



# RCAR

Research Council for Automobile Repairs

Research Council for Automobile Repairs

# Newsletter

www.rcar.org

June 2001

## RCAR Centres in Major Investment Initiative

The Boards of Directors of RCAR centres IIHS and Thattham have approved investment by each of the centres in new crash test sled systems. The need for these arises principally in the testing of whiplash injury severity during rear impacts to vehicles. Whilst IIHS and Thattham have crash laboratories with barriers, crash test sleds are superior for this type of testing because they are more flexible for impact pulse and because they do not damage (or destroy) the vehicle during the test. The total spend by both centres is approaching US\$5 million.

IIHS President, Brian O'Neill, said: "We are looking forward to the additional testing capabilities that the Hyper-G sled will add to our Vehicle Research Centre. Dynamic testing of seat/head restraint combinations clearly is the next step toward promoting more effective designs for whiplash prevention."

Thattham Director of Research, Ken Roberts, said: "British insurers recognise the absolute need to reduce pain, suffering and cost of whiplash related injuries, which are a major contribution to UK personal injuries in road accidents. This new technology will help our research at Thattham and also will allow us to work much more closely with vehicle manufacturers in seeking solutions through improved automobile design."



A description of the technology is included later in this newsletter. The new systems will be installed in Charlottesville, USA, and Thattham, UK, in early 2002. The technology is the result of collaboration between the Austrian company DSD of Linz, headed by Professor Hermann Steffan and the US company Seattle Safety, headed by Tom Wittman.

### Special points of interest:

- News from 10 RCAR Centres.
- Major investment at IIHS and Thattham.
- News Sources and Forthcoming Events.
- Hyper-G Sled System.

### Inside this issue:

<i>RCAR Centres in Major Investment Initiative</i>	1
<i>News from the Centres</i>	2-6
<i>From the Secretary General</i>	6-7
<i>Euro NCAP</i>	7
<i>Hyper-G Sled System</i>	8-11
<i>ESV 2001</i>	12
<i>News Sources</i>	12
<i>RCAR Network</i>	12
<i>Dates For Your Diary</i>	12

## News From The Centres

### VAT - Finland

Activity over the year at VAT, Finland, has been in three principal areas.

The centre has built a pilot treatment facility for End of Life (ELV) vehicles, ie vehicles that have been provided by insurance companies. The aim of the activity is threefold, namely:

- To take the necessary measures to store and treat the vehicles in accordance with the requirements of the European Directive 75/442/EEC and 2000/53/EC.
- To dismantle cars for re-use.
- To recycle cars.

For the present there are a total of six treatment facilities in Finland that meet the demands of the ELV Directive which takes effect on 21 April 2002.

SMART – Small Area Repair Techniques have been researched and VAT has started co-operating with a number of vehicle manufacturers. The aim is to promote the use of SMART repair methods for minor damage to cars being repaired in the dealer shops thus promoting a reduction in costs.

The third area where VAT has been involved is in aluminium repairs. Aluminium is becoming a more popular material for cosmetic panels and an increasing number of cars have aluminium bonnets or boot lids. Repair shops are either not willing or not able to repair aluminium parts and VAT has started the training of damage assessors and panel beaters in aluminium repairs.

### JKC - Japan

The recent Japan Non-Life Insurance Newsletter No.60 April 2001 ([www.sonpo.or.jp](http://www.sonpo.or.jp)) reported on the all-out effort to combat automotive theft in the Japanese Non-Life Insurance Industry. One point in the action plan was to visit UK and meet with the UK Governmental Vehicle Crime Reduction Action Team, The Association of British Insurers (ABI), RCAR Centre Thatcham and others to discuss the UK theft problem and response to it.

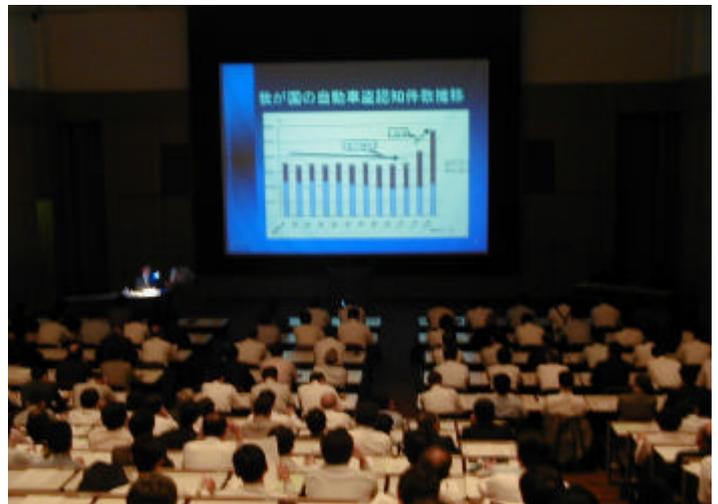
JKC also organised a Car Theft Prevention Seminar with the following key subjects:

- Today's situation and problem of car theft prevention in Japan.
- The modern technology for car theft prevention.
- The activities for car theft prevention of JKC.
- The report of the activities for car theft prevention in UK.
- The investigation of car theft crime.

Tsuneyuki Wada sends us a report of this highly successful seminar.

The number of car thefts has been increasing rapidly since 1999. It was 36,000 in 1998 and reached 56,000 in 2000 – an increase of about 56% in two years. Consequently the insurance payment for the fiscal year 2000 amounted to over 50 billion Yen (approximately \$420 million), which is one of the biggest problems for our insurers. Because of the situation JKC held a car theft prevention seminar in co-operation with the Japan Non-Life Insurance Association on 31 May 2001. More than 200 people, mainly members of insurance companies, attended the seminar, a clear indication of how seriously concerned they are about the present situation.

Specialists from the Japan Automobile Manufacturers Association and the Japan Security Systems Association gave presentations about the modern technology available for the prevention of car theft. JKC and the Japan Non Life Insurance Association also gave presentations about the activities of their respective organisations.



