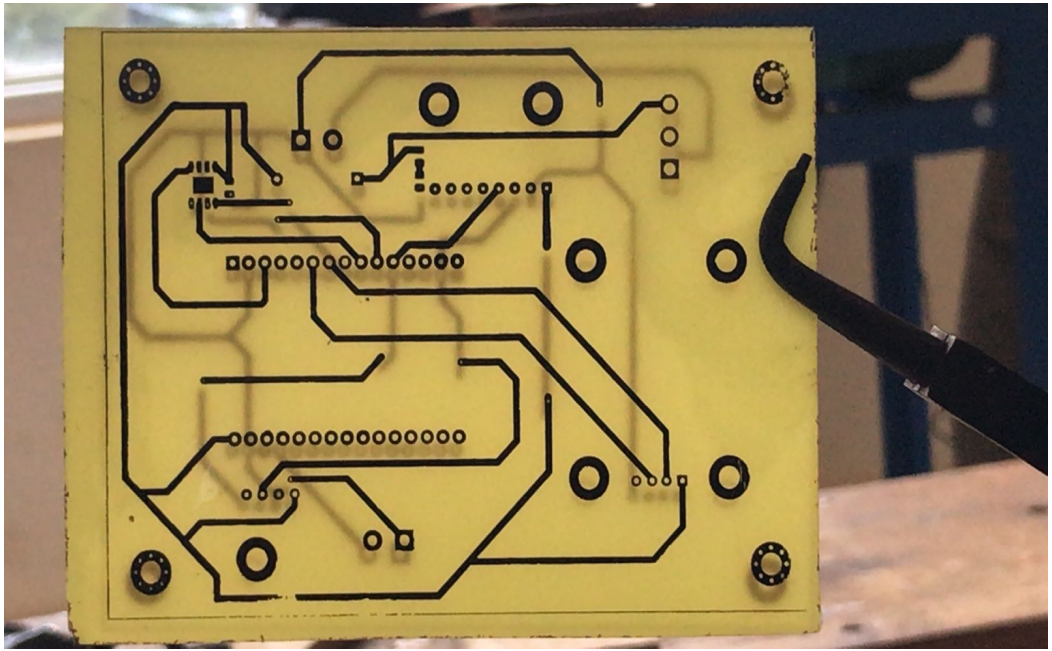
RECOVERY TEAM REPORT

WEEK 6

TASK DONE WEEK 6

- Fabrication of PCB and etching #28
- Simulation of 3D printed piston#43
- Design of the piston holder
- Testing code for kalman filter
- GPS Real time tracking on base-station.#6

