

Section Web Site: [www.sae-arizona.org](http://www.sae-arizona.org) - Sign up for your newsletter on our website.

## HIGHLIGHTS...

- Race Car Suspensions
- Message from the Chair
- Recap of September Meeting
- New ANC Delegate
- SAE Arizona Section Commitment

Dinner Presentation...

## Race Car Suspension Design

By Mike Halpin

In this presentation, Mike Halpin will discuss the basics of why shocks (dampers) are needed, different types of shock designs, shock dynamometers, vehicle dynamic basics for a road race car, and road race car set-up. He will explain ride frequencies, spring rate selection, anti-roll bar selection, and damping ratios. We will look at actual shock dynamometer graph printouts, and he will review damper valving and explain how it works.

Mike will bring some small parts for examination. His emphasis will be on more than components, but he will go into detail as to how to analyze and tune suspensions. Mike will also discuss how the MOTEC data acquisition system is useful in analyzing a racecar's performance. The data from the MOTEC system is compared for different setups to judge effects of suspension tuning.

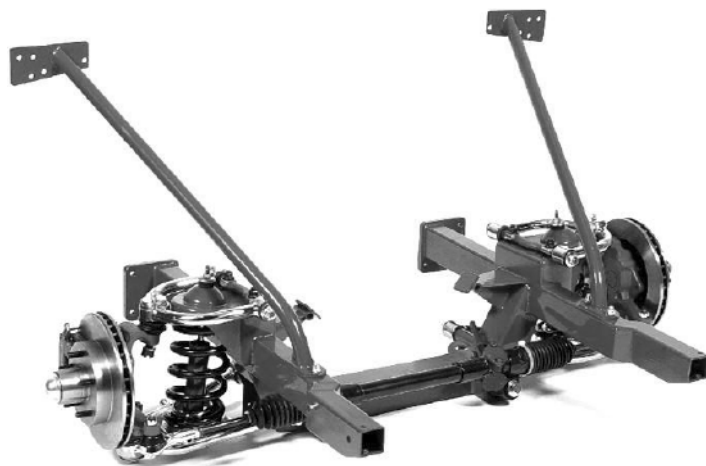
If you don't get the suspension right, having a lot of power will not help. That's why suspension systems are one of the biggest challenges in race car design. Race cars have

double A-arm-type suspensions, which allows for more precise control of wheel movements under cornering conditions. Normally, race cars are designed to over-steer rather than under-steer like the family sedan. The interplay between tire behavior and suspension geometry is what makes the outstanding performance possible of today's race cars.

Race car engineering is less theoretical than other forms of engineering. Much of it is based on real world experience and system tuning. And everything's a compromise. Whatever one does, something else is compromised or in some way impacted by design choices.

### Mike Halpin

Mike Halpin is a Sr. development mechanical engineer with ASM America, an OEM semiconductor equipment manufacturer, in Phoenix. Mike also runs a business that tunes racing suspensions for racecars and racing motorcycles. This company, Suspension Research & Development, Inc., SRD, Inc. is located in Scottsdale, AZ and is a fully equipped shop complete with CNC capabilities, and shock dyno services. SRD performs engineering solutions for many types of vehicle suspension systems, including shock, (damper), design, shock valving development, spring rate selection, antiroll bar design and selection, and structural analysis, along with CAD and FEA work. SRD's customer base includes many motocross racers, NASA pro-racing, SCCA, SCCA-PRO, and Grand-Am racers, General Motors Truck Division, and General Motors Corvette Division. Mike is a holder of 24 US and International patents. Mike is also currently a professional road race driver with a BMW team out of Pennsylvania, competing in Grand-Am events.



**Our new meeting schedule. Dinner now begins 1/2 hour earlier, at 6:30 pm.**

DATE	TIME	LOCATION	COST	With Dinner	Presentation Only
Oct. 20	Social	- 6:00 pm	Crowne Plaza Hotel (Holiday Inn)	Members - \$20	\$10
	Dinner	- 6:30 pm	44th St. & Washington	Guests - \$25	\$10
	Presentation	- 7:30 pm	602-273-7778	Students - \$10	no charge

**RSVP by 2:00 pm Monday October 17. Call Mindy Erway: 602-364-7122**

## Message from the Chair

Our first meeting of the year was very successful with 72 attendees to see Jim Contes tell us about the new Z06 Corvette. The Corvette has a long history of performance, and General Motors has outdone themselves with the new Z06. Not only does the Z06 perform better than any other Corvette, but it does so in a way that is consistent with its heritage, with a push-rod engine with two valves per cylinder. Special thanks go to Jim for his presentation and for bringing the car and the rolling chassis for us to look at. I would also like to



Allan Watts, Section Chair.

thank Bill Guest for bringing his 1966 Corvette and telling us about it. Bill's car shows us how the Corvette has evolved over the last 40 years without giving up its performance character.