## News From The Centres

JKC explained the activities of other RCAR members, suggested the very beneficial effect of the application of immobilisers and highlighted the importance of safeguarding the car keys to prevent theft of the car.

Participants commented that the seminar was meaningful in tackling the problems of car theft and all agreed that it was essential to equip far more cars with immobilisers and to take efficient measures to ensure the security of registered cars.

Finally JKC will ask each RCAR centre to advise them of the trends of car theft crime and the effective actions to prevent car theft, etc.

### KART – Korea

#### New Head of KART Appointed in April 2001

In April 2001 Sun-Chil PARK took over as Chief of KART from Hae Song OH. Following graduation from Korea University he joined the Korea Automobile Insurance Company Limited in 1974 and for 10 years he spent his career in various fields of automobile insurance. He joined the Korea Insurance Development Institute (KIDI) in 1984 and he has been in charge of the automobile insurance division, information and data management division since he has been with KIDI. In April 2001 he was appointed a Director of KIDI and Chief of KART. Sun-Chil PARK is 52 years of age and likes golfing.

(KART is at [www.kidi.co.kr](http://www.kidi.co.kr))



### State Farm Research - USA

State Farm report that the Partners for Child Passenger Safety (PCPS) Interim Report 2001, "Turning Research Into Action", is now on the web at [www.statefarm.com/kidsafety/reports.htm](http://www.statefarm.com/kidsafety/reports.htm).

PCPS's objects are fourfold: to estimate the number of children in crashes; to identify specific safety problems for children in motor vehicles; to suggest solutions to those problems; and to evaluate real-world effectiveness of vehicle and restraint system features.

Research is currently being conducted in 16 States under comprehensive research collaboration between State Farm Mutual Automobile Insurance Company, The Children's Hospital of Philadelphia (CHOP), and the University of Pennsylvania. To date results from the Partners' Study show that an overwhelming number of children continue to be inappropriately restrained in vehicles. One of the major findings has been that the number of appropriately restrained children drops off dramatically between the ages of 3 and 8. Many of these children, who should be using car seats or best-positioning booster seats, are being inappropriately graduated to the adult seat belt. As a result they are more likely to suffer significant injuries, particularly head injuries.

(State Farm is at [www.statefarm.com](http://www.statefarm.com))

### Thatcham – UK

Since February Thatcham has issued a number of Methods Manuals to UK Repairers and Insurance Engineers. These publications have covered Subaru Impreza, Mazda MX5 and the light truck Vauxhall Movano (SWB) 1999. A number of other technical publications have been issued together with the Thatcham Training Centre General Course programme and early notification of the Bodyshop Craft Awards which Thatcham sponsor to encourage and reward excellence amongst repairers. Technical publications cover new Citroën Paint Codes, New Inner Door Panel from the Citroën Xsara, Rover 45 Exterior Plastic Parts, amendments to the Renault Espace MK3 MPV Methods Manual and Peugeot 406, Replacement of Bodyshell.

## News From The Centres

Thatcham's website ([www.thatcham.org](http://www.thatcham.org)) has been updated and partially re-launched. Other highlights this Spring have included a major presence at the European Automobile Trade Show (EATS) and the launching of a new premium IT product offering vehicle research data in "e Scribe". Also there has been a decision to make major investment in the Crash Laboratory (see lead article)

(Thatcham is at [www.thatcham.org](http://www.thatcham.org))

### Allianz – Germany

In addition to issuing a number of technical bulletins, Allianz Centre for Technology (AZT) has contributed to the Global Risk Report 1/01 (see [www.globalrisk.allianz.com](http://www.globalrisk.allianz.com)). This new and influential global review contains a number of interesting topics for RCAR members.

The Formula One: Braking High Speed Risk is the first look at the safety issues involved in Allianz's link up with BMW Williams Formula One Team and FIA, reported in RCAR Newsletter June 2000.

Dog Crash Tests Dig Up Safety Flaws is an interesting look at the containment of animals in the rear of passenger vehicles and, incidentally, a follow up to a paper presented by Dr Dieter Anselm at a recent RCAR conference.

Fleet Programs Go Extra Mile for Safety is an examination of traffic accidents in Ireland together with a comparison of road fatalities in selected countries.

(Allianz is at [www.allianz-azt.de](http://www.allianz-azt.de))

### CESVIMAP – Spain

A number of Technical Data Sheets have been issued in the last few months including the following:

Renault Laguna II	Plastic Adhesives
Treatment of Residual Substances	Repair of Side Air Bags
Pick-Up Trucks	Mega Scooters
Multiplex Electrical Systems	Plastic Covering/Shielding for Painting
Nissan Almera 2000	VIRCO Vehicle Hoist
MIG/MAG Welding of Aluminium	3M-PPS System
Steering Adjustments	Repairs to Motor Cycle Fuel Tanks

CESVIMAP Magazine has been distributed to RCAR members and contains articles on Colour Fusion, Mercedes A Class, Industrial Vehicles, Road Safety, the Car-o-liner Benchrack 5000, REHM Synergic 324 welding equipment, Dealing with People (mainly for claims adjustors), quality control and the environment together with innovations. Shop window travel notebook and books, English and Spanish versions, are on the web at [www.revistacesvimap.com](http://www.revistacesvimap.com)

Earlier this year a significant landmark was reached when Julio Castelo, President of MAPFRE, retired after a very successful career heading the largest insurance company in Spain. In addition to his work with MAPFRE he will be remembered for his pioneering work as the driving force in the internationalisation of CESVIMAP and, together with Antonio Estrada, the creation of the CESVI centres in Latin America and France.