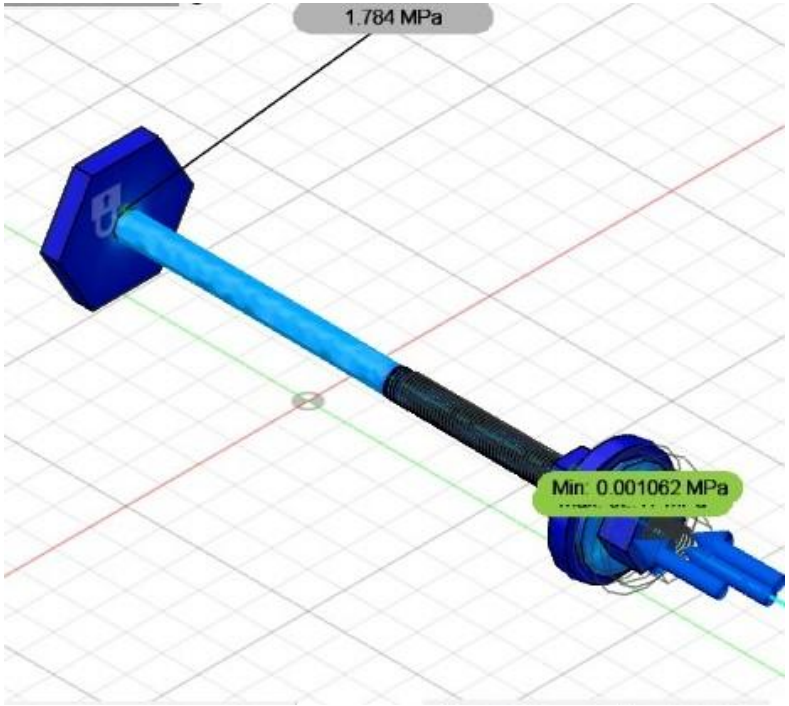
Fabrication of PCB and Etching

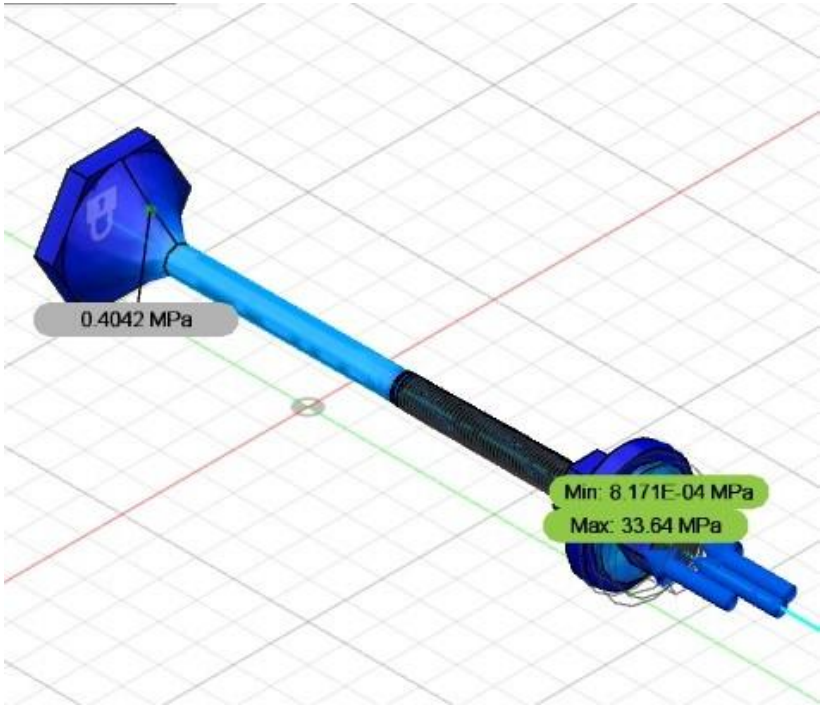


Successful transfer of the layout to the board

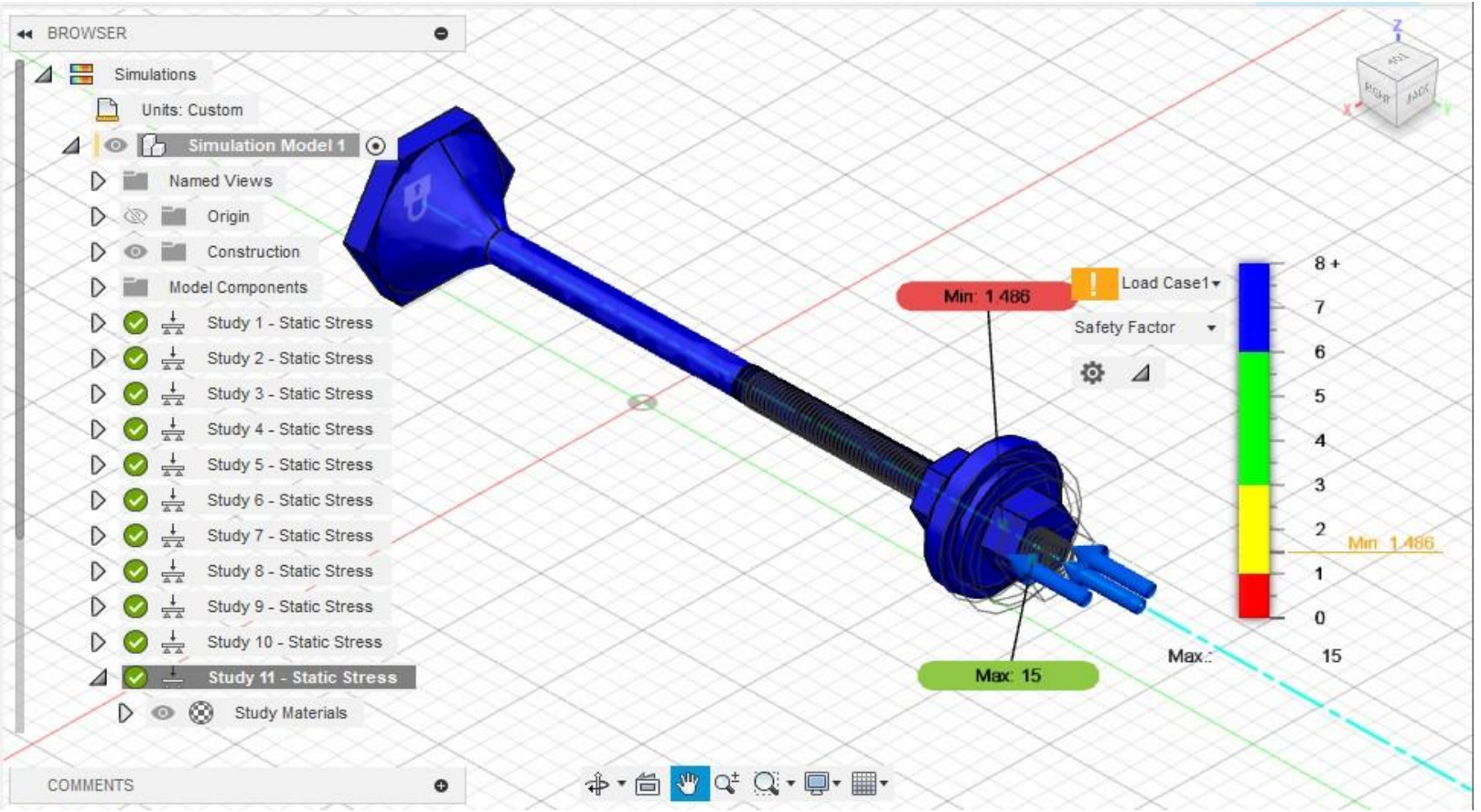
Successful etching of the process the flight computer.

