Club Racing news

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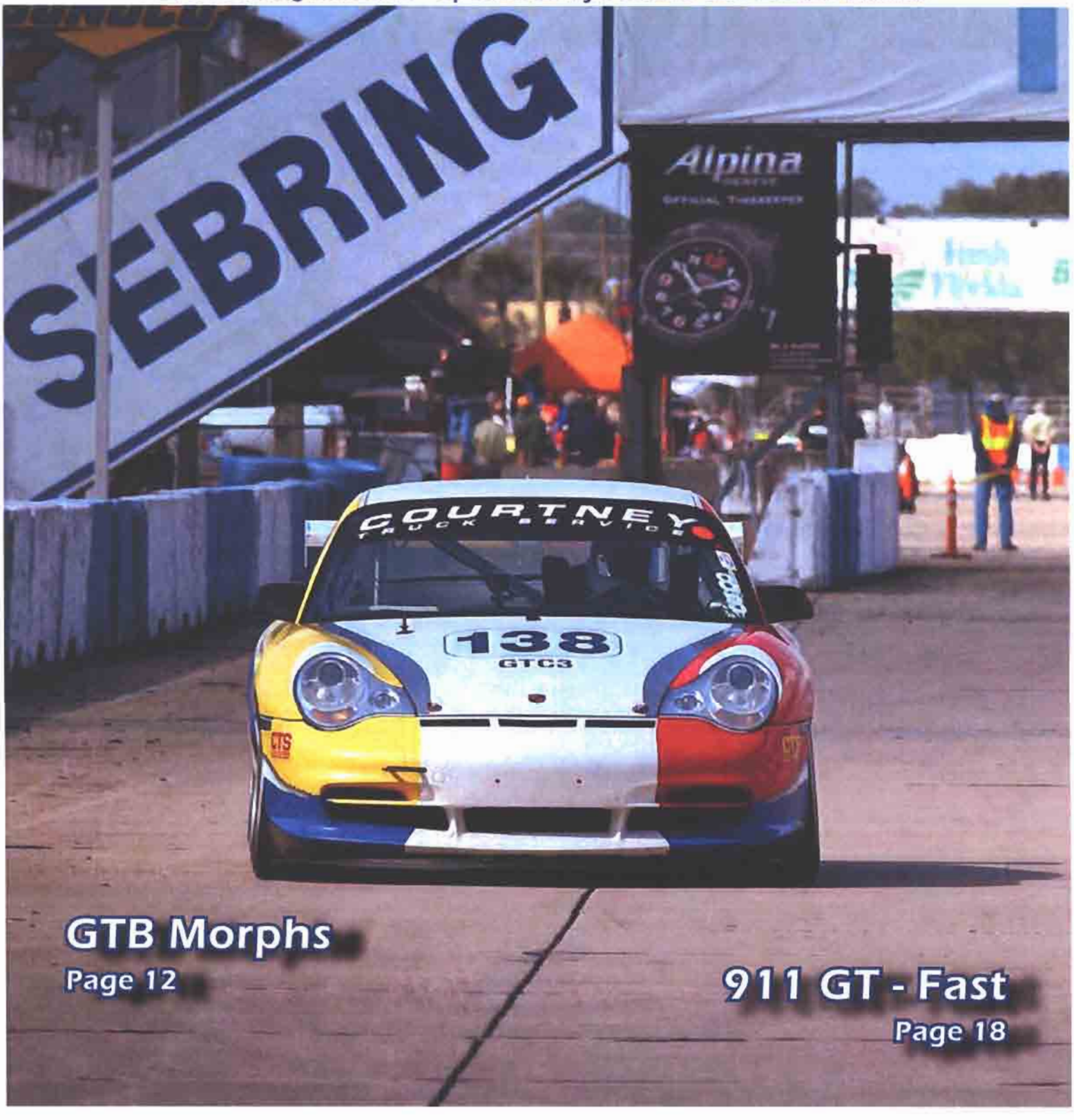

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911 GT - Fast, Reliable & Affordable

By Roger Johnson, PCA Club Racer (Mid South Region)

GT cars can be fast, competitive, reliable, and affordable to build and run. Since Porsche introduced the water-cooled 996 factory racecars, the PCA water-cooled classes have grown as racers look for more performance, reliability, and lower operating cost. As a result, the number of cars in traditional air-cooled upper GT classes has dwindled. But as the 996 and 997 cars accumulate racing hours, racers discover these cars require maintenance according to a prescribed Porsche maintenance schedule to assure reliability. This maintenance can come at a significant cost.

