April 28, 2014

Hi folks!

We have a brief update from the 2014 Formula Hybrid Competition. Day 1 went rather slow. Despite what we thought was conservative planning and proper preparation, we still found ourselves wrestling with rules compliance when we should have been packing the trailer and packing the trailer when we should have been on the road. Still, we fit in some sunrise testing and made it to Loudon today in good spirits! All we can say is WOW this car is quick. We turned it up to twice the torque since you all saw it on Thursday and it’s fantastic.

We were finally able to get into Electrical Tech Inspection at 2:30 PM. By 4PM, we had a small list of fixes that would allow us to pass the Electrical Pre-Inspection and move onto Mechanical or final Electrical Inspections. Our biggest concerns with electrical rules compliance were addressed and the biggest fix just requires running another wire through conduit and cutting a trace on our PCB; not bad!

For now, we’re back in Thayer printing forms, prepping presentations, updating schematics, and resting. Tomorrow, we'll do better about arriving to the track at a decent time to make sure we get through both Mechanical and Electrical Inspections with time for testing.

Look forward to seeing y'all down there,

Ric
Arty, Paul
Seansie, Rik
Willy, Toph
April 29, 2014
Greetings from Loudon!

WOWZERS today was a big day. In an effort to make up for yesterday's tardiness, we were up and out of Hanover early, knowing we had some work to do before tech inspections opened back up. After banging on Christopher's apartment (every team has a chronic oversleeper), we were on the road by 7AM.

So it turns out Tuesday is a rather busy day at the Formula Hybrid competition. First, we arrived with a short checklist of fixes to be done before returning to tech inspection. Easier said than done. Arthur was quite busy educating visiting junior high schoolers about our car. He informed us that talking about the car was exhausting and has since ruled off educator from his potential career list. We then ran to our design presentation. Eric was so out of breath when he started talking that the judges suggested we take a break before but there was no time to stop! There was too much to tell! Too many new things! Anyway, the outcome of the design presentation was that we are in the finals for design, and we will be visited again by the judges tomorrow for more show & tell. Shortly thereafter, Tuck wannabes Paul & Sean ran off for the Business Presentation, in which we make a case for turning this operation into a business. Despite Sean's awful hair and moustache, we received the highest score for the electric vehicle category, a perfect 100! So from a static event perspective, Dartmouth is doing great.

But what about dynamic events!? First, we must pass technical inspection. After our checklist was complete, we passed Electrical Pre-Inspection, allowing us to move onto mechanical inspection. For the most part, inspection went quite smoothly. We cut it a bit close with clearance on templates that define minimum space requirements in the cockpit and footwell, but nothing that required any tough fixes. Even Willy was able to perform driver egress
in under 5 seconds (but just barely, at 4.98 seconds). After about three hours of thumbing through datasheets and schematics, Eric completed the electrical documentation inspection, and the car moved to electrical final inspection. Aside from several wire bundles that required strain relief and some better insulation practices, we cruised through electrical inspections. As of right now, we have made all fixes to pass the rest of inspection tomorrow. Erik, king of fixing all that is broken, even shimmed our loose wheel bearings. Although he probably made them loose just so he could shim them.

As of now, we think UVM is the only team to have passed all inspections, and we’re right behind them. We will hopefully finish inspections in the morning and get a bit of testing/tuning in before our autocross run. Batteries just finished charging. Until tomorrow, we're out.

-the 2014 DFR Team

tl;dr: through electrical pre-inspection & documentation, full mech inspection, and tilt test. all outstanding electrical items are fixed, and we anticipate passing all inspections first thing in the morning. Dartmouth received first place in the business presentation and is in the design finals

April 30, 2014
Hey folks,

First of all, we want to thank the Thayer community for their amazing support today. Our garage bay was packed full of fans today; what a warm feeling it gave us on this rainy cold day.

We started the day off strong: by the time Eric and Erik had finally gotten the stupid CAN to USB converter up and running to talk to the motor controller, Christopher and
Arthur had passed the team through electrical inspection. We then ran off to the rain test, which was probably the most stressful four minutes of the competition thus far. The rain test requires the vehicle to maintain proper ground isolation for four minutes with a sprinkler spraying the car for the first two minutes. Despite our upside down high voltage light being upside down and filling with water, we had no water issues at all, and passed!