Simulation of 3D Printed Piston

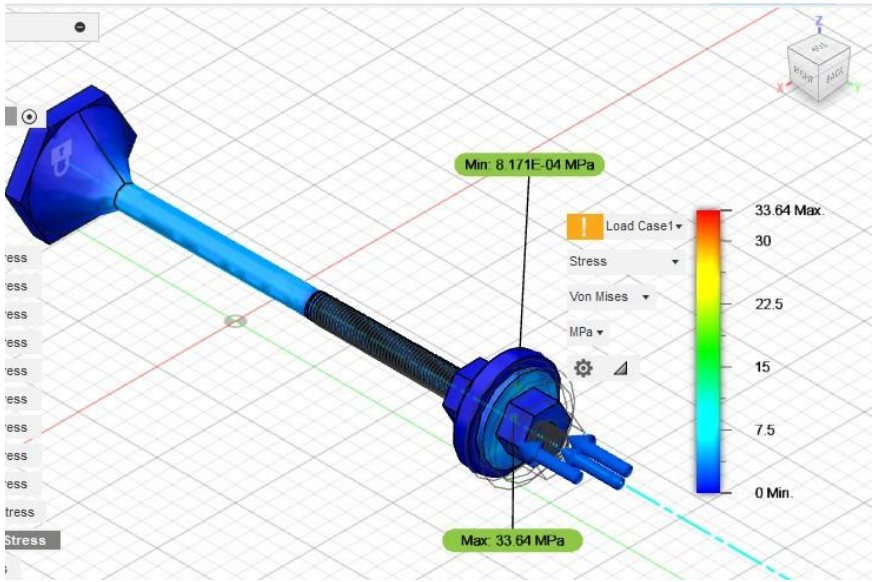


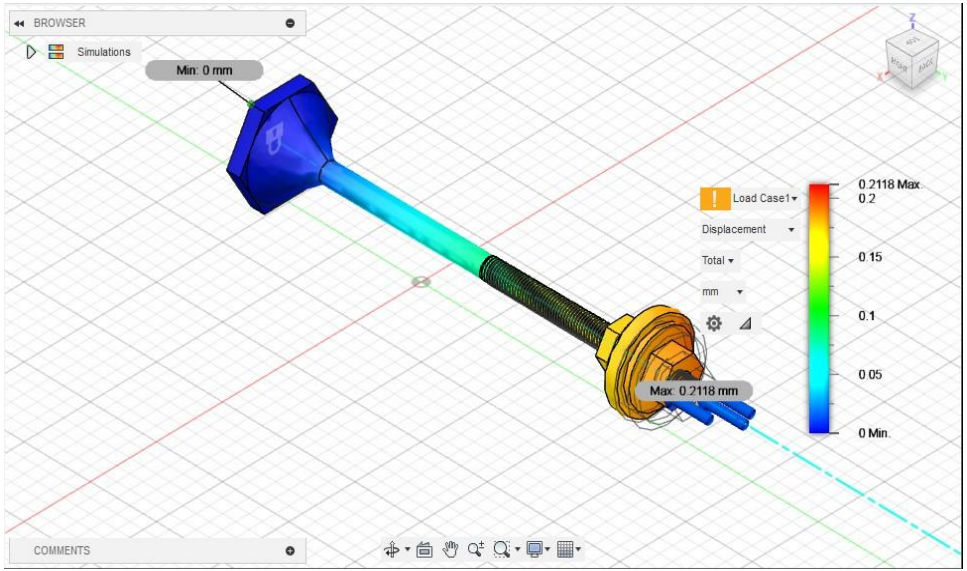


Corner stress in two pistons (With and without reinforcement). 100N of force applied.



