NORTHERN ARIZONA UNIVERSITY

To: Armin Eilaghi

From: Honda EV Conversion - Team P1

Date: January 25, 2023

Re: Project Management

Introduction

This memo discusses several aspects of the Honda EV team's progress in completing the conversion project. The first section includes a reflection upon the group's project management skills with respect to its successes, areas needing improvement, action items, and critical design efforts for future manufacturing and testing work. Next is a discussion of the current Gantt chart built to track the goals and deadlines of the project, specifically looking at the first quarter of the 2023 spring semester which culminates with the 33% build status and presentation. Finally, both the purchasing and manufacturing plans are separately reviewed to detail the status of parts acquisition and the strategy to obtain or custom-build the remaining necessary components.

Reflection

- Project Management – Success

This previous semester, the team had many successful aspects of the project. These successes included, but are not limited to the following:

    - Implementing aggressive, attainable, and flexible timelines
    - Communicating with the client about important design decisions
    - Troubleshooting on the fly
    - Obtaining corporate contacts/sponsorship
- Project Management – Areas Needing Improvement
    - **Time management for deliverables (ensures project success)**
    - **Communication amongst team members about expectations for hands-on work and deliverables (reduces miscommunication and helps everyone be on the same page)**
    - **Splitting up project work while on site more appropriately such as making sure all individuals have work (hands on manufacturing or CAD so work spent in Phoenix is productive)**
- Remaining Design Efforts
    - Battery strap design
    - Drive control actuators and controllers
    - Mechanical subsystems including cooling, steering, and drive axles

Gantt Chart

To give a visualization of this project's goals and their deadlines, the team's previously developed Gantt chart was updated for the remaining portion of the design build. It was modified to show the major milestones that are left for the design and build work, as well as the deliverables that are expected throughout the academic semester. Discussed and shown in this report are the first five weeks of the semester, which encompasses two sets of significant goals that must be met for the project to move forward into testing:

- The fifth week marks the hardware status update and 33% build presentation of the project. Major systems to be completed for this point of progress include:
    - Installation of existing drive control actuators and computers and the design and manufacture of drive unit to battery interface components.
    - The design, manufacture, and installation of necessary drive and safety components including drive axles, electric-assist brake booster, and existing components that need routine maintenance or replacement.
    - The design, manufacture, and plumbing of all cooling and lubrication circuits, including drive motor water cooling and an external-pump oil lubrication system.
    - Making final connections between the low-voltage and high-voltage interface and ensuring proper connection of the high-voltage circuit.
- The semester begins with the team members regrouping and finalizing the first phase of the project:
    - The team connected following the winter break and discussed the status of work that each member performed during that time. A brief meeting was also conducted with Dr. Eilaghi to inform him of the project status and confirm the team's plans to move forward with its work.
    - The team will perform work on a weekly basis at Hasport Performance and during the initial weeks the team will complete the final iteration of the CAD and manufacturing work for the vehicle drive unit mounting system; this will be immediately followed by installation of the drive unit and batteries.
    - Additionally, the team will be completing critical team and individual assignments, including a thorough Engineering Model Summary and further engineering analysis of the parts developed for the project.