It was then time for the brake test. Willy misunderstood the brake test a bit and broke traction when starting the vehicle. Just kidding. He made an awesome cloud of smoke and two black stripes at the start line, and we successfully locked up the tires on our first attempt.

We moved to acceleration, but ran into some issues. Our battery management system kept throwing faults, and we never actually successfully were able to run an entire acceleration run under power. Still, Willy put up a very respectable time of 5.836 seconds from 0 to 75 meters, considering we were only running under power for the first 75% of the acceleration run. Bummer, because UVM beat us by 2/10 of a second...

After rewiring part of the BMS, we were confident our faults were fixed, and we headed out to the autocross event. Christopher, Arthur, Paul, and Sean competed in this event, and it was AWESOME. We had turned up the torque to 100Nm max output of the motor, and the car was unbelievably quick. It was a bit too powerful for Paul, who spun out trying to accelerate out of a corner. Sean, who operates at all times at 110%, put up the best time of 41 seconds, a full 2 seconds faster than UVM! Great job, Sean.

Still, there were only four of eleven runs that were successfully completed without tripping faults, and that's something that we've focused on addressing tonight. We've redone some more wiring and identified and fixed a potential grounding issue. For now, we're back to charging
so we have full batteries for tomorrow. Wish us luck for the endurance run tomorrow. Our record of a faultless car is not strong at the moment, but some morning testing should give us a better idea of what to expect.

Until tomorrow,
the DFR team

May 2, 2014
Hey folks,

Sorry for the delayed update, but we have returned from Formula Hybrid 2014 as the 1st Place Electric Vehicle!

As we described in our previous update, Wednesday night was spent rewiring and making connections to the battery management system more reliable. The night ended with approximately two dozen full start-ups of the car, each time jiggling wires to try to replicate what we were seeing on the track. Confident that the fixes we made were sufficient, we called it a night, topped off the batteries, and got some much needed rest.

In the morning, we had a great plan: test for 30 minutes, charge for 90 minutes, and get ready to crush endurance by noon. We set the car on the ground, wheeled it out to the practice area, and started it up. After a couple of minutes, we realized that not everything was working correctly. Our DC/DC converters that run the low voltage system off the high voltage batteries had failed, and we were running our small low voltage battery down like crazy. We pushed the car back to the garages to see what was going on. When we tried to start again, we were unable to successfully precharge the motor controller. After about an hour of searching, we had found that there was a low resistance path from high voltage positive to negative that had developed in the DC/DC converters that was preventing precharge. It took another hour to fix an issue with our
flashing light on top, but by 1PM we were ready.

So there we were, an hour late to endurance with the officials threatening to shut down the track if we didn't show up soon. In proper pit stop fashion, we slapped the body work back on, closed up all the electrical enclosures, and ran to the track. Now lacking the DC/DC converters that would allow us to run the entire length of the endurance run, we were forced to run until the low voltage battery died. During the madness in the garage, we had heard that UVM was unable to complete a single lap in the endurance run; all we needed to do to win this competition was complete one lap of the endurance course. Erik took it easy on the first lap, and, after successfully completing one lap, romped on it a little more. Unfortunately, we only made it 3.5 laps before throwing a fault.

We talked a big game throughout the entire course of building this car. In the end, we were still stuck with the same issues that have plagued every year of DFR: we weren't ready in time. Literally just one more day of testing would have been enough to identify so many more issues with our reliability, and we could have completed more runs. But this competition is not the be all end all of this car. We have seen a second here or there of smoking tires and going slideways, but we haven't had the opportunity to see anywhere near this car's full potential. We're going to continue working to get this car more reliable, and we plan to race next at the Ascutney Hill Climb in two weeks.

Thank you to everyone in Thayer who has helped us out over the course of the past eighteen months to build this car; we could not imagine a more supportive community.

Eric Din
Paul Hogan
Sean Hammett
Erik Skarin, Christopher Rhoades
William Jewett, Arthur Bledsoe