

Teaching Automotive Engineering or How I got to Run One Lap of America while Being a Professor - Part I

By Andrew R. Barron

About a year ago a group of undergraduates at Rice University suggested I should teach a special topics course on automotive engineering with the aim of working on a real race car. The Rice University student chapter of the Society of Automotive Engineers (RSAE) had in the past competed in a SAE sponsored events such as building on off-road buggy, but that sounded boring and certainly nothing I was interested in. So I started to think about a suitable event to take a group of students to compete in.

America. The idea of the present event is to start and finish in the same location while driving to a series of race tracks to compete in timed trials at each track. The event now runs over 7 days.

The rules for the entry are simple. The car must be street legal, you can only use one set of DOT tires for the whole event, you have to wear a helmet and approved fire suit, be a member of the Sport Vintage Race Association, and err... well that is pretty much it.

Now once I suggested to the students that the One Lap could be just the event, they were enthusiastic, and although there were many more interested than could participate in the first year, I knew that time would sort out

Photo caption here



My first thought was to take a car prepare it to SCCA IT specs and enter our annual 6-hour enduro. The only issue was that this would limit the student's participation to crew members because of the licensing requirements. Then I happened to be channel surfing one night when I lighted on the 70's movie, "Cannonball Run". Based loosely on a real event, the film concerns a group of misfits racing across the Continental US against each other and the law. It started me thinking about the modern equivalent, the Car and Driver One Lap of America (www.onelapofamerica.com).

The original Cannonball runs were replaced in 1984 by a legal version organized by the Cannonball's originator Brock Yates. Brock is Editor-at-Large and featured columnist for "Car and Driver" magazine and was responsible for the screenplays of both Cannonball Run and Smokey and the Bandit II. Trying to create a legal event, Brock developed the format for the One Lap of

those who would be involved.

Part of the allure (?) of One Lap is that the tracks are a long way apart often necessitating all night drives from one location to the next. Thus, it is not unusual to have a team of (up to three) drivers consisting of track specialists and those who drive the grueling road stages. A couple of the students, Damon Hattori and Brad Tonnesen, had the necessary track experience, and Damon even had extensive race experience in Formula Barber Dodge. Others such as Ben Kosbab and Lucas Marr had experience working on cars and were interested in coming for the chance to crew and drive the road sections with me driving the tracks and sharing the road driving.

So we had a goal, now how to get a couple of cars and how to create a class to give the students credit for the event? In my own time I dedicated two semesters to the class. The first semester tried to teach the basics of tires, suspension,

chassis design, handling, and aerodynamics. The second semester was to be a “laboratory course” with the final exam being the entry into One-Lap-of-America! Now don’t you wish you were a student at Rice University?

The second problem was raising sponsorship to purchase the cars and the entry fees. In part this came from a longtime sponsor of my SCCA racing, First Community Bank (www.firstcommunitybank.net).

Getting cars that could hold more than two people and perform reasonably well on the track stages is an issue, and obviously rules out my favorite SCCA ride my Caterham Seven! Most One Lap entrants spend more on their cars than my years racing budget could handle so we were never going to compete that way. It was to be beg, steal and borrow. We just wanted to have something that would let us have fun and finish then event. So reliable and simple to drive and work on were the key to our choice. So why did we end up with the cars we did?

The first car chosen came about through SCCA member, and Alfa specialist Andrew Garcia of Garcia Alfa Racing (www.garciaalfaracing.com). I had co-driven Andrew’s GTV6 in the 2004 6-hour enduro at Texas World Speedway. It had the advantage of being rear wheel drive and seating 4 (3 in comfort with baggage), but the disadvantage of being Italian and therefore not known for its reliability. (I know this is the pot calling the kettle black given my love of Lotus cars that are commonly known by the acronym – Lot Of Trouble Usually Serious.) Andrew assured me that the GTV6 and its saloon sibling, the Milano, were actually good choices. Andrew is a true Alfa nut (his garden has more Alfas than flowers) and he also drives a Milano on a daily basis. He suggested the Milano would be easier to use with its four doors and real boot. He also pointed out that the Milano was raced in IMSA. OK, so I was convinced but where to get a suitable car. Enter a friend of Andrew’s, who had a suitable Milano that he had already done much suspension work. The car had lived in the North East all its life resulting in more rust and gunk than is normally seen in Texas, but the engine was in good shape and the car’s handling almost sorted.