When I was in engineering school at ASU, I dreamed about having a career with an automobile manufacturing company. My SAE student section trips to the GM and Chrysler proving grounds in Arizona furthered that desire. But when it came time to graduate, I was told by a number of individuals that there wasn't much of a career path with the automobile manufacturers in Arizona, and that in order to have a successful career at an automobile company, one would have to go live in Michigan. When it came time for graduation, I decided that I wanted to stay in Arizona. I bought the story that a successful career with a major automobile manufacturer in Arizona was not an option, and did not try very hard to get on at one of the proving grounds in Arizona. Jim Contes' career shows that it is possible to have a long and successful career with a major automobile manufacturer in Arizona. Although I am very pleased with how my career turned out, I wonder what other alternatives might have been like. In addition to being fun, and teaching us about solutions to problems that might have other applications, presenters such as Jim serve as a role model for engineers who are just starting out. Jim's enthusiasm for what he does makes him an outstanding role model indeed.

Our last presentation was on the whole car, but our next presentation focuses on just one area of motor vehicle engineering. Our October presentation is on automobile race suspension. This should be an excellent opportunity to take a detailed look at this particular area of technology. I look forward to learning more in this area, and look forward to hearing Mike Halpin's presentation. I hope you can join us.

Allan Watts  
Section Chair

## Recap of September Meeting by Derek Logan

Our September presentation on the new 2006 Corvette Z06 was a great start to a new year of SAE meetings. Jim Contes, Senior Development Engineer for V8 Engine Development at General Motors, gave us a very informative and fast-paced presentation on the awesome 2006 Z06 and its 505hp powertrain. Jim, one of our favorite long-time presenters, spoke with great enthusiasm of the Z06's design and development. He also brought two cars with him -his early-production "company" car and a rolling chassis. It was great to see both up close!



Section Chair, Allan Watts (right), thanks Jim Contes (left) for an excellent presentation on the new 2006 Corvette Z06.

The Z06 is based on the 6th generation Corvette and its engine is based on the 4th generation small block Chevy V8. (Jim quietly noted that he has worked on all four generations.) This small block, however, has 7.0 liters (427 cu. in.) and boasts a true (SAE J1349 standard certified) 505hp and 470lb-ft torque. It can do 0-60mph in 3.7 seconds, the quarter mile in the mid-elevens, and has a top speed of 190mph. Even with all this power, the Z06 does not require the gazzler tax. In fact, with its 0.50:1 ratio 6th gear, Jim is getting 28mpg on the highway!

GM used new technologies and even some old 'hot rodder' technologies to get this normally-aspirated, push-rod engine to be not only powerful, but also dependable. The oiling system now has a dry sump to make sure oil is available at all rpms and cornering loads. (The Z06 can corner at over 1 g.) 6-bolt mains hold the forged-steel crank securely in place while pushing titanium connecting rods up to 7,000rpm. The aluminum cylinder heads are ported and polished just like the racers and allow for this 11:1 compression ratio engine to be run on regular gas if need be. Of course, premium unleaded is highly recommended to get the most power and longest life.

Many other new features include a 3" exhaust with an extra set of outlets that are mechanically opened under full throttle; an oil-to-oil heat exchanger that cools the differential oil via the transmission oil as it returns from the radiator; and a full aluminum chassis, carbon-fiber front fenders, magnesium engine cradle and roof structure. Even with the added 'go-fast' stuff, the Z06 is 50 lbs lighter than the standard

Corvette - 3130 lbs! Note: The weight distribution is also set very close to 50-50 and, with a lot of the mass near its center, the polar moment of inertia is greatly reduced thereby making this car a great track car.

Not only can this car go fast and corner like its on rails, it can stop too. The Z06 has 14" front rotors coupled with 6-piston calipers -each piston with its own brake pad! The rear rotors are a massive 13.4" and, like the front, are cross-drilled. Tires are P275/35ZR18 mounted on 9.5" wide



Newsletter Editor, Bob Riley (left), checks out Bill Gest's (right) vintage Corvette

wheels up front and P325/30ZR19 mounted on 12" wide wheels at the rear.

So, with dual-zone air conditioning, Bose audio system with XM satellite radio, this car is one great commuter, trip and track car!

A special thanks to Jim for another wonderful presentation!

---

## SAE Arizona Section Commitment

By: Max Rumbaugh, Jr.

In the 2003 J.D. Powers survey of SAE members, the SAE Arizona-Nevada Section achieved a 90% satisfaction rating, placing the section amongst the highest group of SAE's 71 sections.

The Arizona Section is committed to bringing educational opportunities to mobility engineers. Programs are selected to be timely and relevant. Their delivery in Arizona permits aerospace and automotive engineers to obtain ongoing education without overnight travel and without expensive registration fees.

Over the past eighteen months, SAE Arizona programs have covered such important topics as:

- Intellectual Property and Patents
- Honeywell AS900 Turbojet
- Quality and Six Sigma
- Hybrid Electric Vehicles

Advances on Environmentally Friendly Vehicle Air  
Conditioning Systems

Aerospace Executive Panel

42 Volt Automotive Electronic System

The New Nissan Titan, Full Sized Pickup

Telematics and Advanced Vehicle Electronics

Plan now to participate in the educational programs and activities planned for you here in Phoenix.