Minimum and maximum Safety Factor (Nut closest to crimson powder at risk). 100N applied.





Stress Highlight: Nut closest to the force experiences the most stress (33.64 MPa), followed by the shaft of the bolt. 100 N applied.

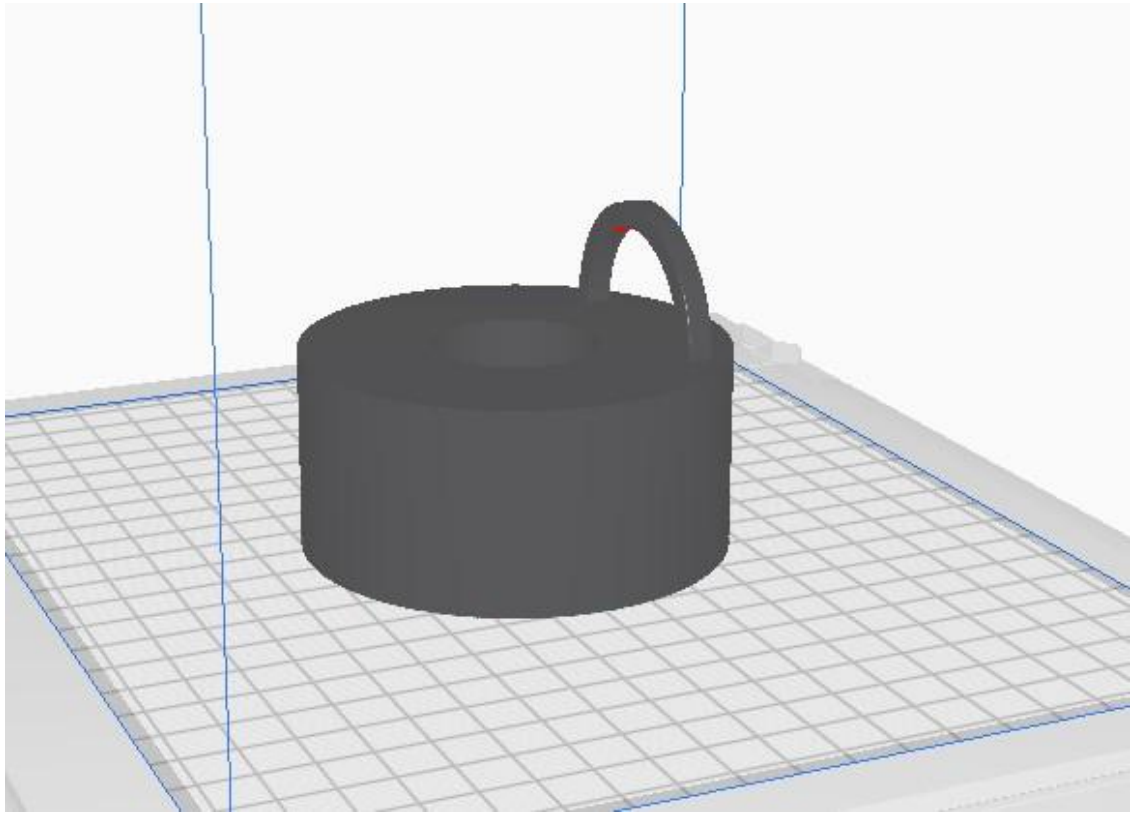
Displacement Highlights: Maximum displacement happens at the end of the piston. This gradually recedes until zero at the other end. 100 N applied.