With the help of Andrew Garcia the students removed all the engine ancillaries that allowed access to the water

pump and cam belt that needed changing. Unfortunately despite Andrew and my repeated warning to put a rag over the intakes so that nothing ended up inside the cylinders one of the students dropped a screw down the #3 cylinder. Without knowing this, the car was made ready to run. Thankfully the fuel rails had been drained so the car didn’t start on initial attempt. Instead there was a clunk and the engine only turned over once! Andrew’s business partner Michael Keith investigated and found that the #3 exhaust valve had been snapped off and was sitting like a Hershey’s kiss on top of the piston precluding compression. Disaster! We didn’t have time to re-build the engine, so Andrew kindly donated a spare head from a 3L engine.

So with one car chosen and work started, what to do for the other one? Being a Lotus fan I had long ago thought of doing One Lap in an Esprit. At this point I happened to mention possible choices to friend and Lotus Limited President, Mark Pheffer. It turned out part of Mark’s ‘wooing’ his wife included giving her and a friend a lift home in his Lotus Edition Isuzu Impulse Turbo.

The Lotus Edition’s of the Isuzu Impulse Turbo came about during GM’s tenure as owners of Lotus. As part of its engineering business Lotus had performed various tuning upgrades to the Impulse wedge-shaped coupe. Unlike many other consulting projects that are often unadvertised and sometimes held secret, the work with Isuzu was openly advertised through “handling by Lotus” badges and the use of the Lotus name in the sales literature of the time. Being essentially disposable would also mean that nay modifications for the track (or damage resulting on the track) would not be an issue that would deter its use in One Lap.

A high mileage example obtained from Virginia along with more Northern rust. As such the Isuzu needed far more than the Alfa. After the interior was stripped the next task was to remove the engine and gearbox to allow for an engine re-build. The engine had over 120k miles on it with an uncertain history. The students under the supervision of Jamie and Randy Brooks at BrooksSpeed Garage accomplished the engine strip down and re-build.

Inside the car as much of the sound insulation (ca. 40 lbs) was chipped away. In addition to the weight savings, the main reason for this was to provide bare metal for welding

the roll cage and race seat brackets to. A race seat, air filter, and steering hub were donated by local SCCA vendor ProAm (www.proamauto.com). Tires were donated by Yokohama, while ExxonMobil provided all lubricants as well as a large supply of T-shirts. ConocoPhillips provided gas cards with almost inexhaustible credit which came in really useful.

The Impulse was originally red although the color had faded over the years, while the Alfa was a faded gold pewter color. So re-sprays were in order. Sterling McCall Toyota in Houston had agreed to supply the paint and do the work on both cars. Manager Harold Whittey had already arranged for some samples panels to be painted in the colors we had decided on, and supplied us with all the materials to prep the cars. The students had chosen a smart two tone silver and blue (Rice colors) finish for the Alfa while Dodge Viper Red was chosen for the Isuzu.

“It was at this point that we realized we had taken a couple of knives to a gunfight!”

With the cars as ready as we had hoped, it was off to the track to make sure nothing fell off! Lotus Owners of South Texas (LOST) had arranged to rent the local test facility at the Houston Police Academy for a track day and were gracious enough to allow us to bring along the Alfa and Isuzu to test the cars.

The LOST track day showed that the Alfa was mechanically sound – except for some hose clamps coming off on the fuel rail, but it indicated the ride on the Impulse was too high and the sway bars not working. With three days of hard work by Andrew, Mike, Jamie and the students. We were ready to start One Lap of America.

We left Houston at 1:30 am on Thursday after a delay in packing and getting some final issues sorted with the Alfa. I drove the Isuzu through most of the night while my co-drivers slept. After the first 1000 miles both cars developed ongoing problems. The Isuzu showed a vibration at ca. 20 mph. We incorrectly diagnosed this as the rubber bushing that holds the carrier bearing for the drive shaft. As we were leaving a rest stop I noticed a second and more

worrying problem. The rear right caliper was rubbing on the disk and grinding it down. This was the start of an ongoing saga that was not resolved until the third day. The Alfa seemed to have an intermittent misfire and have a major leak in the power steering. The former was fixed by firmly wiring down a loose connector to one of the fuel injectors. Feeding the steering rack a diet of fluid three times a day solved the second issue.