Performance & Reliability

How fast are GT cars? Chris Musante's yellow 3.6L GT3R and Roger Johnson's 3.6L GT3R (aka Red Dawg) have turned lap times comparable to the top 996 and 997 cars. Pat Williams' GT3R, GT2R and GT1R twin turbo also lay down lap times competitive with the 996 and 997 cars (Table 1 below). If fast is what you are looking for, these cars can deliver.

How reliable are GT cars? Porsche air-cooled engines have always been known for endurance and reliability. In the past, some reliability was lost due to 20 to 30 year old parts, and the design was limited by the "off the shelf" parts available at the time. Now the availability of new parts such as head castings, crankshafts, pistons, rods, and camshafts has allowed us to keep the reliability and increase the horsepower. New manufacturing techniques have allowed parts to be made to specific engine builder tolerances and these parts are available and affordable.

Brady Refenning

Brady Refenning (The 901 Shop) says we have always tried to build engines with the goal of 40 hours or more between rebuilds. We can now maintain our reliability while increasing performance though the use of coatings, better designed oiling, , and custom designed heads, pistons, and camshafts. Our 2.0L engines that used to produce 225 HP at 8200 RPM now produce 240 HP at 8000 RPM. The 3.0L engines were making 335 HP at 8000 and are now making 365 HP at 8000 RPM. 3.6L engines used to generate 375 HP and are now up to 420 HP. 3.8L engines that were 390 HP at 7400 RPM can now reach 440 HP at 7600 RPM. The last 2.0L engine looked new after 40 hours of running at 8000 RPM.

GT2R & GT3R Lap Times Compaired to GTC3 & GTC4

Track	3.6L 911 Refenning GT3R	3.6L 911 Musante GT3R	3.0L 911 Turbo Hulbert/Jarvis GT2R	Best GTC3	Best GTC4
Road Atlanta	1:27.559	1:29.306	1:25.664	1:32.436	1:26.257
VIRginia International Raceway	N/A	2:00.655	1:55.546	1:58.567	1:55.331
Daytona International Speedway	1:55.345	1:55.601	N/A	1:57.253	1:55.320

Table 1: Comparison of GT and GTC best lap times from select 2009 race events

Mid-Ohio Region PCA Proudly Presents...

SPRING AT THE CAROUSEL – 2010

Spring at the Carousel – PCA Race at the famous Mid Ohio Sports Car Course.
Hosted by Mid Ohio Region PCA. May 14-16. Featuring Sprint races and Enduros.
Driver's Education Session available.
Registration opens March 29th at http://register.pca.org
See Mid Ohio region website at www.morpca.org for details.

On-line Registration information will be available at: **http://register.pca.org**

Event Chair: Jay Koehler, (614) 499-0536, koehlerjk@gmail.com
Registrar: Ginny Barry, (614) 850-9107, MidOhioClubRace@columbus.rr.com

See you at SPRING AT THE CAROUSEL!

MID-OHIO SPORTS CAR COURSE

Chris Musante (Musante Motorsports) says that about 10 years ago, a typical well built air-cooled 911 engine would achieve 110 HP per liter for the small engines (up to 2.5L) and about 105 HP per liter for the larger 3.0L and up engines. We now make numbers like these at the rear wheels, so the power has increased by about 12% in the last 10 years due to development work in the cylinder heads, intake, exhaust and camshaft. The power curves tend to be broader and not as peaky, resulting in a car that is easier to drive with higher average usable horsepower. Even with the higher engine outputs, reliability has substantially improved. The two main problems we used to see were piston breakage and rod bearing failure. Newer piston designs, larger rod ratios, engineered oil system, and improved engine tuning have allowed these engines to get to the point that they tend to wear out before they break. Mechanical over-rev safety has also greatly increased through the use of lightweight valve train components and proper clearances in engine assembly. The recently adopted Porsche Club technical rules that use displacement to weight formulas to classify cars encourages the development of the older cars.

