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## **WELCOME**

Mark Ortiz Automotive is a chassis consulting service primarily serving oval track and road racers. This newsletter is a free service intended to benefit racers and enthusiasts by offering answers to chassis questions. Readers may submit questions by mail to: 155 Wankel Dr., Kannapolis, NC 28083; by phone at 704-933-8876; by e-mail to: [markortiz@vnet.net](mailto:markortiz@vnet.net). Topics are also drawn from my posts on the tech forums at [www.racecartech.com](http://www.racecartech.com) and [www.rpmnet.com](http://www.rpmnet.com). Readers are invited to check out these sites, and to subscribe to this newsletter by e-mail.

Mark Ortiz

## **WINTER READING MATERIAL**

As the racing season winds down, I'm getting lots of requests for recommendations for off-season reading. Therefore, I have decided to devote this issue of the newsletter to sources of information to help readers advance their self-education.

Please note that it is impossible to include all works of value in a brief list. Omission of a work does not imply condemnation. Likewise, inclusion of a work does not imply infallible accuracy, although I am making an effort to recommend documents that are largely accurate and widely well-regarded.

Let's start with some of the best general-purpose texts on vehicle dynamics.

*Race Car Vehicle Dynamics* by William & Douglas Milliken, SAE, 1995: Widely considered the standard reference work on the subject. Some portions are by other authors. Some chapters are highly mathematical; others are more conversational. Includes a chapter on the history of vehicle dynamics. Authors operate Milliken Research Associates, Inc. in Williamsville (Buffalo area), NY.

*Tires, Suspension, and Handling* by John Dixon, SAE, 1996: Another excellent reference. Good discussions of tire and suspension characteristics. Author is Senior Lecturer in Engineering Mechanics at The Open University, Great Britain.

*Fundamentals of Vehicle Dynamics* by Thomas Gillespie, SAE, 1992: A somewhat shorter and very readable vehicle dynamics text. Author teaches vehicle dynamics at University of Michigan and Ford Motor Company.

*Car Suspension and Handling* by Donald Bastow and Geoffrey Howard, SAE, 1993: Third edition of a work first published in 1980. More conversational than the above books, with a large appendix devoted to calculations. Authors are engineers with long and varied experience in the English automotive industry.

A couple of sources specifically on dampers (shock absorbers) deserve mention.

*The Shock Absorber Handbook* by John Dixon, SAE, 1999: Not really my idea of a handbook. More of an engineering text on dampers. Good coverage of principles and history of damper design and ride tuning theory. Not much on use of dampers as a tool to control transient behavior of race cars.

For a good discussion of how to use low-speed damping to influence transient handling, plus a good brief overview of damper function, see a pair of articles in the March and April 1996 *Sportscar*, entitled *Damper Physics: The Black Art of Adjustable Shock Absorbers*, by Neil Roberts. These articles, minus illustrations, can also be read and downloaded for free at [www.gtf1.com](http://www.gtf1.com) under the titles of *Racing Dampers 201 & 202*.

On aerodynamics, a couple of good ones are:

*Competition Car Downforce* by Simon McBeath, Haynes/Foulis, 1998: A fairly brief, highly readable work specifically dealing with downforce – therefore readily applicable to racing.

*Aerodynamics of Road Vehicles*, ed. by Wolf-Heinrich Hucho, SAE, 1998: Compendium of papers and articles by a variety of authors on aerodynamics. Fourth edition, originally published in Germany. Good general-purpose text on the subject, including lift/downforce, drag, and directional stability.

Some lesser-known magazines I like include:

*Racecar Engineering* and *Race Tech*, published in England, both available by subscription in the US from EWA Magazines, 205 US Hwy. 22, Green Brook, NJ 08812, phone 1-800-392-4454, web site [www.ewacars.com](http://www.ewacars.com). More technical depth than most US car magazines.

*Grassroots Motorsports*, available from Motorsport Marketing, 555 West Granada Blvd., Suite B-9, Ormond Beach, FL 32174, phone (904) 673-4148, web site [www.grmotorsports.com](http://www.grmotorsports.com). Good coverage of amateur road racing, autocross, and vintage racing.

*Speedway Illustrated*, P.O. Box 37574, Boone, IA 50037, phone 1-888-837-3684, web site [www.speedwayillustrated.com](http://www.speedwayillustrated.com). New magazine from former *Stock Car Racing* editor Dick Berggren.

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I have published 6 articles in *Racecar Engineering*. These comprise a 2-part series on suspension interconnection and a 4-part series on asymmetrical cars. I have photocopies

available at \$2/article, check or money order to me (postage included; NC residents please add 6% sales tax).