We finally arrived in South Bend Indiana at midnight to the host hotel for the start of One Lap. In the hotel car park was several of the competition. It was at this point that we realized we had taken a couple of knives to a gunfight! There was more horsepower and more money displayed in that car park than should be legal. There were factory-backed cars, turbo Corvettes, 1000 bhp Vipers, a street legal Radical CSR (don't ask it was from New Hampshire), and enough Porsches to start your own race series.

After a great nights sleep, we got up early and went for breakfast and met the co-organizer of the event Brock Yates Jr. A really nice guy and SCCA racer he clearly enjoys the interactions with all the entrants. He immediately apologized for putting the Isuzu in SSGT2 small bore as opposed to economy where we had expected it to be placed. Not a problem we thought, until we viewed our competition which turned out to be a brand new Lotus Elise, a Dodge Daytona, a Toyota Supra, a third generation Mazda RX-7 turbo and a ultralight Seven replica. Not one of these was stock and all had clearly been prepared with just this event in mind. They even had trailers for all their stuff! It was just as bad for the Alfa having been put in mid-price sedan with various products from Germany!

The first day of the event was spent getting through tech – which seemed more concerned with the placement of stickers than anything else. Therefore, prior to tech we put all of the decals on the car. In addition to our numbers and the event sponsors, we had to artistically arrange decals from First Community Bank, Mobil 1, Yokohama, Bridgestone, ConocoPhillips, Porterfield, CarboTech, PPG, BrooksSpeed Garage, and Garcia Alfa Racing. Finally, in homage to the ‘screaming chicken’ of the Pontiac Firebird we placed large Rice Owls on the hood of each car.

Day 3 of the adventure was actually the first day of the

event, a wet skid pad. The idea was to run two laps in each direction of a circular skid pad. The total time for the four laps was then used to determine a G-force. The students got suited up and ready for the run, neither car was too fast, however, we were not last. That was reserved for a Porsche GT (last year's winner) who forgot which direction he was going and did four laps in one direction – he must be an Aggie!



Photo caption here

With the first event under our belts we packed the cars and left for Indiana Raceway Park. The format for One Lap track events is simple and somewhat similar to Indy qualifying. You arrive at a track, unload your gear from the car, and line up in the hot pits. The cars are sent-out in groups of three to five depending on the track length and the expected lap times. The cars make a reconnaissance lap and line up in single file on the grid. Each car is waved forward and given the green flag. A 15 seconds gap is left between cars to limit the need to overtake slower cars. After three hot laps the checker flag is shown and the cars return to the pits. The aggregate time of the three laps is used to determine the position. Points are awarded like NASCAR with 500 for 1st place, 450 for 2nd and so on.

Having arrived at the Indianapolis Raceway Park we replaced the offending brake disk but it still rubbed – bollocks! With no choice I got in the car and went out on the track. At the first braking zone I found that only rear

left brake was working causing the car to try and spin. As a consequence my lap times were not great. The second run was better. Having decided to run without using the brakes and just carrying momentum through the corners I dropped 5 seconds a lap on the second run. Unfortunately, in the Alfa, Damon was trying a little too hard and spun twice; once in front of me and then again trying to follow my line through a fast series of corner.

Having seen a WRX being almost destroyed after hitting a wall, we were so happy to have survived we made a dreadful mistake. We stopped for dinner and this meant we got to the hotel near BeaveRun Raceway in Pennsylvania (539 miles away) at 5:30 am just in time to sleep for a couple of hours and get up for 8 am. That was the last time we stopped for dinner. After that all meals were courtesy of the ConocoPhillips gas card!

With about two hours actual sleep and a hot shower we were at the track and attempted to sort out the calipers. Buy this time Ben and Lucas were able to remove and replace the brake caliper in nearly a minute. Eat your heart out NASCAR.

Having raced at BeaveRun with Classic Formula Car Racing, I had a reasonable idea of the track. First session was not good since the brakes were still pulling the car in all sorts of unwanted directions. With a Dremel™ Ben performed miracles and got the calipers to stop the rubbing enough so the car could be trusted to stop the car in a straight line. Thus, the afternoon session was slightly better, but my attempts to put in a good series of laps was frustrated by a CRX got in the way. Its surprising how big a CRX can be when it is driven in the middle of the track! Brad and the Alfa managed to keep on track, but seemed to be having power issues that later turned out to be a fuel injector connector coming loose.

Tuesday night was oval track night. I had been dreading this and it proved as bad as I thought. Finding NASCAR a bore I had no idea what to do. In contrast, Damon used his hours of following NASCAR to good advantage and put in a great time with the Alfa.