(CESVIMAP is at [www.cesvimap.com](http://www.cesvimap.com))

### Centro Zaragoza – Spain

Two editions of Centro Zaragoza's magazine have been issued since the last Newsletter. Topics in the March edition included accreditation, blending in the paint process, the ageing of plastic material, recycled parts, detection of fraud in traffic accidents with reference to the level of damage to lights and bumpers. Two safety issues were included covering the loading of goods vehicles and maintenance of safe distances between vehicles. Centro Zaragoza's laboratory was accredited by the National Accreditation Body (ENAC) according to EN45001 which describes the workings of test laboratories and analyses their quality control systems.

Topics in the June edition cover the use of alternative parts, the use of aluminium in cars, the use of the Aerographic Spray Gun, the management of toxic and dangerous residues in workshops, painting of plastic parts, electronic injection of diesel engines, transmission and drive shafts of passenger cars, and the collection of information at the scene of a road accident.

## News From The Centres

### VICC – Canada

The Canadian Vehicle Research Council (CVRC), under the administration of VICC, has the following projects underway.

- CVRC is in the process of evaluating and distributing a report which is the result of a comprehensive survey involving vehicle manufacturers, component suppliers and individuals in the collision repair sector to attempt to identify various near-term technologies and rank them in terms of likely repair costs from the perspective of the Canadian insurance market. The intention is to use the report in discussions with vehicle manufacturers on Damageability and Reparability (D&R) and potentially in considering whether certain vehicle design features may be used as additional parameters in Canadian Loss Experience Automobile Rating (CLEAR) predictive equations.
- Under the mandate of CVRC's Glass Issues Subcommittee a test programme will begin shortly to determine if there are detectable differences in quality between various suppliers of windshields for the same applications. The project compares windshields for adherence to ANSI Standard Z26.1 as well as comparing variations in mounting surface dimensions.
- Since air bag systems are not explicitly required by Federal Canadian motor vehicle safety standards (which regulate mandatory equipment in new vehicles), certain Provincial jurisdictions, which are responsible for ensuring roadworthiness, have taken the position that air bag systems need not be operational. CVRC is striving to present the case to provincial regulators that seat belt systems are designed to work in tandem with the air bag and removing the air bag system likely compromises safety.

A number of other initiatives are under way, namely use of salvage air bag modules, use of aftermarket collision repair parts, identification of collision repair parts with high replacement frequency, and advancements in the VICC Theft Deterrent Program.

### VICC Hosts Successful AIM Conference

VICC hosted their annual AIM (Automotive Insurers & Manufacturers Forum) Conference in Toronto, Canada, in May this year. The theme was Enhancing Value Through Co-operation. The two-day conference covered the following areas: combating vehicle theft, vehicle repairs, occupant safety, insurance perspectives, distribution and technology, vehicle technology, networks and connectivity.



**Group of Speakers**



**AIM Conference in Progress**

RCAR members giving papers and sitting on discussion panels were Costa Kaskavaltzis, VICC, Ken Roberts, Thatcham, Jack Zacharias, MPI, Brian O'Neill, IIHS, and Henning Norup, VICC. For details see [www.vicc.com](http://www.vicc.com) in What's New – Events and Conferences.

(VICC is at [www.vicc.com](http://www.vicc.com))

## News From The Centres

### IIHS - USA

The Institute has issued three status reports since the last RCAR Newsletter, including a special issue on crash worthiness, together with other issues covering red light cameras, adjustments to yellow light timing, new Federal head restraint rules and the RCAR Global Standard for Whiplash Prevention. The latest special issue advocates that education alone does not make driving safer.

In their continuing monitoring programme on crash worthiness the Institute was upbeat in its assessment that automakers are paying attention to the results of the Institute's 40 mph frontal offset crash test. Comparisons were made between 1995-98 models where 22% were rated GOOD and 1999-2001 models where this had risen to 52%. At the other end of the scale, 29% were rated POOR in 1995-98 whereas this had fallen to 12% for 1999-2001. Some 20 vehicles are listed as having improved, with 8 vehicles showing no improvement following redesign. The improvements are acknowledged as being general as witnessed by NCAP performance and not restricted to the USA (see Euro NCAP results elsewhere in this newsletter).

In new research into the crash effects of camera enforcement in the USA, the Institute has shown that "front into side" crashes at intersections with traffic signals – the collision type most associated with red light running – fell by 32% with 68% less front-into-side crashes involving injuries. As the Institute points out, this is the first proof following a scientific study that citywide crash reductions have followed the introduction of red light cameras. In a separate development the Institute reports upon a joint initiative with the Institute of Transportation Engineers (ITE) and State and local transport officers in New York. By retiming the change interval (the yellow light phase plus the very short all-red phase that follows the yellow light at many intersections) crash reductions were noted at 8% overall. Copies of "Changes in Crash Risk Following the Retiming of Traffic Signal Change Intervals" by RA Retting et al are available from the Institute.

In its recent special issue the Institute focuses on driver education and makes the point that education alone will not make driving safer. What is needed is a broader, more mixed approach. Certainly central to any sustained improvement in safety is an understanding of what works and what does not work. Also that drivers, vehicles and roads should all be considered. Less well-intentioned educational encouragement via safe driving courses, public service announcements, bolstered by billboards, bumper stickers and assorted trinkets and more emphasis on traffic laws and enforcement would pay off. Children are an exception in that education works in changing their behaviour. However, in a thought provoking and well-referenced article, balance and a holistic approach is advocated. This theme was endorsed at the recent ESV Conference in Amsterdam in a key note by Claes Tingvall (see Secretary General's short report to RCAR Members, June 2001).

(IIHS is at [www.hywsafety.org](http://www.hywsafety.org))

## From The Secretary General

Welcome to our June 2001 Newsletter. I very much hope that you find it varied and relevant. Certainly at the mid-year point there is a great deal of activity and of course our thoughts start to turn towards the annual conference to be held in Korea in just three months' time.

