

Journal 08

Date: 01/29 (11:35-12:10 lunch meeting, 4:00-6:00 after school)

Team/Group Members Involved:

- Frame Team
- Katie

Work Summary:

- Planned out week's work and discussed progress of rover
- Determined timing of waterjet visit (9:00-12:00 Saturday)
- Finalized tolerances on majority of waterjet parts
- Sent .stl and .step files to Byron
- Checked bottom bracket compatibility with bottom bracket shell
- New wheels (plywood) were test driven
 - Laps around flagpole
 - Up panther drive
 - Rear of rover having minor chain difficulties
 - Rear of rover geared down too far - difficult to apply force
 - Lap done around track (approx. 2 min time)
 - Plywood rings of wheels are detached entirely, spinning freely
 - Need solution

Implications:

The waterjet visit will help move the construction of the rover forwards significantly because a great deal of our current issues have to do with unavailability of parts. The tolerances are important because, as I found last year, lacking a tolerance will prevent two steel components from sliding together. I was not aware of the .stl/.step distinction until today. The bottom brackets finally arrived - since they are compatible, as soon as the waterjet visit is complete, the hammerschmidts can be attached to the frame. The test driving of the frame was productive as well. Although it has already been determined that the resin-coated wheels are not feasible, the plywood, it seems, will take some additional reengineering to be truly useful, since glue does not properly hold it together. Furthermore, the gearing on the rear of '17 may need to be changed, perhaps by changing the chainring used at the pedals. The rover is slightly faster than Burny was last year.

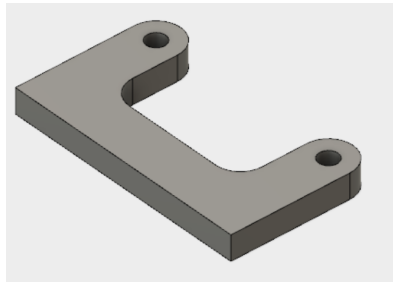
Date: 01/30 (10:00-11:25 class)

Team/Group Members Involved:

- Frame group

Work Summary:

- Wheel mounted on new frame (w/o freewheel)
- Brake disc mocked up
- Distance measured for brake caliper
- Height determined for brake caliper
- Brake caliper mount designed in CAD - designed for caliper to fit at 45 deg mark on brake disc



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- [Brake Mount Drawing](#)
- Flange hole dimensions/distances and brake disc dimensions standardized (e.g. 8.633" → 8.5")
- Seat beams were fabricated [Micah+Austin]

Implications:

It was important that the brakes were figured out because not placing them as accurately as possible could only result in issues on the serpentine chicane. As such, their accurate placement and distance is essential to the functioning of the rover. The brake disc location seems like it will work properly, if unconventionally. Furthermore, the angle of the brake caliper relative to the straight line formed by the bolt holes shows that mounting the caliper straight necessitates its application to a 45 degree from the vertical position on the brake disc. The distances were all measured as accurately as possible, and I believe that brake mount should function as intended and grasp the brake disc strongly enough to be useful. One issue that came to light was that the flange dimensions were likely all designed in mm instead of in, which caused issues for the bolt-hole diameters. All such issues were resolved.

Date: 01/30 (8:00-9:25 free period)

Team/Group Members Involved:

- None

Work Summary:

- Cut and ground additional 16.5" piece for stool
- Welded last 16.5" piece for stool
- Polished and welded three legs onto stool
- Stool stands - too large

Implications:

The stool is coming together properly, if slowly. However, in its construction, it has become apparent that it is far too large for a normal stool. I should have, instead of a 18" outer section, made a 12"-15" outer section. However, it still stands properly, so that, at least, is working. However, the lower power welder does not work near as well as the high power welder, and therefore I will try to use the higher power welder for all further work on the stool.

Date: 02/01 (10:00-11:25 class time)

Team/Group Members Involved:

- Frame team

Work Summary:

- Experimented w/ tolerances on chainring adapter, brake mount, and flanges
 - Narrowed all tolerances



- Published steel-steel tolerance = 0.005", actual determined to be 0.002-0.003
- Attached freewheel bearings to freewheel adapters
- Mounted two wheels w/ new flanges to freewheels and to axle
- Freewheels work properly - drive in one direction, slip in the other
- All left-thread freewheels go on left side of wheels, all right-thread on right side

Implications:

The tolerances on the parts were modified because, after cutting them on the laser cutter, we found them to fit too loosely onto the axles. A tighter fit is desired to reduce play and shifting during use. The published steel → steel tolerance seems to high, but that may be due to inaccuracies in manufacture of the shafts. The freewheel bearings were attached to adapters, and

all are functioning as they are supposed to. However, the right hand thread ones idle much more nicely than the left hand thread ones. All, however, work properly, and the rear axle was tested with them and performed well. Driving the axle forwards drove both wheels, but one wheel could be accelerated without driving the other wheel. Furthermore, stopping the axle did not stop the wheels, illustrating the need for a wheel-mounted disc brake on at least two wheels.

