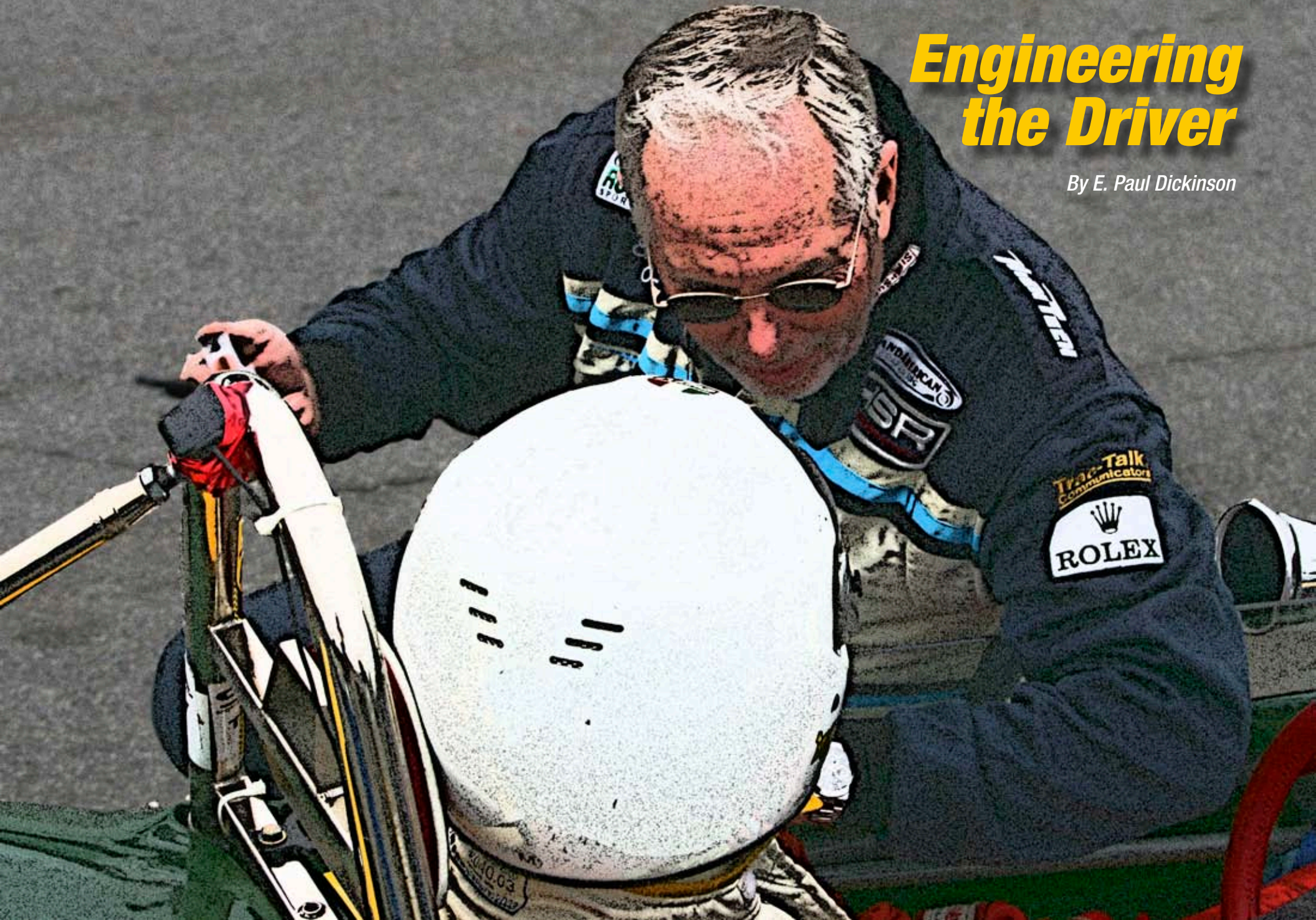


Engineering the Driver

By E. Paul Dickinson



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The Early Years

From the 1920's through the 1950's, tires were tall and skinny and their contact patch was so small that details of wheel alignment did not seem to matter much. Throughout this period the engine was the dominant component that anyone knew how to improve. This focus, on increasing horsepower, resulted in more and more power with little improvement in handling.

The realities of high horsepower and very light cars became progressively evident from the 1960's and into the 1980's. Serious attention to design and application was concentrated on separate engine, chassis, suspension and aerodynamic development programs. Increasing loads on the chassis to improve straight line and cornering grip dictated: "fat" tires, better brakes and progressively sophisticated suspension and aerodynamic systems.

The 1990's focused the interdependence of these separate programs into a discipline.

A shift had occurred. Horsepower was no longer the major component of the go-fast equation. The Science of engineering a complete race car had been born. However, for many, even today, the early years legacy of a dominant focus on horsepower still exists.

What is in store for this decade?

Quite literally it will separate past from future. We will, in this next decade, come to understand how to engineer the driver as we engineer a race car.

Formula One driver development studies prove, once a certain level of driver betterment is reached, additional practice does not produce significant improvement in performance. This is easily seen in many racing drivers. They continue improvement up the ladder until they reach a plateau — where they stop improving.

Consider the environment of a racing car where things happen really quickly. Something happens... the driver works out a solution... then he reacts. By the time the processing is complete and the message has gotten down to the muscles in question quite a bit of time has elapsed in terms of rectifying what has happened.