News From The Centres features 10 of our 24 Centres. Two Centres have organised conferences or seminars, namely JKC, Japan, for vehicle theft in their country, and VICC, Canada, their annual AIM Conference. Meanwhile in the lead article substantial investment is being made in the UK by Thattham and in the USA by IIHS. This is on top of the investment reported in the February newsletter by CESVI Argentina in an intelligent building in Buenos Aires, and ICBC, Canada, in their crash laboratory in Vancouver. It is great to see the Boards of Directors of these centres, all insurers, providing resources to meet well defined needs and hence move towards controlling the cost of motor insurance claims and improvements in occupant safety. As the technology used in sleds has changed so much I felt that RCAR Members would appreciate a briefing on the sleds being provided to IIHS and Thattham, hence the article in the newsletter. I saw the sled in action when I visited Linz in Austria late in 2000 with colleagues from Thattham and IIHS, and I was most impressed by the results.

The group dealing with the development of a dynamic standard for whiplash in passenger cars has progressed well and embraces three RCAR Centres, namely IIHS, AZT and Thattham. The group is also joined by the German Insurance Industry's safety research arm of GDV. Members will know that progress is reported on the RCAR web site: [www.rcar.org/projects](http://www.rcar.org/projects).

## From The Secretary General (continued)

On the question of the web site I am pleased to report an increase in the number of monthly "hits". March, April and May registered 18,000, 21,000 and 23,000 respectively. There is a great deal of interest in the web site and particularly in the access to and downloading of the RCAR Standards and Position Papers.

I attended the ESV Conference earlier this month in Amsterdam. I enjoyed it very much and I believe benefited from some of the papers and also welcomed the networking opportunity. This is reported elsewhere in the Newsletter, but it was good to meet colleagues from a number of RCAR Centres. Of course ESV is one of a number of safety conferences and I was reminded whilst in conversation with Dieter Anselm of AZT that the safety research community have a comprehensive series of networking opportunities compared with their colleagues researching material damage where the annual RCAR Conference provides the main and, in most years, the only research forum. We must cherish it and ensure we continue to get the most from it.

I have received most of the topics for our 2001 Conference in Seoul and will be putting together the Technical Programme shortly. As in previous years the diversity of subjects covering material damage, safety and security promises to be extremely varied and useful. I am looking forward to an interesting and valuable conference and to meeting RCAR delegates and partners in early October.

Best wishes

Michael Smith

## Euro NCAP

The latest test results were released on 5 June 2001 as follows:

	<u>Occupant protection</u>	<u>Pedestrian protection</u>
<b>Small Family Cars</b>		
Honda Civic	4 stars (79%)	3 stars (72%)
<b>Large Family Cars</b>		
Mercedes C-Class	4 stars (92%)	2 stars (33%)
Rover 75	4 stars (88%)	2 stars (36%)
Volkswagen Passat	4 stars (82%)	2 stars (36%)
Mitsubishi Carisma	3 stars (71%)	2 stars (44%)
Renault Laguna II (*)	5 stars (97%)	2 stars (33%)
Audi A4 (*)	4 stars (88%)	1 star (19%)
<b>Small MPVs</b>		
Fiat Multipla	3 stars (56%)	2 stars (36%)
Vauxhall/Opel Zafira	3 stars (65%)	2 stars (36%)

(\*) Results released in March 2001

The Honda Civic was singled out as having achieved a break through in levels of pedestrian safety. Max Mosley, Euro NCAP Chairman and FIA President said: ".....For the first time in the history of Euro NCAP it's clear that a manufacturer has designed a car which genuinely balances the safety needs of both occupants and pedestrians."

Full details at: [www.euroncap.com](http://www.euroncap.com).

Related sites:   Australia    [www.nrma.com.au](http://www.nrma.com.au)  
                   Japan        [www.osa.go.jp](http://www.osa.go.jp)  
                   USA         [www.nhtsa.gov/cars/testing/ncap](http://www.nhtsa.gov/cars/testing/ncap)  
                                   [www.highwaysafety.org](http://www.highwaysafety.org)

# Hyper-G Sled System

By Tom Whittman\*

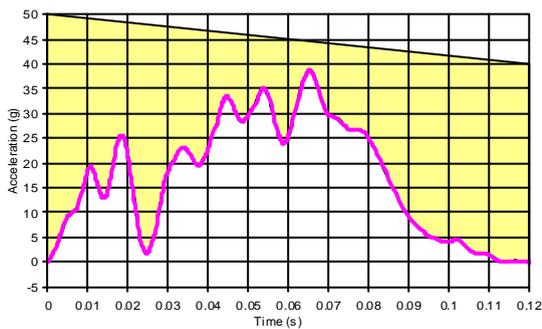
## How the Hyper-G Works:

All reverse acceleration sleds, from the Bendix pin-orifice sled developed in the 1950's, to the Hyper-G of today, are basically alike. The test article (often a car body with crash dummies inside) is mounted on a carriage or sled. An accelerator pushes on the sled with variable force. Since force is proportional to acceleration ( $F = ma$ , Newton's Law), if the force can be modulated quickly and accurately the sled will experience an acceleration duplicating what is experienced by a car during an actual impact. These systems are called reverse acceleration sleds, because unlike a car crash, where the car might decelerate from 56kph (35 mph) to zero in less than a meter, on a sled the car body accelerates from zero to 56kph (35 mph) in that same meter. So long as the acceleration pulse is the same in each case, the dummy (or occupant) response is the same.

A reverse accelerator is difficult to design because the forces it needs to generate are extremely high, upwards of 2MN (450,000 lb), and the force must be modulated very quickly. Below is a typical modern offset-impact car pulse. The impact lasts less than 1/10 second, and in that very short time it needs to modulate a number of times. When analyzed for frequency, car crashes pulses often have significant frequency components up to 175 hz.

