

Milestone #8 – Finish Mechanical Work & Begin Electrical Work

DUE: 10 April along with Milestone #7 Deliverables if applicable

DESCRIPTION:

This week will serve as a ‘buffer week’ for finishing your vehicle if it did not pass the Milestone 7 inspection, as well as redressing deficiencies that were addressed during the checkoff. Additionally, you will start planning out your vehicle’s electrical systems and optionally begin fabricating it.

Complete vehicle Solidworks Model: You should have been updating your vehicle’s Solidworks model if you made any changes during fabrication. The **finished** SW model of your vehicle is due **next** week. **Finished** means assemblies are fully constrained, there are no “blank template” parts, all holes have mating features (e.g. a corresponding hole). The amount of detail you put into it is up to you, but here are some guidelines:

- All major vehicle parts have to be present. Steering components, braking components, drivetrain components, seating/piloting and electronics mounting arrangements must be present.
- All parts must at least have basic mounting dimensions. For instance, your motor can be a cylinder with another cylinder as the shaft, but it should at least have mounting holes at the correct spacing.
- All moving parts - wheels, steering columns, linkages, etc. should move as they do in real life (Modeling brake movement is not necessary). For instance, gear/rotation mates between pulleys and correctly mated steering links.
- Include a motor controller model, battery placement and mounting structure models, and power switch/access port holes and features if applicable. No other electrical parts are required.
- There is no need to add fasteners, teeth to your pulleys and belts, individual balls in the bearings, etc. More detail does not necessarily imply better grade.

Vehicle Electrical System Plan: You should create a drafted plan for the electrical system of your vehicle. For now, you have enough information to fully create a power-side wiring diagram, and you should also start on a signal-side wiring diagram. When completed, this diagram should include:

- Motor(s), controller(s), switches and relays, charging connections, and the correct number of batteries your vehicle will be using. Each ALM12V7 battery is treated **separately** *i.e.* a 24v electrical system has two separate batteries in the plan.
- Which wire sizes (in AWG) you plan on using. All wiring should have this indication.
- Which connectors will be used on which wires. (4mm Bullets? XT60 (the yellow ones)? Deans? ¼” Quick Disconnect terminals? Etc.)
- Indicate solder joints (no connectors) where necessary.
- Any other relevant power-side circuitry such as precharge switches/circuits or removable links (indicate how you will make them if you are planning on using removable links).

Computer-generated graphics are encouraged, but *clean* hand-drawn diagrams will be allowed.

Motor Sensor Mounting: If your vehicle is using **sensored brushless** commutation (i.e. all Kelly controllers, optional for Chinese e-bike controllers) you should obtain an appropriate Hall sensor board and mounting assembly. Your vehicle **must** have mounting facilities for this sensor board – it cannot operate without them!

FORMAT OF DELIVERABLE:

- Milestone 7 deliverables, if applicable or incomplete from last week
- Your vehicle's **power** electrical system plan as 1-2 pages in your notebook.

OTHER ACTIVITY: Office hours on Friday will focus on Homework 4 and power/signal system wiring.

RESOURCES:

Vehicle electric system notes on STELLAR

<https://stellar.mit.edu/S/course/2/sp13/2.007/r11/courseMaterial/topics/topic2/resource/vehelec/vehel ec.pdf>

The “Wiring” section of the Instructable document may be handy in providing you links to power switch, etc. resources: <http://www.instructables.com/id/The-New-and-Improved-Brushless-Electric-Scooter-Po/step13/Electrical-System-Loose-Wires/>

Radio Shack in Central Square is open until 7PM most days and may be the quickest way to obtain small switches, buttons, and relays!