NASCAR was going to continue to be the theme, as a 433 mile journey to New Hampshire would put us at New Hampshire International Speedway Loudon. We had

the advantage of staying with Brad's parents who were wonderful hosts. How many other teams got to sleep in a soft bed have a hot shower and then come down to a home cooked breakfast of bacon, eggs and hash browns. This is what racing should be. What was even better was the homemade brownies that Brad's mother made and somehow got moved to the Isuzu and consequently devoured by without the knowledge of the Alfa crew.

In addition to the oval New Hampshire International Speedway has a road course with some serious elevation changes. Just think of a cross between TWS long course and Hallett. The Isuzu rear right brake was still sticking slightly so after a frustrating morning I decided to call Porterfield. During the conversation their technical guru said, "Oh you may have to fit the pads by filing them down." Now they tell us! A quick grind of the pads and they moved again. We have brakes that work! Or rather we do for the first two laps since the front brakes now got hot enough that gas was trapped causing 'kick-back'. A lesson for next year put cooling ducts on the front brakes.

In the mornings session the Radical CSR went into a tire wall due to an Evo dropping coolant onto track. And it must have been the presence of his parents, but Brad who had been so steady at BeaveRun had a spectacular spin. The afternoon went smoothly for us, however, good news was that the Dodge Daytona in GT2 blew its bottom end and retired. In the afternoon we ran a different track configuration including NASCAR turns 1 and 2. Oh no, more ovals.

It was then off to West Virginia. As we traveled through New York City and some of the worst roads in the world (there are potholes the size of an elephant) we hit something big (possibly the elephant). We never worked out what it was, but it was furry and wasn't alive after we hit it. A quick stop didn't reveal any damage; however, just as we started off again the speedo took a nose dive. Once again we stopped in a car park and looked under to see black stuff dripping from the gearbox. Oh no! But it was not fatal since the black was grease and tar from road with

a little bit of oil and lots of water and possibly blood! But we did find out that the speedo cable was nicely snapped. After that we used the GPS as a speedo.

A new day, a new State and a new track; the Shenandoah Circuit at Summit Point Motorsports Park complete with a replica of the carousel at the Der Nurburgring. The morning session was completed in WRC Rally style. Ben read the track map to me over the two-way radio while I drove. It worked really well and got a better time than

should have done. The afternoon was marred

by having seen a very bad crash on the approach to the Der Nurburgring. A

WRX (what is it about these cars)

lost control and was briefly airborne before crashing into a tire barrier.

The driver was fine, but the car was

written off. With this image still fresh in my mind I slowed down.

The Alfa did much better since the students are younger and therefore braver (or is that dumber).

After the run, a short journey to the Mason Dixon Dragway was in order.

Here the goal was to set a target time and

on each subsequent run match that run

without red lighting (going before the green light) or breaking out of your time (being faster

than your first time). Lucas did a great job, although the

Isuzu looked a little out of its class lining up for the 1st

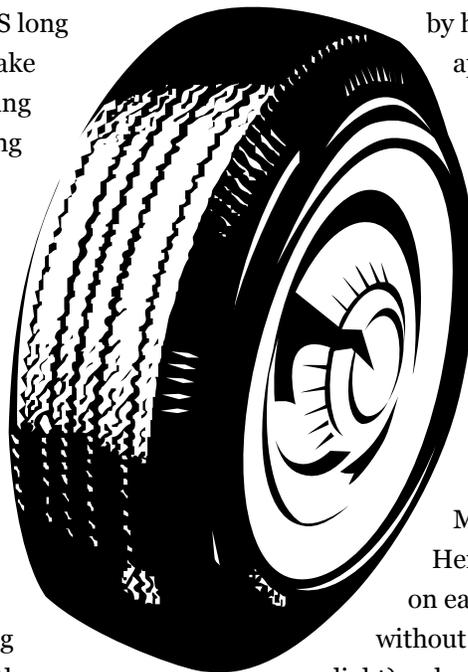
drag run with a Red Viper with 1000 bhp. On their first

run the Alfa boys braked at wrong point (1/4 mile not the intended 1/2 mile) so had very slow time and had to invent

their target time. In second run the Alfa and Isuzu ended up competing back to back with the Alfa winning. Damon

did a great run, but Lucas thought he was going to break out so he slammed on the brakes, twice, and ended up well

outside his estimated time. Oh well, but at least we got out of there early for once.



To be continued...

Look for Part II in the upcoming issue of HSCN.