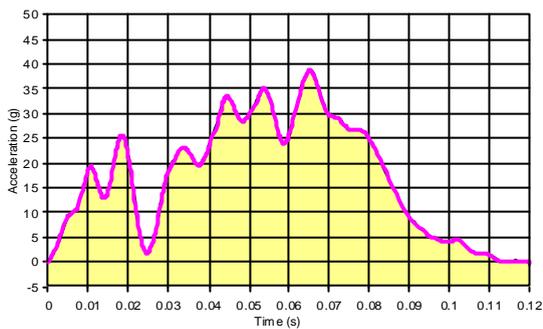
The pin-orifice Bendix/Hyge and similar systems simply cannot modulate force this quickly, and they are inconvenient to operate because different pulses require different machined pins. Greater convenience and higher frequency response is now possible with computer controlled sleds, which now dominate the market.

The curves below show the basic operating difference between the Hyper-G and competing servo-hydraulic sled systems:



### Hyper-G System

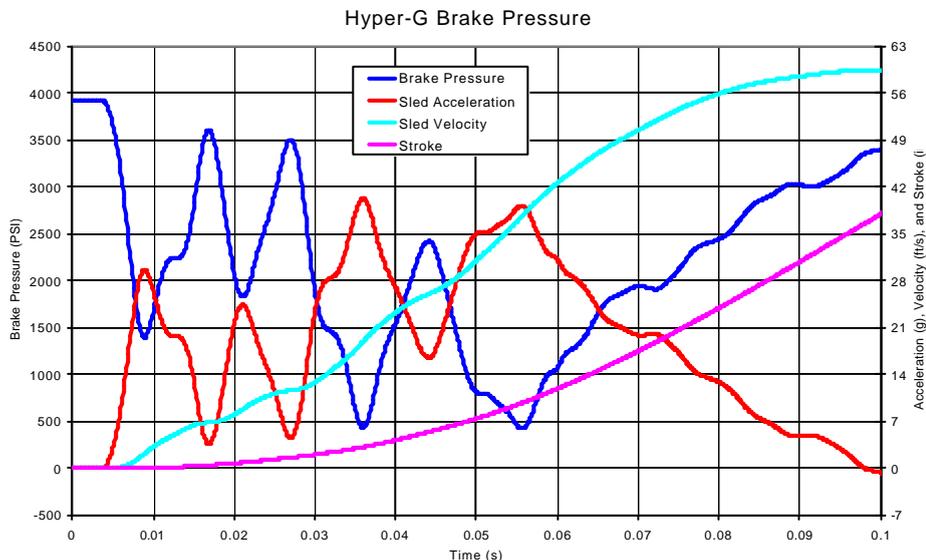
Small servo-valves modulate a friction brake that absorbs energy to produce the curve. Yellow area corresponds to force absorbed by the brake.



### Conventional Servo-Hydraulic System

Very large servo-hydraulic valves directly modulate flow needed to produce pulse. Yellow area corresponds to hydraulic force modulated by hydraulic system.

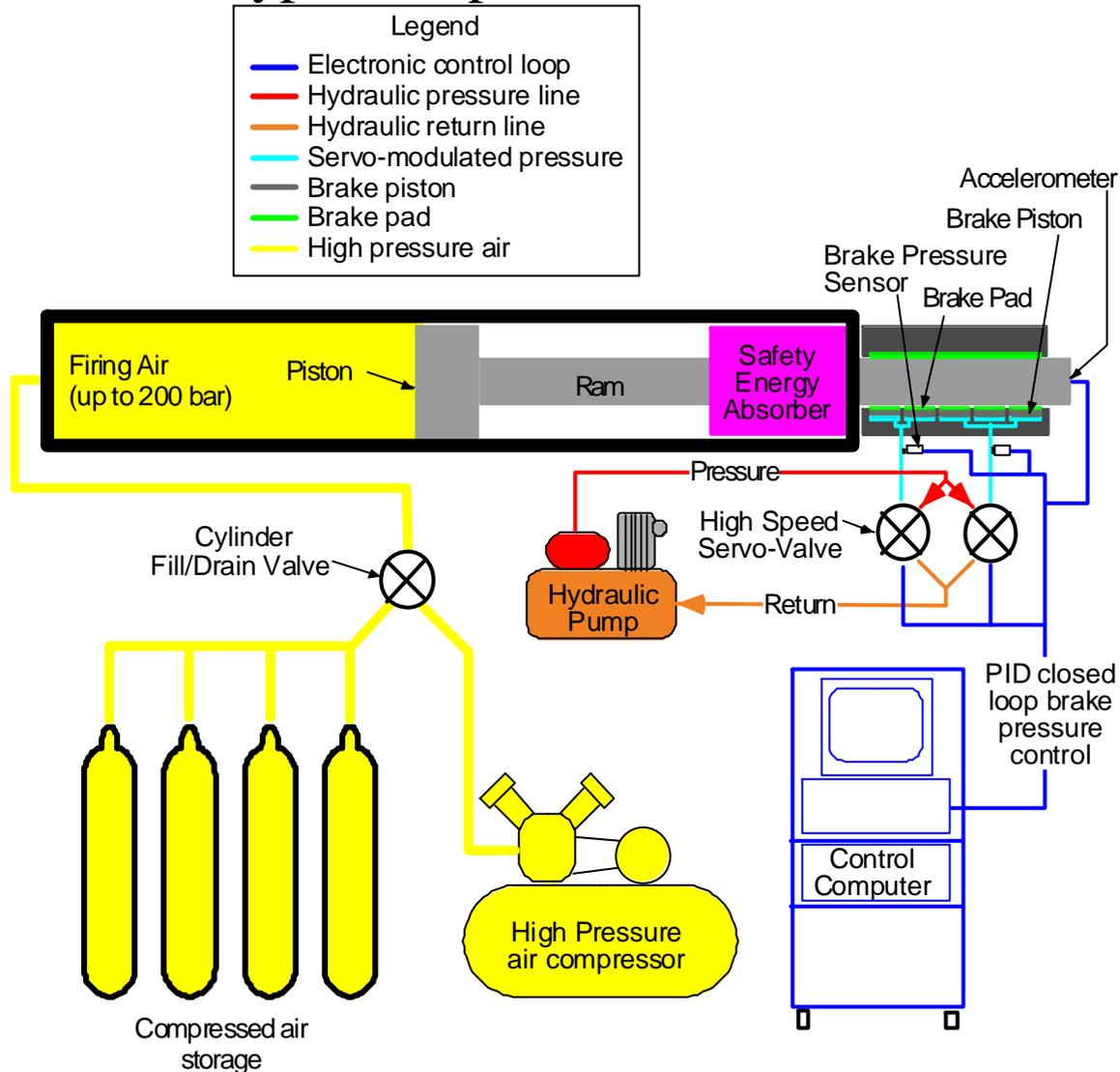
The chart below shows the relationship between brake pressure and sled acceleration in the Hyper-G:



## The Hyper-G Sled System (continued)

This curve is another offset impact car crash acceleration. The dark blue curve is brake pressure plotted on the left in PSI. On the right sled acceleration, velocity and stroke are plotted. (My apologies to readers more familiar with metric units). Sled acceleration follows an essentially inverse relationship with brake pressure, with the pressure drop in the pneumatic system as the air expands a complicating factor (this pressure drop can be graphically seen as the sloped top of the yellow area in the first Hyper-G graph). Before the pulse, the brake holds the ram in place so it cannot move, while the high pressure air exerts its full force on the ram. As brake pressure is dropped, the sled starts to move. The sled accelerometer is being monitored, and the servo fills and bleeds the brake as required to adjust the brake pressure so that the desired acceleration curve is achieved.

### Hyper-G Operational Schematic



The Hyper-G system can be broken into two parts: Force Production and Force Attenuation. Force Production is not modulated, so it is very simple. In the Hyper-G force is produced by expanding compressed air in a cylinder, driving a piston attached to the ram which pushes the sled. Compressed air cylinders are commonly used in industry for supplying large amounts of force, and all parts of the pneumatic system are made up of conventional parts that can be serviced using common methods. An advantage of the Hyper-G is that no nitrogen is needed in the pneumatic system. Air alone is required.

Force Attenuation is performed by a friction brake. In the Hyper-G brake, multiple brake pads press directly on the side of the ram. The braking force is directly proportional to how hard the brakes press against the ram, which is directly proportional to hydraulic pressure in the brake. By modulating brake pressure the sled acceleration is varied.

## Hyper-G Sled System (continued)

A conventional hydraulic pump acts as a hydraulic power source. High speed servo-valves are used to modulate brake pressure. These valves direct fluid from the hydraulic pump supply line into the brake if higher brake pressure is needed. If lower brake pressure is needed, they bleed brake pressure into the hydraulic return line. The servo-valve has a frequency response exceeding 200 hz, so ample speed is available to vary brake pressure.

Another key feature of the Hyper-G brake is mechanical rigidity. If the brake pads did not move at all as the brakes are applied and released a very small hydraulic valve would be adequate for the system, as the hydraulic flow would be negligible. In real life all components are elastic. Careful design of the Hyper-G brake keeps movement below 0.25mm (0.01 in). This corresponds to fluid flows small enough so that a modest hydraulic system can drive a very powerful brake.

### Hyper-G Performance

Sled performance comes down to four basic questions:

- How Fast?
- How Accurate?
- How Powerful?
- How Easy to Use?

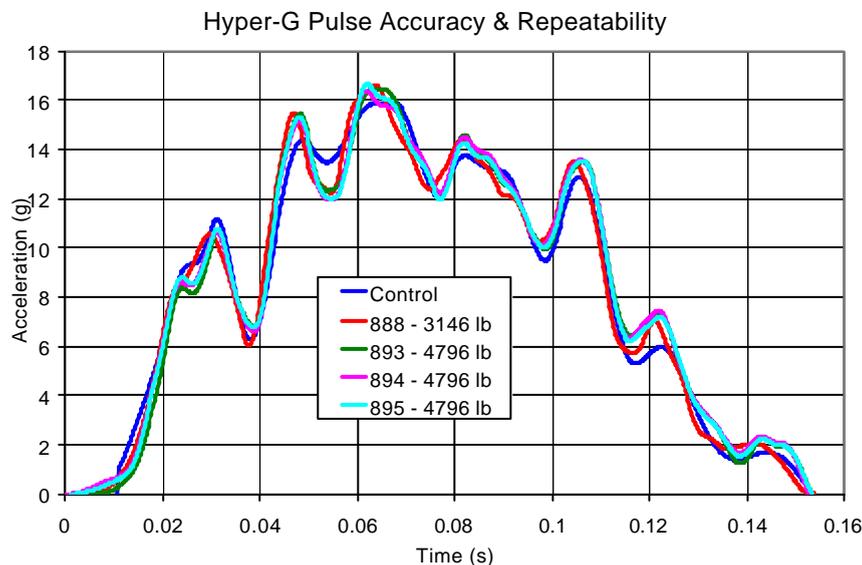
The Hyper-G is a new technology. Two Hyper-G sleds exist: a Hyper-G 22 and a Hyper-G 140. The Hyper-G 22 is a small sled (215KN or 48,400 lb) that was built to prove the concept. It works well and is four years old with 1500 tests run. The Hyper-G 140 is powerful (1370KN or 308,000 lb) and is one year old with over 500 tests run. Even though the technology is new, the Hyper-G 140 already performs on a level that is fully comparable to conventional servo-hydraulic sleds, a 20-year-old technology. Unlike conventional sleds, Hyper-G performance improvements are just starting. The production sleds are a still newer generation with performance significantly better than is available elsewhere at any price.

### How Fast?

The Hyper-G system uses a smaller hydraulic system, which is inherently faster. Furthermore, Hyper-G hydraulics flow very little fluid, so inertial and friction effects of large fluid flows do not slow performance or cause system non-linearity. The difference is crucial. Only the Hyper-G is fast enough and linear enough to allow 100% closed loop operation, which has huge advantages detailed below.