		5N	10N	20N	30N	40N	50N	60N	70N	80N	90N	100N
SAFETY FACTOR	MAX	15	15	15	15	15	15	15	15	15	15	15
	MIN	15	14.86	7.431	4.954	3.715	2.972	2.477	2.123	1.858	1.651	1.486
VON MISES STRESS	MAX	1.682	3.364	6.729	10.09	13.46	16.82	20.19	23.55	26.92	30.28	33.64
(MPa)	MIN	4.09E-05	8.17E-05	1.63E-04	2.45E-04	3.27E-04	4.09E-04	4.90E-04	5.72E-04	6.54E-04	7.35E-04	8.17E-04
DISPLACEMENT	MAX	0.01059	0.02118	0.04236	0.06354	0.08472	0.1059	0.1271	0.1483	0.1694	0.1906	0.2118
(mm)	MIN	0	0	0	0	0	0	0	0	0	0	0
STRAIN	MAX	0.00129	0.002597	0.005194	0.007792	0.01039	0.01299	0.01558	0.01818	0.02078	0.02338	0.02597
	MIN	2.87E-08	5.38E-08	1.15E-07	1.72E-07	1.30E-07	2.87E-07	3.44E-07	4.02E-07	4.59E-07	5.16E-07	5.74E-07
REACTION FORCE	MAX	0.0856	0.1712	0.3424	0.5136	0.6848	0.856	1.027	1.198	1.37	1.541	1.712
(N)	MIN	0	0	0	0	0	0	0	0	0	0	0
CONTACT PRESSURE	MAX	2.174	4.347	8.695	13.04	17.39	21.74	26.08	30.43	34.78	39.13	43.47
(MPa)	MIN	0	0	0	0	0	0	0	0	0	0	0
CONTACT FORCE	MAX	0.6523	1.305	2.609	3.914	5.218	6.523	7.828	9.132	10.44	11.74	13.05
(N)	MIN	0	0	0	0	0	0	0	0	0	0	0

Results of 11 simulations with different amounts of force.

https://docs.google.com/spreadsheets/d/1NvJ6pXUdveLw251FrG-tFvC7kZtVW92Ass-LZihBGb4/edit#gid=0
(Link to the above spreadsheet)

Design of the Piston Holder



Piston Holder with a u-bolt for attaching the shock cord of the parachute.

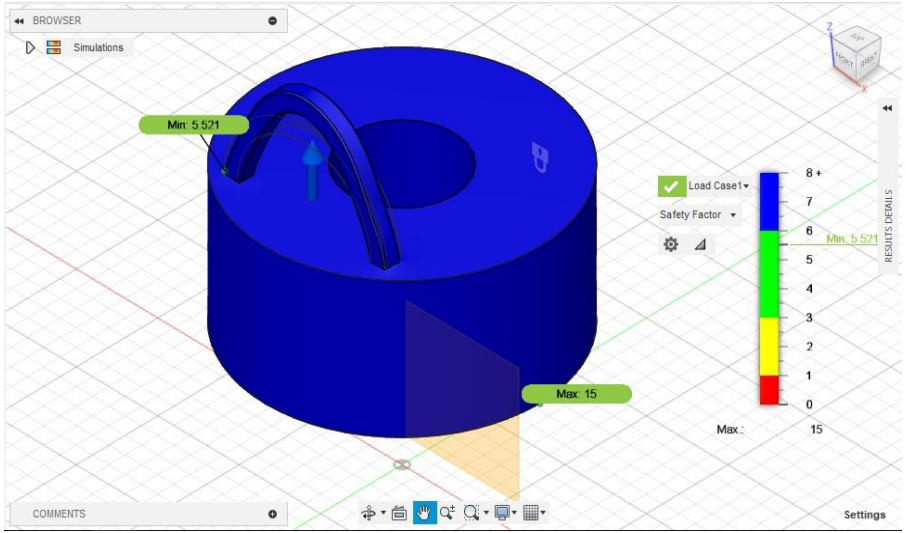
The designed U-bolt was subjected to a load of 132.6 N. (This is the opening load of the parachute)

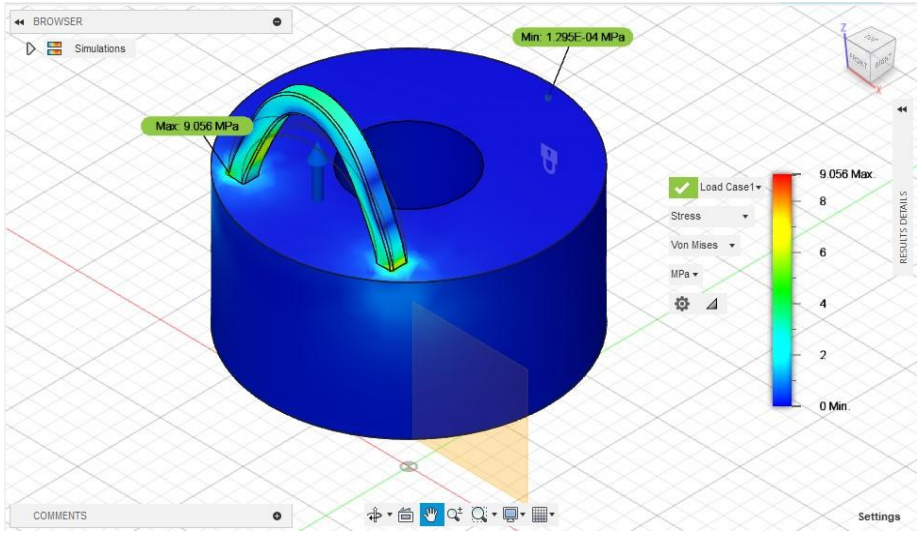
Opening Load = Drag × Xo × X1

Drag ≈ weight

Xo = 1.7 (Flat Circular Shute)