The officers of the SAE Arizona-Nevada Section are dedicated to providing you with cost effective, educational programming. Your support and attendance at our local, high quality programs will pay dividends to you and your organization. Just a couple of hours a month will provide you with up-to-date technical information on your profession.

---

## Dearborn Deuce November Presentation

It's getting easier to own a 1932 Ford. Next month's presentation, given by J. E. "Ted" Robertson (2005 SAE President and Vice Chairman of Production Development at ASC Incorporated), will be about a "one-of-a-kind" 1932 Ford hot rod replica, the Dearborn Deuce.

American Specialty Car, Inc (ASC), is offering a fully-made ready-to-drive 1932 Ford hot rod, the Dearborn Deuce. The Dearborn Deuce has a steel body, 355-horsepower



Dearborn Deuce, courtesy AutoWeek Magazine

Chevy V-8 engine, and goes from 0 to 60 mph in less than 5 seconds. Unlike the original 1932 Ford hot rod, it has more leg room and is wider. However, it does not have a radio, air conditioning, or a seat belt, all of which can be installed after the purchase. Since the unveiling of this vehicle a year ago, about 50 have been sold at around \$100,000 each. For the hot rodders that want their own engines and crafts put in, it has also sold another 200 bodies at around \$20,000 each.

---

## New ANC Delegate

ANC Delegate:

Derek Logan

1st ANC Delegate Alternate:

John Lester

THE UNIVERSITY OF ARIZONA  
*Announces*  
**THE 43<sup>rd</sup> ANNUAL**  
**APPLIED RELIABILITY ENGINEERING AND**  
**MANAGEMENT INSTITUTE**  
 November 14-17, 2005  
 Clarion Hotel  
 Tucson Airport, 6801 Tucson Blvd.  
 Tucson, AZ 85706  
 520-746-3932 or 800-526-0550

**INSTITUTE OBJECTIVES**

To provide all engineers, and particularly Reliability Managers and Engineers, and Product assurance Managers and Engineers in government and Industry, with a working knowledge of Reliability Engineering Theory and Practice; Mechanical Reliability Prediction; Reliability Testing and Demonstration; Accelerated Testing; Failure Analysis Techniques; Complete Industry Product Assurance; Maintainability; Quality Management; Concurrent Reliability; World Class Manufacturing Techniques; Variability Reduction; Customer Satisfaction Strategies plus many more! Numerous practical applications of these methodologies will be presented. This Institute will also prepare and help participants with their ASQ CRE Examination.

**STAFF**

Dr. Dimitri B. Kececioglu, Professor of Aerospace and Mechanical Engineering, Professor-In-Charge Reliability Engineering Option, The University of Arizona, Fulbright Scholar, Internationally Renowned Educator, Reliability and Maintainability Consultant, and the Director of this Institute, plus 10 speakers from 15 sponsoring industries will take part in expertly covering the subject matter of this Institute.

*For Detail and Technical Information, Please Write To:*

Dr. Dimitri B. Kececioglu, P.E.  
 Aerospace and Mechanical Engineering Dept., Building 119  
 The University of Arizona, Tucson, Arizona 85721-0119  
 or Call: (520) 621-6120, or FAX: (520) 621-8191, or  
 Email: dimitri@u.arizona.edu. Please peruse his Web site at  
[www.u.arizona.edu/~dimitri](http://www.u.arizona.edu/~dimitri)

*Meeting Schedule*

October 20 - Racing Suspension Systems  
 November 17 - Special Program by SAE International  
 President, Ted Robertson  
 (2007 programs to be announced)

**Design Engineer Wanted**

Needed at Elio Engineering Inc. for Mechanical Engineering, Design using CAD, FEA and CFD; Solid modeling using Unigraphics; linear & nonlinear FEA using ABAQUS; pre-processing (mesh creation) for FEA using ABAQUS; CFD & thermal analysis using FLUENT; computer aided design, simulation and testing of automotive components and other mechanical engineering devices. Position requires a Master's Degree in Mechanical Engineering plus one year of experience as a Design Engineer or one year of experience as a CAD Mechanical Engineer to include experience in Unigraphics, ABAQUS, and Fluent; experience may be gained as part of academic training or subsequent to it. Please submit resumes to:  
 Administrative Officer,  
 Elio Engineering Inc.,  
 9830 South 51st Street, Ste. B-101  
 Phoenix, AZ - 85044

Allan Watts Chair 602-364-7331	Dave Vasquez Vice Chair idave@asu.edu	Bill Gest Secretary 602-618-1304	John Lester Treasurer 480-733-6532	Robert Riley Newsletter Editor 623-872-8010
--------------------------------------	---	--	--	---



Non-Profit Org.  
 U.S. POSTAGE  
**PAID**  
 Phoenix, AZ.  
 Permit No. 1571

Society of Automotive Engineers  
 Arizona Section  
 69 West Wilshire Drive  
 Phoenix, AZ 85003  
 ADDRESS SERVICE REQUESTED

**POSTMASTER: DATED MATERIAL - PLEASE DELIVER PROMPTLY - THANK YOU!**