### How Accurate?

Uniquely, the Hyper-G monitors sled acceleration during the sled pulse, and modulates the force to keep the pulse correct. This error correction means the system automatically adjusts for changes that may occur over time or due to error. Although competing systems have closed-loop control of some system sub-components, they simply are not fast enough or linear enough to run closed loop from the sled accelerometer. This means accuracy is dependent on exactly knowing all conditions prior to test. If the sled weight is off, accuracy suffers. If the hydraulic fluid is thicker accuracy suffers. If the system simulation is not accurate accuracy suffers. If the valve offset or gain has drifted accuracy suffers.



## Hyper-G Sled System (continued)

### How Powerful?

The Hyper-G operates by using a number of brake cylinders acting in tandem. Larger Hyper-G sleds don't use bigger valves or brake cylinders, they use of the same components acting in tandem. For this reason the Hyper-G concept can be expanded to any anticipated power with no performance loss.

The Hyper-G is also more powerful in a subtler way. Sled systems are rated by nominal peak force, which is the highest static load they can produce. Actual load delivered to the sled is less. In all systems the deliverable load drops with ram stroke, because all sleds use expanding gases as the power source. How much the load drops depends on how large the air source is. All sleds have this problem; all can address using larger tanks or accumulators. But conventional servo-hydraulic sleds have another, worse problem; the deliverable force drops as sled velocity rises, because the valve increasingly resists faster fluid flow.

In contrast, Hyper-G hydraulics flow no more fluid as the sled speeds up, and the air powering the sled flows with very little restriction. The Hyper-G can be easily engineered to deliver 80% of peak load at a stroke of 1m (3.28 ft) at a sled velocity of 56 kph (35mph). This is really important with modern pulses like the first two above which are characterized by longer strokes and late peak acceleration. It means that in real world a smaller Hyper-G is actually equivalent to a larger conventional servo-hydraulic sled.

### How Easy-to-Use?

The closed loop operation makes the Hyper-G much easier to use. Has the sled weight changed? The system corrects. Is the test a duplicate of one run a year ago? The system adjusts for any changed characteristics due to temperature or wear automatically. Is the pressure dropping? The system corrects. Most importantly, the closed loop operation makes running a new pulse far easier. In conventional servo-hydraulic sleds running a new pulse entails an iterative process where the system is mathematically modeled, and then a practice test is run. The results of the practice test are then incorporated into the model and another practice test is run, etc.

The inherent non-linearity of the high-flow hydraulics limits the accuracy of the model, and the lack of real-time correction limits the improvements from each test. 5 to 10 practice tests are common with conventional servo-hydraulic sleds. The Hyper-G system is more linear, and therefore the models are more accurate. Furthermore, the closed-loop operation means the sled corrects itself in real-time. This means that in real life simple pulses (regulatory pulses and other pulses that do not oscillate much) can be run with no practice tests. (An industry first) Even the most complex pulses require only 3 practice tests.

## Advantages At A Glance

This system, the Hyper-G™, has been selected by IIHS and Thatcham for their sled systems. Manufactured by DSD/Seattle Safety ([www.seattlesafety.com](http://www.seattlesafety.com)), the system has several advantages that made it particularly attractive for the intended whiplash studies:

- It is available in smaller sizes. Since the intended testing is relatively low velocity, a smaller system is all that is needed by IIHS & Thatcham. The system chosen is the Hyper-G 70, which indicates a nominal peak force rating of 70,000 kgf. Systems are available from 40,000 kgf to 210,000 kgf. For reference the 12 inch Bendix/Hyge sleds that are still the most common sled type have a peak force rating of 102,000 kgf.
- A small hydraulic system inherently has faster and more linear response than a larger system. This allows the system to monitor the sled acceleration during the test, and correct sled force instantly. This 100% closed loop control is only available on the Hyper-G, and it greatly minimizes the need to run 'practice tests' to get the pulse right.
- The smaller hydraulic system is built up from commercially available components, and is therefore easily serviceable into the future. Expected maintenance cost and downtime are far lower than with the conventional hydraulic systems.
- Purchase price.

---

\*Tom Whittman is President of Seattle Safety.

E-mail: [info@seattlesafety.com](mailto:info@seattlesafety.com)

Web Site: [www.seattlesafety.com](http://www.seattlesafety.com)

Pound House  
Lockeridge  
Marlborough, Wiltshire  
SN8 4EL United Kingdom

Phone: +44 1672 861072  
Fax: +44 870 705 8565  
Email: michael.smith@rcar.org

## The RCAR Network

Of the 24 RCAR Centres in 17 countries, 18 have web sites. Addresses are to be found on [www.rcar.org](http://www.rcar.org). However, for convenience, web sites are also listed below.

AZT	<a href="http://www.allianz-azt.de">www.allianz-azt.de</a>
Centro Zaragoza	<a href="http://www.centro-zaragoza.com">www.centro-zaragoza.com</a>
Cesvimap	<a href="http://www.cesvimap.com">www.cesvimap.com</a>
Cesvi Argentina	<a href="http://www.cesvi.com.ar">www.cesvi.com.ar</a>
Cesvi Brasil	<a href="http://www.cesvibrasil.br">www.cesvibrasil.br</a>
Cesvi Colombia	<a href="http://www.cesvicolombia.com">www.cesvicolombia.com</a>
Cesvi Mexico	<a href="http://www.cesvimexico.com.mx">www.cesvimexico.com.mx</a>
Folksam Auto	<a href="http://www.folksamauto.com">www.folksamauto.com</a>
ICBC	<a href="http://www.icbc.com">www.icbc.com</a>
IIHS	<a href="http://www.hywsafety.org">www.hywsafety.org</a>
KART	<a href="http://www.kidi.co.kr">www.kidi.co.kr</a>
KTI	<a href="http://www.k-t-i.de">www.k-t-i.de</a>
Lansforsakringar	<a href="http://www.lansforsakringar.se">www.lansforsakringar.se</a>
NRMA	<a href="http://www.nrma.com.au">www.nrma.com.au</a>
State Farm	<a href="http://www.statefarm.com">www.statefarm.com</a>
Tech-Cor	<a href="http://www.tech-cor.com">www.tech-cor.com</a>
Thatcham	<a href="http://www.thatcham.org">www.thatcham.org</a>
VICC	<a href="http://www.vicc.com">www.vicc.com</a>

## Dates For Your Diary

**45th Annual Conference of the Association for the Advancement of Automotive Medicine (AAAM)** is to be held in San Antonio, Texas, 23-26 September 2001.