Date: 02/01 (8:00-9:25 free period, 4:00-6:00 after school)

Team/Group Members Involved:

- Frame team

Work Summary:

- Welded last leg onto stool
- Began welding struts, but legs are slightly crooked, so spacer had to be put and welding wire used to bridge gaps



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- Found that waterjet/laser would have to be done on Friday night, not Saturday
- Refined tolerances for all parts
- Produced final iterations of all components for waterjet/fiber laser
- Determined amounts of $\frac{1}{4}$ " steel, $\frac{1}{8}$ " aluminum to purchase
- Determined amount of $\frac{1}{8}$ " steel necessary
 - *Steel was cut using plasma cutter*

Implications:

The attachment of the footrests to the stool proved difficult. The bent legs prevented a tight fit, and therefore I had to introduce spacers into the gaps. However, even with spacers, I was forced to weld across gaps, which I accomplished with quick bridges followed by a slow bead run across the bridges to weld them together and to each piece. The footrests can all take my weight, so the welds hold. However, I will need to polish the welds to make the seat look nice. The moving ahead of the waterjet/laser date is simultaneously good and bad. It meant that we had approx. 1.5 hrs extra to get the parts ready because Mr. Cribbs would not be bringing

them, but it also meant that we would need to have everything sent immediately. For that purpose, I got all the parts prepared and used Vcarve to nest them and determine the minimum amount of metal to use to cut them.

Date: 02/03 (9:30-5:00 Saturday work)

Team/Group Members Involved:

- Frame team

Work Summary:

- Checked chainring adapters for fit - it seems steel tolerances can be less than 0.002" or that the fabrication was not accurate to 0.001"
- Ground surface of seat brackets to remove them
 - Eventually, Micah used a mallet and a cutting blade to remove the seat brackets
 - Seat fits onto seat brackets
- Used dremel to slightly modify lever for steering to fit properly
- Fit as many freewheel bearings as possible into flanges and bolted together, but there is a shortage of nuts for the bolts
- Hammerschmidt assembly
 - Welding of ISCG-05 tabs to bottom bracket shell produced bubbling on inner threads
 - Solved by using a dremel to get rid of threads in the bubble location
 - With force, bottom bracket threaded onto shell, but spacers were required
 - Entire assembly put together after replacing 24T chainring w/ 22T
 - Entire assembly works - idles backwards, drives forwards



- **Problem: Right side hammerschmidt chain will output to the outside of the frame. Need to add small, 5"x5/8" axle to pedal bar on right w/ two chainrings to transfer chain from right side of pedal bar to left to prevent chain from going to outside of frame rather than inside**
- Attached common axle w/ roller sprocket 30T and two chainrings 22T

- Strung chain between hammerschmidt and chainring - functions and drives common axle
- Steering system
 - Attached steering lever to its axle
 - Attached steering lever to control rod w/ tube
 - Attached control rod to frame w/ 1"x1"x1/4" steel piece
 - Steering system functional up to control rod, but need to straighten piece control rod is attached to
- Updated smartsheet

		Task Name	Start	Finish	Assigned To	Duration	Predecess...	Stage	Status
48		Complete waterjet cutting	02/03/18	02/03/18	Sohum Kulkarni, We	1d			Completed
49		Determine brake placement	01/29/18	01/31/18	Sohum Kulkarni, Ma	3d			Completed
50		Finalize flange + freewheel attachment/brake disc	01/29/18	01/31/18	Sohum Kulkarni, Ma	3d			Completed
51		Attach wheelbox	02/03/18	02/09/18	Mark Dodson, Wes I	7d			To Do
52		Attach steering system	02/03/18	02/09/18	Sohum Kulkarni, Ma	7d			In progress
53		Attach wheels			Frame Team and Wh	1d	113		To Do
54		Send new wheelbox design to Byron	02/05/18	02/05/18	Sohum Kulkarni	1d			In progress
55		Attach ball joint mounts	02/05/18	02/05/18	Frame Team	1d			To Do
56		Order new brake, universal joint	02/05/18	02/05/18	Frame Team	1d			To Do
57		Attach 1st universal joint	02/05/18	02/07/18	Frame Team	3d			To Do
58		Attach 1st brake	02/05/18	02/07/18	Frame Team	3d			To Do

Implications:

This was, as expected, a highly productive day. All components are properly fitted, but the tolerances are looser than expected, and a caliper measurement showed that they are truly looser than they are in the drawing. After slight modifications, both the steering control lever and the seat brackets are fully functional. However, there seems to be a lack of the nuts used to hold on the freewheel bearings. Why that is I do not know, but we may need to order extras. The hammerschmidt mounting initially seemed to be difficult, and was further complicated by the bubble on the threads of the bottom bracket shell, but after that one issue, the rest proceeded smoothly and without incident. However, in order for both to be fully functional, it will be necessary to add a second axle to the pedal bar on the right side of the rover to transfer the chain to the opposite side of the pedal bar. The common axle is fully functional. The steering system is, as well, fully functional with the exception of the wheelboxes. The rest of the system works well and without resistance, and confers a mechanical advantage by the point of the steering control lever.