Chris Musante

Pat Williams (Pat Williams Racing) accomplishes reliability through a different route - utilizing quality stock Porsche parts and turbo charging a base 3.0L engine. Effective use of quality engine management systems is the reason air-cooled turbocharged Porsche engines can reliably make more power over a longer

Pat Williams

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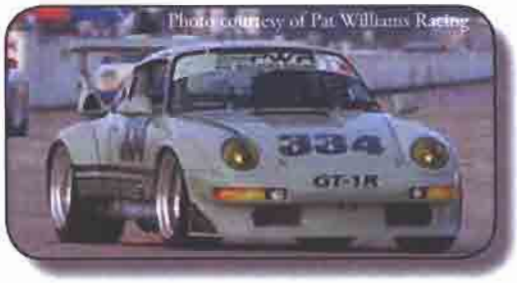
How I Came to Embrace Turbos

By Pat Williams, PCA Club Racer (Mid South Region)

I remember being at the track during the IMSA era when all of the top cars were turbocharged. When allowed, Porsche, Audi and many others always go for turbocharged engines. Look at the LeMans winners over a decade and it will be obvious.

With the advent of water-cooled Porsches, the normally aspirated air-cooled car was basically finished. A water-cooled Porsche has more power, better aero and good handling, but it is not light and the handling is not improved over a properly set up and lighter air-cooled car.



Pat Williams in his GT1R Turbo at Sebring

Solution – turbocharge the air-cooled Porsche engine with modern technology. I remember my buddy Bob Holcombe from the IMSA days. He built a dominant no nonsense machine that seemed to have excellent reliability. This was Martin Snow's PCA car and it achieved early PCA dominance. The only person that I ever saw do early programmable engine management justice was Bob.

Bob had a full CNC machine shop and had experience machining turbo housings. When we started building the small displacement 911 turbo engine for the old 1.3 multiplier rule, Bob's company had moved away from automotive applications. However, he still had the machining equipment to continue development of hardware that was simply not available in the early days of the air-cooled Porsche turbo engine.

Bob lived vicariously through our efforts in fielding multiple turbocharged air-cooled cars. We would literally design parts over the phone. Bob's ability and his seven CNC machines, made it happen. This wasn't possible 10 years ago because it was cost prohibitive to make parts in small numbers.

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life span than their turbocharged predecessors. Properly mapped turbocharged engines where turbo sizing and design match engine volumetric efficiency have advantages over their normally aspirated counterparts. These turbocharged engines deliver power over a larger RPM range and do not require as high an RPM as a normally aspirated engine for specific power (HP/liter or torque/liter). Also, the engines benefit from a lower static compression ratio. Programmable engine management makes it possible to control the fuel and ignition timing to manage the ultra high cylinder pressures produced in turbocharged engines.

Pat Williams in his GT1R at Road Atlanta

The first turbocharged Porsche ever to do this effectively was the 956/962. We measure turbocharged engine longevity by seasons now, not hours. The old 935s required a very rich fuel mixture because the engine management (mechanical injection) had a difficult time following the engine fuel curve. This caused the engine to be extremely rich off of boost and it subsequently had a very narrow and brutal power band. In other words, it was so dead off boost and so alive on boost it was very difficult to drive. With modern engine management systems and turbo technology, engines now have a broad torque range. These engines can be modulated much like a big normally aspirated engine. Our single throttle body twin turbo 3.0L engine in Robert Jarvis' car has a practically flat torque curve for 2500 RPM and instantaneous boost while in this range, making it a good road race engine.

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Increased Performance

Brady, Pat and Chris each credit suspension development and tuning as the primary influence in increased performance in GT cars. First, over 30 years of development of the same basic 911 design combined with the use of newer shock and spring combinations provides a package that is able to compete with the later Porsche Cup cars. The availability of reliable triple adjustable shocks from vendors such as JRZ, Moton, and Fox has improved suspension performance. The lighter weight air-cooled chassis provides an advantage over the heavier water-cooled counterpart. The 996 and 997 GT3 Cup suspension was designed hand-in-hand with a tire manufacturer to create a superior handling production-based car. Other tire manufacturers have taken the design ideas learned on the 18" Cup tires and applied them to the 16" tires that work well on the vintage cars. This has allowed suspension and tire combinations with exceptional mechanical grip.

