

I Spit In The Eye of the Prince of Darkness

Last month our British Motor Club of Southern New Jersey club members attended a workshop at Motorcar Garage on the Lucas electrical and wiring systems, famous in British cars. Coincidentally, in conversation with other club members, I mentioned that last June I had completed a full restoration and EV conversion of a 1967 Triumph TR4a IRS and now had a battery powered British sports car with a 60 mile range and 60 mph top speed. One of the other club members said, 'You spit in the eye of the prince of darkness', and the story would make a great newsletter article. I laughed and agreed so here goes....

About 4 years ago, my friend, Eddie Adams, owner of Eddie's Antique Restorations in Egg Harbor, NJ and also a club member, offered me an old, disassembled, TR4a he had in a garage taking up valuable storage space for the last 8 years. The last owner had left it for restoration around 2001, got ill and never picked it up. Eddie had completed all the metal body work then put it in storage waiting on the owner. The owners wife finally said he could keep the car, I offered her \$500 for the title and Eddie gave me the car.

The frame was shot so I had RATCO in Long Island build a new Triumph frame and mount all the new brake, tire/wheel, steering and suspension parts I purchased. I now had a totally new rolling chassis, a sound, whole body but a questionable drive train that had not run in 10-12 years. At this point I had about \$10,000 invested and thought I'd be lucky if I only had to put another 10 into the project. Little did I know....



I had been reading articles on Electric Cars and got the thought that maybe a way to keep young people interested in the car hobby in the future was to convert classic vehicles to battery power. New technology, old classic style....that sort of thing.

Could I convert this '67' TR4a to an electric vehicle? Plus, I wanted to see if I could do it. Years earlier when doing my first restoration after retirement (64 E type), I was completely intimidated by the thought of wiring a car without burning it up. I watched Eddie Adams wire that one but tried the next one (57 MGA) myself and overcame my fear. Building this electric car would be like getting a graduate degree in wiring. And everything was pretty much custom.

I started buying books on EV conversions and doing lots of internet and uTube research on the subject. I found that there were a bunch of consulting/conversion companies out there (mostly in Calif.), that specialized in either doing the ev conversions of fuel powered cars and trucks to electric or assisting do-it-yourselfers by selling the parts or kits needed and offering counseling and advice on ev conversions. After evaluations, I ended up contacting Electric Vehicles of America, Inc.(EVA) of Wolfeboro, NH as my helper.

They did the following to help me:

- Talked me through the entire conversion process.
- Helped me choose the right battery to use.
- After feeding all the stats of the TR4a into a computer model, generated all of the components and sizes required for me to build a vehicle capable of a minimum of 60 mph and a 60 mile range and be safe.
- Provided an outlet to purchase all components needed except batteries.
- Built me an adapter plate system between the Chevy T5 manual transmission I used in the project and the electric motor they provided.
- Helped with the design and placement of the battery boxes in the sports car.
- Assisted me in weight computations of the original drive train, fuel, oil, water and exhaust systems vs the new components and 13, 80lb batteries.
- Provided extensive how-to documentation, wiring diagrams, testing procedures and safety steps.
- Answered my every question via phone or email along the build. I sent them progress pictures every week during the conversion build.

Bob Batson and his staff at EVA were excellent.

Early on in the project much time was spent on battery selection, placement (Safety and weight distribution), building and installing steel battery boxes and hold downs. The batteries were not purchased until the last step but we needed to know exact size and weight up front. Twelve, 74 lb. deep cycle, golf cart, wet acid Trojan batteries were selected as the power source. These cost \$2400 and added 900 lbs to the car for a total of 144 volts. Lithium Ion would have been a third of the weight but double the cost for the same output and I just could not justify it for a show car that would be driven only 1-2000 miles a year. A 13th conventional battery is also used to power lights, horn, radio, etc. We finally decided on placing 4 batteries behind the front grill, 4 behind the seats where the TR fuel tank used to be and 4 batteries in the trunk.



The car is stock from the transmission back with the exception that I used a Chevy T5, manual 5 speed transmission instead of the Triumph 4 speed. As it turns out only 2nd, 3rd and reverse gears are used and the clutch is removed since an electric motor stops when you take your foot off the pedal. I start in second and shift to third at 35mph.



After installation of the transmission, adaptor plate and electric motor I built a 1/2" Plexiglas (non-conducting) engine bay panel over the motor to support the other components, switches and cabling. This panel is removable to provide access to the motor for maintenance. In total, I removed 660 lbs (TR4 engine, radiator, exhaust, fuel tank, starter, generator, heater and hoses) from the car but added 1100 lbs (motor, converter, charger, DC/DC converter, switches, cabling, batteries and battery boxes) back into the car. Fortunately I got heavy duty springs and shocks on the chassis rebuild.

