

## Review of *Think Fast*

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Neil Roberts has written *Think Fast*, an excellent discussion of vehicle dynamics for race cars. The 180-page book is completely devoid of mathematical formulas but has solid engineering reasoning. He describes the technical chapters as “*Fast Physics*.” Roberts assumes the reader has studied Carroll Smith’s *Prepare To Win*, *Tune To Win*, and *Engineer To Win*. His effort is worthy of Smith’s legacy.

Roberts broke into racing right out of Texas A&M University with Jim Hall’s IndyCar team and spent four years with the IndyCars. As a chief engineer, his best known design is the Swift Engineering 014.a Formula Atlantic car. His book reflects his experience and is built around high-powered, high-speed formula cars.

You might question the relevance of 150 mph (Atlantic) or 200+ mph (Indy cars) to parking lot Grand Prix conducted at 70 mph or less. Clearly the aerodynamics section is less relevant than the handling chapters. But Roberts began his driving career autocrossing.

"I still remember what it was like to empty my change jar to try to scrape together the entry fee for an autocross." He states a driver should learn in autocross, taking one to five years to learn the fundamentals with a car with 150 hp or less.

Roberts also notes that autocross teaches how to drive on cold tires. Autocross involves rapid transitions which are good preparation for the emergency moves sometimes needed on a race track.

Roberts also raced a SCCA Formula Ford (a Swift DB-1) in Texas, winning four of his last 12 races before joining Swift.

Roberts also credits the driver with 80% of the performance and the car just 20%. Given such frank acknowledgement by an engineer he also discusses how the engineer relates and reassures the driver. For instance, the simple subject of throttle linkage can reflect how well the driver deals with the car. He quotes Jim Hall, driver and designer of the Chaparral [Can-Am] Cars as saying big-block Chevrolets absolutely needed a progressive throttle linkage in the middle range to be drivable.

Of course, every piece of advice should be considered in context. For instance, back in the ‘70s when I was learning racing and autocrossing in the San Francisco Bay Area, Formula One designers were often quoted as saying “Aerodynamics do not matter below 50 mph.” Autocrossers took this as reason to ignore aerodynamics. Then.

What the F-1 expert really meant was “When you have a race car which must travel 200 mph, the aerodynamic effect at 50 mph is 1/16 and thus of little effect,” they just did not add (or think of) the context. Finally some autocrossers went back to basics and

realized aerodynamics would work in a parking lot if you replaced the formula car wing with something more like the huge device found on a sprint car.

Further context included the assumption that we are dealing with a four-wheel vehicle racing on asphalt. Racing on dirt is very different with chassis roll as large as 12 degrees and drag racing and/or Bonneville events.

Roberts does recognize context is stating that 1000-hp monster trucks can not spin their tires, simply because there 5+ foot tires weighing 1,000 pounds have HUGE inertia which prevent spinning the wheels. More relevant to autocrossers is his observation that front wheel drive cars often corner on three wheels. While working as an SCCA corner worker he observed when a VW GTI is cornering on three wheels and the driver touched the brakes, and stopping the airborne wheel and tire, he would get passed on the next straight. The engineering analysis is that stopping the airborne wheel removes energy from the vehicle.

On the next straight that energy must be recreated by the VW engine, which makes the driver vulnerable to a higher energy car. The lesson for autocrossers: if you are lifting a wheel keep it spinning.

Roberts has a few beliefs I want to think about – such as minimizing all anti effects in order to eliminate as many analysis interactions as possible. But I want to think carefully about my thoughts before discussing them with Roberts. But then Roberts states his intent to provoke thought rather than to provide all the answers. "Now it's your turn to think for yourself."

**Think *Fast*** gives you a better basis for your thoughts.

#### **Background Info provided by Bill Mitchell**

Wm. C. Mitchell, one of four Bill Mitchells in motorsports, has a degree in math from Cal Tech and a Masters in Computer Science from Stanford. While residing in northern California he discovered the joys of road racing. He began autocrossing and working as a corner worker in the early '70s. He soon discovered autocrossing in the Bay Area was HARD, and he was not going to advance very quickly with about 90 seconds of driving around the Pleasanton Fairgrounds parking lot every week. He began to concentrate on working corners in the SCCA's San Francisco Region as well as Cal Club. Trips to Westwood, BC, provided a glimpse of the young Gilles Villeneuve, Kiki Rosberg and other future stars.

Around 1980 Mitchell became a reporter for *The Wheel*, *Autoweek*, and *On Track*. He learned to write under the careful and patient teaching of John Kelly, for which he is ever so grateful.

In the mid 1980s personal computers became available and Mitchell needed a problem to learn to program the small things. He had read of Dan Gurney discussing the camber curves on his Eagle Formula Ford, and decided here was a math problem suitable for learning.

In 1983 he was amazed to learn that Doug Peterson, local mini driver and future CART owner would pay cash money for suspension geometry software. Over 25 years he is still writing suspension geometry software. See MitchellSoftware.com.

For recreation he attends Formula SAE events. He met Neil Roberts at the F-SAE event in Fontana, CA. He is still addicted to racing and his latest interest is dirt track racing.