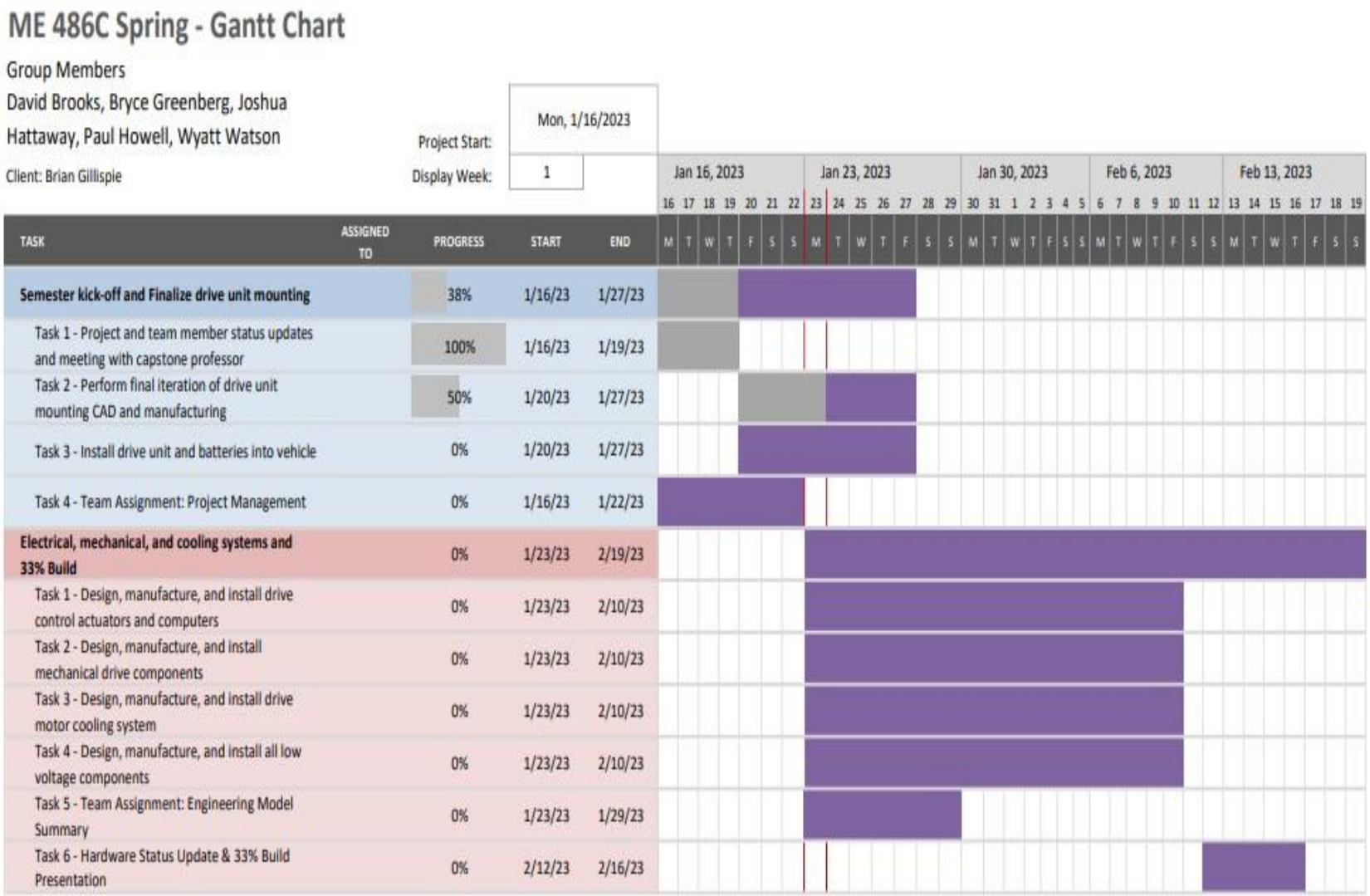

Figure 1: Honda EV conversion team Spring 2023 Gantt chart

Purchasing Plan

The Honda EV team has already made several purchases through its client which has helped with maintaining its accelerated pace in developing and manufacturing the mounting system for the electric drive unit and battery array. To this point, the only purchased item that has not yet been received is one of the two Tesla drive axles; the team requires a pair of already built Tesla axles so that the drive unit mating ends can be used in manufacturing axles designed to fit into the project vehicle. In addition, there is a selection of important parts requiring purchases from different vendors, where time is of the essence to maintain the teams progress towards completion:

- **AEM** – This vendor will be providing the team with the drive controllers that are needed to receive operator inputs and provide control commands to the drive unit and charging circuits.
- **Rywire** – At the request of the client, this vendor will be building the high-voltage wiring harness which connects between the battery array, drive unit, and charging components.
- Miscellaneous – There are other significant drive components required to complete the vehicle that will be sourced from used automotive part vendors or even Hasport's selection of used parts; an electric assist steering column; and cooling system parts, including a radiator that will need to be modified to work with the required hose size and an electric fan.

Bill of Materials

Part	Cost	Buy or Manufacture	Vendor or Manufacturer	Lead Time	Part Status
12' of 1.5" square steel tube	$ 55.00	Buy	Home Depot	-	On hand
32 ft^2 of .188 in sheet steel	$ 200.00	Buy	Home Depot	-	On hand
Tesla SDU	$ 1,500.00	Buy	Junkyard	-	On hand
25 M12 Bolts	$ 23.45	Buy	Home Depot	-	On hand
25 M12 Nuts	$ 16.20	Buy	Home Depot	-	On hand
12 Chrysler Pacifica hybrid batteries	$ 3,500.00	Buy	Junkyard	-	On hand
2 Hasport K-Flip3 Mounts	$ 350.00	Buy	Hasport Performance	-	On hand
Electric brake booster	$ 150.00	Buy	Junkyard	-	On hand
Cooling system components	$ 500.00	Buy & Manufacture	Junkyard & Custom radiator vendor	2 weeks	Needs designed and ordered
Drive axles	$ 200.00	Buy & Manufacture	EV Parts Solutions	4 weeks	Waiting on delivery
Electric steering column	$ 150.00	Buy	Junkyard	-	Needs ordered
AEM VCU	$ 3,500.00	Buy	AEM	2 weeks	Needs ordered
AEM PDU	$ 750.00	Buy	AEM	2 weeks	Needs ordered
Vehicle wire harness	$ 2,000.00	Buy	Rywire	4 weeks	Rywire needs vehicle
TOTAL	**$ 12,894.65**				

Figure 2: Bill of materials displaying items for purchase

Manufacturing Plan

- To manufacture the design created in the first semester of the capstone project, the team will use the manufacturing equipment at Hasport Performance's machine/auto shop.
    - The equipment that the team has been granted access to includes a laser cutter, a drill press, mills, lathes, CNC machines, welding equipment, and sheet metal bending equipment.
- The team, led by manufacturing engineer, Bryce Greenberg, will use this equipment to manufacture the necessary motor and battery mounts, as well as the contactor box and any other mounts for the vehicle's components.
- The material for all parts (unless future analysis proves a different material must be used) will be .188" thick sheet steel.
- The laser cutter will cut the sheet steel into the correct shape, then the bending and welding equipment will make the parts ready for installation into the vehicle.
- The installation will take place on one of the hydraulic lifts in Hasport Performance's shop.

Bill of Materials

Part	Cost	Buy or Manufacture	Vendor or Manufacturer	Lead Time	Part Status
Cooling system components	$ 500.00	Buy & Manufacture	Junkyard & Custom radiator vendor	2 weeks	Needs designed and ordered
Drive axles	$ 200.00	Buy & Manufacture	EV Parts Solutions	4 weeks	Waiting on delivery

Figure 3: Bill of materials displaying items for manufacture