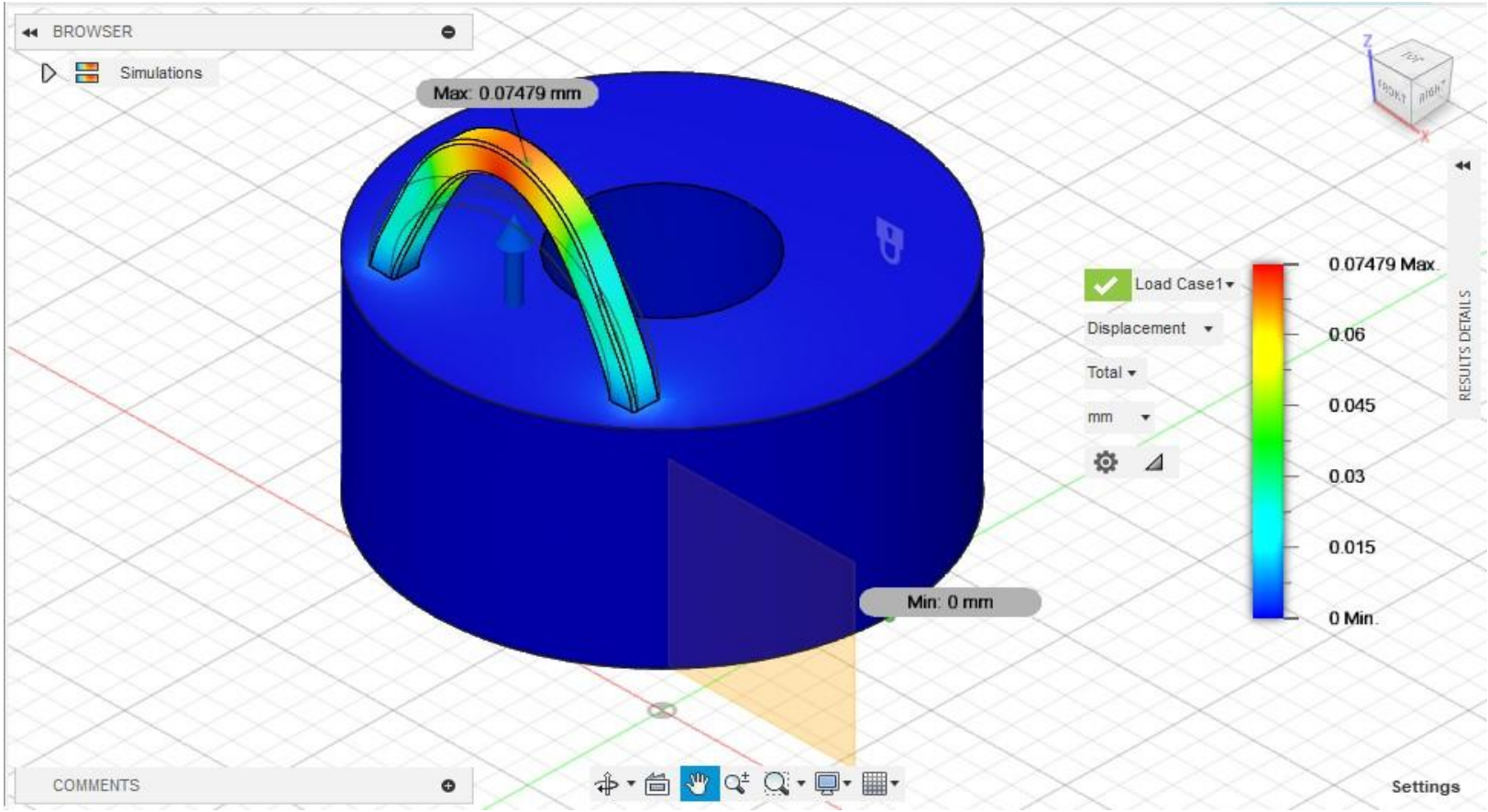
X1 ≈ 1.0 (Infinite Mass Cond.)