Details: <http://www.carcrash.org/annual.html>

**Annual RCAR Conference 2001** is to be held in Seoul, Korea, 7-12 October 2001, and will be hosted by KART.

**IRCOBI (International Research Council on the Biomechanics of Impact) Annual Conference** is to be held in the Isle of Man, UK, 10-12 October 2001.

Details: <http://www.ircobi.org>

**45th STAPP Car Crash Conference** is to be held in San Antonio, Texas, 15-17 November 2001.

Details: <http://www.stapp.org>

**NACE 2001** will be held in Las Vegas, from 29 November to 2 December 2001.

Details: <http://www.naceexpo.com>

**SAE 2002 World Congress** is to be held in Detroit, Michigan, 4-7 March 2002.

Details: <http://www.sae.org>

## ESV Amsterdam 2001, 4-7 June 2001

The 17<sup>th</sup> International Conference on the Enhanced Safety of Vehicles (ESV) was held in Amsterdam, Netherlands, 4-7 June 2001. The Conference attracted some 550 delegates from 23 countries. Over the four days the scientific programme covered the presentation of 153 papers in 12 sessions with a further 18 poster presentations and 69 written papers.

This meeting brings together key participants in government, vehicle manufacturing and supply, consumer organisations and the research community. The first day was dominated by status reports of the various governments reporting progress in their countries. The technical programme covered the following outline topics: injury criteria and dummy development, advanced technology safety systems, worldwide NCAP related to existing test procedures, data collection, event data recorders and risk assessment, development of frontal impact protection, simulation of computer modelling and vehicle safety, comparability in frontal and side collision, improved safety for vulnerable road users, development of restraint systems, developments in side impact protection, safety of heavy trucks and buses, and intelligent transport systems collision avoidance.

RCAR Members have a separate short report from the Secretary General. The programme can be viewed on [www.esv2001.com](http://www.esv2001.com).

## News, News...

It is not the intention to provide the latest automotive or insurance industry news in this Newsletter. However there are some excellent sources available on the Web and members may find the following sites useful.

Automotive Online.	<a href="http://www.automotive-online.com">http://www.automotive-online.com</a>
Automotive.com	<a href="http://www.automotive.com">http://www.automotive.com</a>
AM-online	<a href="http://www.am-online.com">http://www.am-online.com</a>
Associated Press.	<a href="http://www.ap.org">http://www.ap.org</a>
AutomotiveNewsWire.	<a href="http://www.brgtownsend.com">http://www.brgtownsend.com</a>
BBC	<a href="http://www.news.bbc.co.uk">http://www.news.bbc.co.uk</a>
Bloomberg.	<a href="http://www.bloomberg.com">http://www.bloomberg.com</a>
CeBIT	<a href="http://www.cebit.de">http://www.cebit.de</a>
Cisco Systems	<a href="http://www.cisco.com">http://www.cisco.com</a>
CMGI	<a href="http://www.cmgi.com">http://www.cmgi.com</a>
CNN.	<a href="http://www.cnn.com">http://www.cnn.com</a>
Computer Weekly	<a href="http://www.cw360.com">http://www.cw360.com</a>
E-commerce.	<a href="http://www.ecommercetimes.com">http://www.ecommercetimes.com</a>
Far East Newsletter.	<a href="http://www.feer.com">http://www.feer.com</a>
Financial Times.	<a href="http://www.ft.com">http://www.ft.com</a>
Fleet NewsNet.	<a href="http://www.automotive.co.uk">http://www.automotive.co.uk</a>
Glass's Information	<a href="http://www.glass.co.uk">http://www.glass.co.uk</a>
Individual.Com	<a href="http://www.individual.com">http://www.individual.com</a>
JUST-AUTO	<a href="http://just-auto.com">http://just-auto.com</a>
JRM.	<a href="http://www.jrm-software.co.uk">http://www.jrm-software.co.uk</a>
Microsoft Web-Venturer	<a href="http://www.web-venturer.co.uk">http://www.web-venturer.co.uk</a>
MSN.	<a href="http://www.msn.com">http://www.msn.com</a>
NEC.	<a href="http://www.necgroup.co.uk/exhibitions">http://www.necgroup.co.uk/exhibitions</a>
New York Times.	<a href="http://www.nytimes.com">http://www.nytimes.com</a>
Newspage.	<a href="http://www.newspage.com">http://www.newspage.com</a>
ODETTE	<a href="http://www.odette.org">http://www.odette.org</a>
REUTERS.	<a href="http://www.reuters.com">http://www.reuters.com</a>
Roadtransport.	<a href="http://www.roadtransport.net">http://www.roadtransport.net</a>
Silicon.	<a href="http://www.silicon.com">http://www.silicon.com</a>
SMMT.	<a href="http://www.smmt.co.uk">http://www.smmt.co.uk</a>
Slate.	<a href="http://www.slate.com">http://www.slate.com</a>
The Independent	<a href="http://www.independent.co.uk">http://www.independent.co.uk</a>
Wired.	<a href="http://www.wired.com">http://www.wired.com</a>
Wall Street Journal.	<a href="http://www.interactive.wsj.com">http://www.interactive.wsj.com</a>
Yahoo!	<a href="http://uk.yahoo.com">http://uk.yahoo.com</a>
ZD.	<a href="http://cgi.zdnet.com">http://cgi.zdnet.com</a>