low speed crash tests are designed purely to determine the cost of repairing motor vehicles following crashes. They do not test occupant safety, and no personal safety conclusions can be drawn from these tests.

There a very limited number of reports that related to products, such as adhesives or structural foams, where the effectiveness or strength of the product was illustrated through a crash testing process that demonstrated that structural integrity was not compromised on a repaired motor vehicle component subjected to impact damage.

This research has documented the very limited number of crash repair tests that have been published. The test conducted at the Autoliv Australia facility on 15 November 2005, as documented in the STAYSAFE 71 (2006) report, was the first full publication of an analysis of a crash repair test. The test involved the crash testing of a Ford Fairmont Ghia AU III that had been involved in a severe road crash previously and had been repaired to the relevant insurer's specifications. The purpose of the crash test was to determine whether the repaired motor vehicle would provide the same protection to occupants as it had been assessed in the original new condition. The test was a frontal barrier offset test, equivalent to the Australian New Car Assessment Program (ANCAP) test, and allowed a direct comparison with previous ANCAP data for this model of motor vehicle.

I understand that after the release of the 2005-2006 STAYSAFE reports into the motor vehicle repair industry in New South Wales, a program of crash testing of repaired motor vehicles was undertaken at the Crashlab facility operated by the then Roads and Traffic Authority. This program also included crash tests of “rebirthed vehicles” – vehicles that had been reconstructed by criminal gangs and which were being resold to the public. The NSW Police Force and the Australian Crime Commission were occasional observers to this work, and some of the vehicles were supplied from these organisations after seizure. Unfortunately, however, the research results of this crash testing program have never been released.