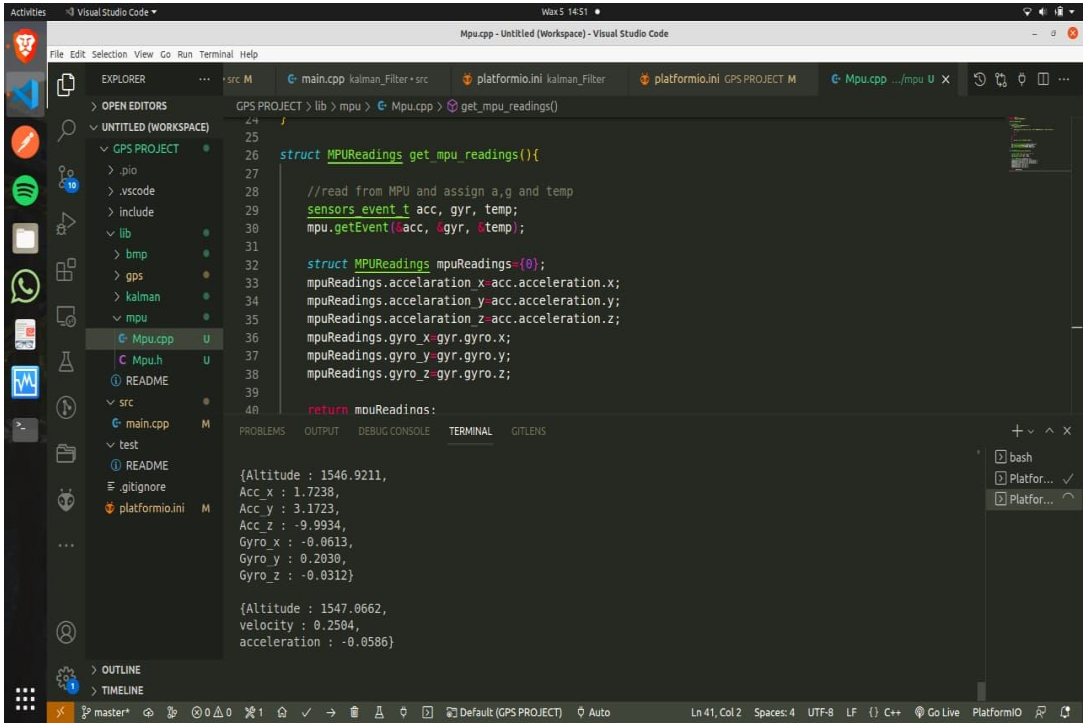
Minimum Safety Factor = 5.521, Max = 15

Maximum Stress = 9.056 Mpa



Maximum Displacement = 0.07479 mm (0.37%)

