Class Day 1

For the first half of the day Mike explained how the project was designed, and reviewed several considerations when picking donor vehicles and designing electric conversions. Most of this is covered in books and on web sites so we won't repeat it here; Mike suggests the book From Gasoline To Electric Power, A Conversion Experience by Gary Powers [ISBN 0-9660953-0-8]. Another good book is Build Your Own Electric Vehicle by Seth Leitman and Bob Brant [ISBN 9780071543736]. Some additional information that Mike provided:

- Batteries must be cycled (charged and discharged) several times before they yield full range. Discharge them down to 60% to 80% of their original capacity during each cycle. Best to not charge until you've used at least 40% of their capacity.
- Maximum safe discharge for a Lead Acid battery is about 1.75 volts, or a 10% drop in total voltage, but ask the manufacturer for the exact number for the battery you'll use. Battery chargers must be programmed with this data.
- When possible, let batteries rest for an hour before recharging them.
- Scrutinize the battery management system used in some designs. Some only monitor the connections at the battery charger, but you also need to monitor individual batteries to avoid killing them.
- Don't use batteries that contain recycled lead. Need all virgin lead.
- Lead acid batteries tend to perform best between 40°F and 90°F.
- Batteries that are going bad tend to get hotter than other batteries in the pack.
- Batteries that are going bad take longer to charge than good batteries.
- "State of Charge" meters can fool you – it's better to monitor your battery pack voltmeter and ammeter and keep track of how many miles you've driven. Mike likes to mount the voltmeter to the right of the ammeter because it's easier to tell when your battery pack is running down – their needles will point towards each other. Battery voltage falls as the pack discharges (needle moves to the left) and battery current draw increases as battery voltage falls (needle moves to the right).
- AC systems have better capacity for speeds over 45 mph than DC systems.
- Expect a converted vehicle to gain 400 to 1000 pounds due to batteries. Note that this reduces the vehicle's payload.
- When working on an electric vehicle, use good six-ton jack stands and four-ton jacks because of the extra weight.
- Mike found that a 1500-watt ceramic heater element works well, and can run off of the battery pack. It mounts in place of the vehicle's heater core inside the ducts. However, be sure to turn on the heater fan before tuning on the heater element lest the element will overheat.
- If converting a front wheel drive car, watch out for front axles with support bearings along the shafts. They make it hard to mount an electric motor while keeping everything aligned.

Electric Motor to Transmission Mount: The next order of business is to assemble the electric motor to transmission mount. The machine shop made several pieces:

1. The motor to transmission plate.
2. A coupler that mounts on the electric motor's output shaft.

3. A round plate that will bolt to the original clutch's pressure plate.
4. Round spacer(s) to locate the pressure plate over the transmission's input shaft splines.

Please see the document entitled "Electric Motor to Transmission Mount" for details.
Control Board: Next was to assemble the Control Board to hold several components under the hood. Ampmobiles had already prepped the board; for details, see the article "Control Board". The main Control Board components are:

- Motor Controller,
- Two contactors,
- Main Traction Battery Pack fuse,
- Fuse block for new 12 Vdc accessories, and a
- Shunt for the Ammeter that will mount in the instrument panel.

We bolted the Control Board (with components but without wiring) to mounts that were already welded to the truck frame. The Control Board is hinged in the back so it can tilt up to give access to the electric motor below it, although movement is limited because the Motor Controller hits the firewall.