The driver inputs a correction. Maybe it is a little too much. Maybe the input is a little too slow. In any event the driver thinks he is reacting to something that is happening NOW, but in terms of vehicle dynamics it actually happened a long time ago. In real-time vehicle dynamics, we are lagging pretty far behind the car.

The next thing you know, the car is going the other way. The driver reacts to that, but he is always behind — he is out-of-phase with the whole situation and he is in real trouble! It is this out-of-phase-lag that causes drivers to do things in the car they are convinced are happening in real-time when they are not.

At lower skill levels things do happen a lot slower and you can catch them as they happen. As a driver progresses to higher skill levels things get quicker and more difficult. With progress to higher skill levels, drivers need to change strategies to compensate for their increased skills and knowledge.

One of the key tasks in engineering a driver is to identify these less than optimal solutions and help find better solutions. This is not achieved by simply comparing differences between drivers and showing one where he is slower than another. What is really needed is to provide the driver with insight. An understanding of why he does what he does, and why it is less than optimal.

Remember — for that driver — his solution did feel faster or was the right thing to do. With new understanding, a driver will have renewed comprehension, see the situation in a different perspective, and arrive at a more efficient solution naturally.

At a point in driver development the consequence of each driver's performance becomes his particular solution to a specific situation and its immediate circumstances. The optimum solution for one car in a specific situation may not be the optimal solution for another in the same situation.

Why?

This may surprise you. It is our differences in perceiving the sensory information we act upon.

Drivers suffer from both perceptual and decision making illusions. Sensory information upon which we base our driving strategies is often distorted. We are all familiar with illusions where something looks quite different from how it really is, like railway tracks converging in the distance.

The straight rail lines are the fact. The apparent convergence is the mirage. If we base our judgments on the mirage, the distortion, our judgment will be flawed and our assessment less than optimum. It is all too easy to be tricked into thinking that any given solution is the optimum solution when it is not.

Most of a driver's solutions are picked-up by trial and error. Within this trial and error process there are many diversions and dead ends that initially look helpful. But, ultimately prove to be less than optimal.

We want our driver to interpret all the incoming information and determine the optimum solution. When we can help the driver make this kind of change, in judgment, we find we have not just cured a problem. Rather, we have cured a whole class of problems that apply to different corners at different tracks.

Three iterations per second is the maximum speed at which the entire human motor control system can work. A relatively slow time in which to perceive changes in a fast paced driving environment and update your

actions. That means a shortcut process must exist, multiple motor skills must be performed as a single instruction containing numerous complex sub-instructions.

The cerebellum is the area of the brain that processes information from your six senses. It sees the situation you are faced with going up into the brain and it sees the answer coming back down. Any task repeated often enough is stored in the cerebellum; so is the complete problem and solution.

Repeating the process enough times for the cerebellum to learn the solution is what practice is all about. Once enough practice using portions of the entire brain has occurred, the cerebellum stores the process and simply intercepts the problem and provides an immediate answer.

This shortcut operation by the cerebellum is completely unconscious and very fast. Of course you are not aware of these things happening in your brain. You simply perceive everything happening in real-time.

Numerous studies have shown, in general, great drivers do not typically have faster reflexes than other drivers. Then how is it that, Champion Drivers seem to have “all the time in the world” when there car is at the limit?

The answer. Quicker assessment.

The utility and success of a solution depends on our ability to assess. The only way to achieve quicker assessment is to develop a richer, a larger and more efficient bank of experience in the cerebellum. If five different inputs all end in the same output, the cerebellum will have a broad brush stroke approach. However, becoming aware of even subtle differences will develop a much richer set of answers.

The better a driver's grammar of motion is optimized the more ability he has to quickly assess, anticipate problems and select the appropriate response program in the cerebellum. It is critical to the success of outcome that these automatic shortcuts are optimized.

There is no need to always be behind, out-of-phase with the situation. If optimum decisions can be selected, a driver can afford extra time in the response sequence to let a couple of iterations proceed before he needs to make further corrections. There will be less need to rush and more time to choose when to rush.

Lesser skilled drivers have fewer choices of appropriate response sets. That means, on the next iteration of the response sequence, there is a larger margin between what they perceived the car was going to do and what it actually did.

Just how important is the driver? Of anything that can be changed, driver skillsets have the most significant effect on outcome.



E. Paul Dickinson

“E. Paul” is a multiple-National Championship winning, licensed competitive driver, past member of Porsche’s Playboy/Escort Endurance Racing Team, with over 30 years of driving instruction experience. In the ‘70s and ‘80s E. Paul was owner/ chief instructor of a 40-acre SCCA approved driver training center that also provided accredited law enforcement driver training programs. He was Chief Instructor for Historic Sports Car Racing (HSR) from 1995 through 2002. As a

member of the Vintage Motorsports Council (VMC), E. Paul developed and conducts VMC’s Nationwide Instructor Certification Program. He is the author of “The Ace Factor,” and upcoming, his second book, “The Go Faster Equation”.

Since 1972 E. Paul has provided group and one-on-one teaching and coaching services within the industry. Numerous clients have won Regional and National SCCA Road Racing and Solo Championships, as well as Vintage Racing Championships, and a number have gone on to win multiple Championships. In the past 7 years, 3 clients have been Class Winners at the annual Daytona 24 Hour race.

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