Transmissions with upgraded parts have also provided increased performance capability. Advances in transmission technology include dog ring 915 and 930 transmissions that use the same gear design as the 997 sequential boxes. These transmissions significantly improve lap times from faster shifts and more "power on" during up shifts. Aftermarket parts have also improved the longevity of the internal

Brady Refenning in his GT3R at Road Atlanta

components of these transmissions. The reliable G50 transmission provides an ample selection of gear sets while handling the higher torque put out by the stronger air-cooled engines. These transmissions can easily be retrofitted to the older engine cases that accepted the 915 and 930 transmissions.

Aerodynamic grip has improved significantly as well. The mechanical grip afforded by the suspension and modern tires can be augmented by aero efficient rear wings from vendors such as Crawford, TRG, and GT Racing. These wings add significant down

Chris Musante in his winged GT3R at Road Atlanta

force while producing less drag. With the available wings, tires, and a well-matched suspension, it is not unreasonable to expect between 1.4-G and 1.8-G of lateral load in a flat corner. Now that will place a strain on your neck muscles!

Assured Performance

When shopping for a racecar prep shop, look for one that has accumulated documented proven results. Check all references. The racing community is really a very small world. If you check references, you will soon find names that have stood the test of time. Stay with Porsche engine builders. Someone who can build a great Chevy engine may not have a great track record with Porsche engines. Your Porsche racecar prep shop should either have its own Porsche engine shop with a proven record, or it should have built a relationship over a number of years with a Porsche engine builder. The prospective racecar prep shop should be able to provide reasonable expectations. When comparing performance, be sure the examples provided are from average racers and not pros. Finally, keep up with car maintenance. Whether you do the work yourself or you hire a track-side support crew, always maintain your car based on a schedule provided by the racecar prep shop from which you purchased the car or developed the car. If you buy from an individual, contact the racecar prep shop that built the car and get the recommended maintenance schedule. With proper maintenance and shifting techniques (no over-revs),

your reinvented air-cooled 911 will be out mixing it up with the water-cooled drivers.

Affordability

If constructed new from a base 911 car, it would not be unreasonable to spend $60,000 on the chassis. The engine would add another $50,000 plus $10,000 in engine electronics and data acquisition. A race prepped dog ring transmission would add another $15,000. Thus, to build a new car from scratch, you might expect to pay around $135,000 to get the car onto the track.

If you purchased an already built and refurbished 911 GT2 or GT3 class car, you should be able to find one for $60,000 to $85,000. Compare this to a new 997 Cup at $225,000 and a used 996 Cup at $125,000 with 30 hours on the engine or a used 997 Cup at $175,000 with 40 hours on the engine. While both these used car examples have some engine life left, the rebuild to factory specs will be substantially more than the air-cooled counterpart. The suspension and transmission components in the 996 and 997 factory racecars are also items that require periodic service and even outright replacement. Compare that to the rugged old 911 suspension components that have soldiered on for years of racing service.

Many existing air-cooled 911 GT racecars are available for nearly the price of a stock class racecar. These existing GT cars were well prepared in the past, but may lack an engine built with the latest components. Starting with a solid base engine, you can build a high performance GT racecar without shelling out your hard earned dollars all at once.

Over time the continuing development of the GT cars will produce a more competitive product, while the GTC classes are frozen under the rules. The building and running of GT cars creates an opportunity for inventive people who want to express themselves and enjoy the journey that building a custom car affords.

Acknowledgments

This article would not have been possible without the assistance of Chris Musante (Connecticut Valley Region),, Brady Refenning (Gold Coast Region) and Pat Williams (Mid South Region). Their experiences and technical information provided the basis for this commentary on GT racecars.

Chris and Brady, a couple of GT3R competitors battle for position at Daytona