The longest time was spent on wiring as this electric vehicle has three separate wiring systems:

- 1) High voltage cabling system - This inter-connects all 12 batteries, switches, circuit breaker, motor and controller with 2.0 welding cable.
 - 2) Low voltage system - This system opens and closes switches when the pedal is depressed, feeds re-charging juice back to the 13th battery for lights, etc and manages the main vehicle charging system.
 - 3) Conventional Triumph wiring system - Utilized the TR4a wiring harness without ignition, starting or generator circuits.
- 1 and 2 are NOT grounded to the car but only to the negative battery side.



Safety in dealing with 144 volts in a moving vehicle is important and challenging. The largest amount of design and fabrication time is spent on immobilizing the batteries and providing fuses and rapid disconnect ability in case of an accident or problems. Remember, the high voltage wiring system is NEVER grounded to the vehicle and if the batteries are not properly secured, they may be dangerous in an accident. In addition, there are three rapid disconnect points in the design.

1. A 400 amp circuit breaker is wired in the engine bay with an emergency switch on the dash to kill power in an instant.

2. The 144 volt wiring contains 4 disconnect connectors that will stop current from the batteries to the controller to the motor used when working on the electrical systems or battery maintenance.
3. A power fuse is located mid way between batteries #6 and #7 to blow out in case of a short circuit.



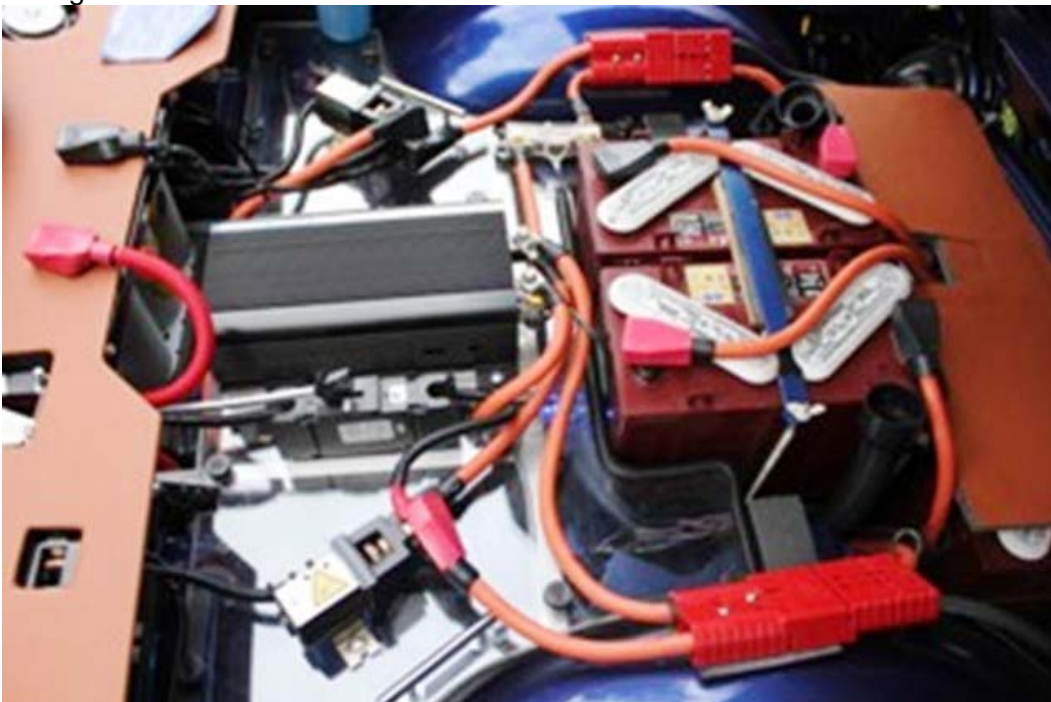
Two areas were modified in the interior design. Different gauges were used to measure, high voltage, low voltage, amp's and a simulated fuel use gauge. Also, the rear storage area behind the seats was re-engineered to accommodate 4 batteries.

Back-In-Time Interiors in Mt. Holly ,NJ completed the all leather interior with my design assistance. We went with a tan buckskin leather and navy blue cording. Since the car was painted in a non-stock neon metallic blue, there was no attempt to stay with a stock interior. A copper rust colored carpet and tan canvas convertible completed the package. My friends, Jay Rossel and Ray Hunt did an outstanding job again as they have before. Rays skills with leather and attention to detail never fail to amaze me since Ray lost one eye in Vietnam and is a better craftsman that any two eyed equal.

The actual ev conversion cost me around \$12,500 for components, wiring and batteries. The total conversion however went north of \$40,000 but is ended up a beautiful show car, but since I joined the 'More Money than Brains School of Auto Restoration' in 2005, I build for quality and enjoyment not profit.



I have taken the TR4Aev to a few car shows last summer and gotten two different reactions. Either they love the car, think it's very unique and have a million questions on how it was converted or they think I ruined a great classic! (purists). I look at it this way. If I can get some young technocrat interested in the old car hobby by converting a classic to electric power, maybe my widow someday can sell it and return good value. That's because I believe when all us baby-boomers are gone nobody will want the old cars anymore and my wife will find out I have been lying all these years calling them investments!





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