Testing code for kalman filter



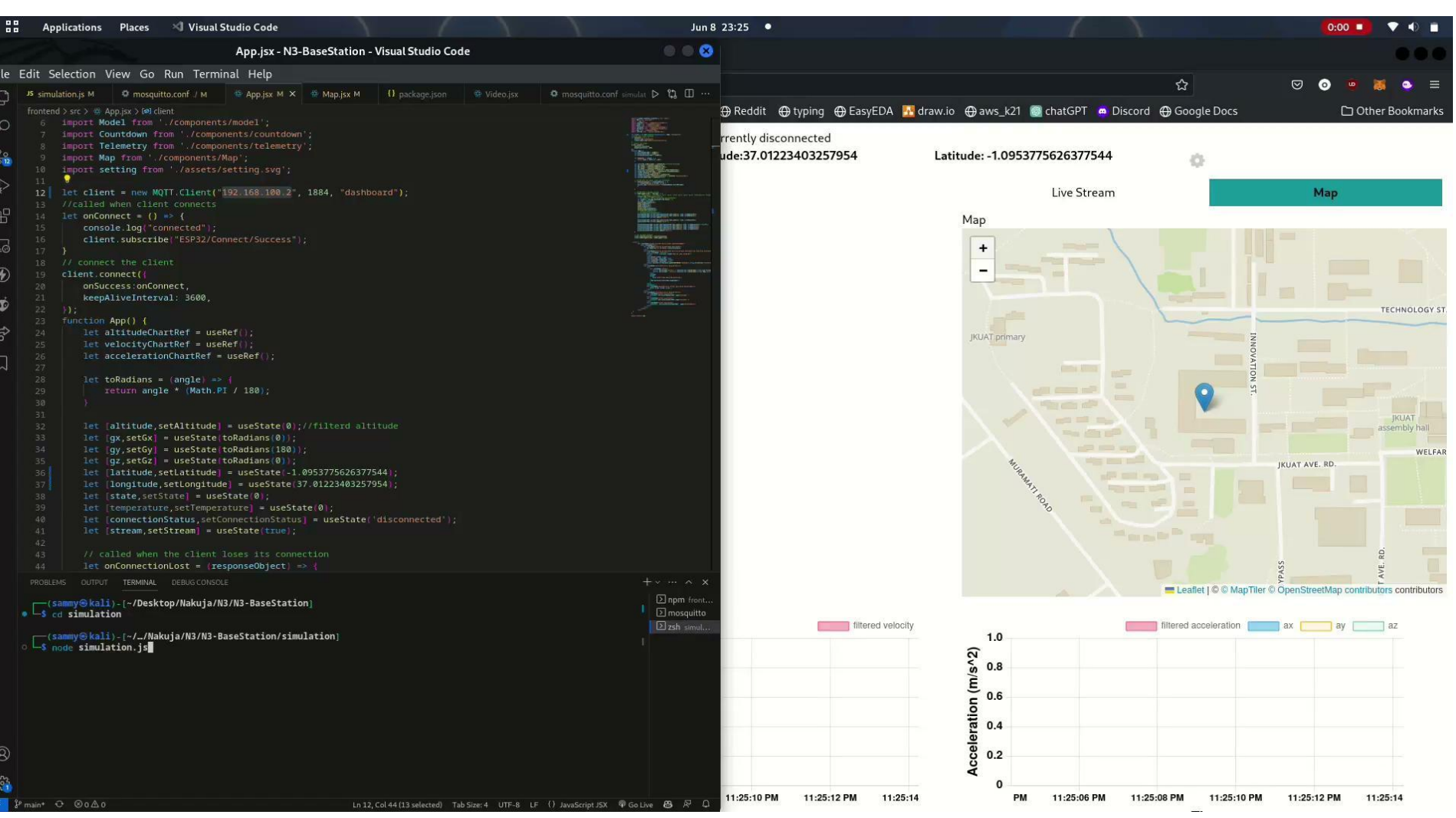
Determined the kalman filter used by previous batch is okay, will proceed to use it.

GPS Real Time Tracking on Base-station

Transmit coordinates via mqtt to base station

The map is hosted on a local server

Map is displayed on base station. The coordinates pin a point (offline)


Applications
Places
Visual Studio Code
Jun 8 23:25
App.jsx - N3-BaseStation - Visual Studio Code
File Edit Selection View Go Run Terminal Help
simulation.js M
mosquitto.conf ./ M
App.jsx M
Map.jsx M
package.json
Video.jsx
mosquitto.conf simulat
frontend > src > App.jsx > client
import Model from './components/model';
import Countdown from './components/countdown';
import Telemetry from './components/telemetry';
import Map from './components/Map';
import setting from './assets/setting.svg';
let client = new MQTT.Client("192.168.100.2", 1884, "dashboard");
//called when client connects
let onConnect = () => {
console.log("connected");
client.subscribe("ESP32/Connect/Success");
}
// connect the client
client.connect({
onSuccess:onConnect,
keepAliveInterval: 3600,
});
function App() {
let altitudeChartRef = useRef();
let velocityChartRef = useRef();
let accelerationChartRef = useRef();
let toRadians = (angle) => {
return angle * (Math.PI / 180);
}
let [altitude,setAltitude] = useState(0);//filterd altitude
let [gx,setGx] = useState(toRadians(0));
let [gy,setGy] = useState(toRadians(180));
let [gz,setGz] = useState(toRadians(0));
let [latitude,setLatitude] = useState(-1.0953775626377544);
let [longitude,setLongitude] = useState(37.01223403257954);
let [state,setState] = useState(0);
let [temperature,setTemperature] = useState(0);
let [connectionStatus,setConnectionStatus] = useState('disconnected');
let [stream,setStream] = useState(true);
// called when the client loses its connection
let onConnectionLost = (responseObject) => {
PROBLEMS
OUTPUT
TERMINAL
DEBUG CONSOLE
(sammy㉿kali)-[~/Desktop/Nakuja/N3/N3-BaseStation]
$ cd simulation
(sammy㉿kali)-[~/…/Nakuja/N3/N3-BaseStation/simulation]
$ node simulation.js
npm front...
mosquitto
zsh simul...
Ln 12, Col 44 (13 selected)
Tab Size: 4
UTF-8
LF
JavaScript JSX
Go Live
Reddit
typing
EasyEDA
draw.io
aws_k21
chatGPT
Discord
Google Docs
Other Bookmarks
rrently disconnected
ude:37.01223403257954
Latitude: -1.0953775626377544
Live Stream
Map
Map
TECHNOLOGY ST.
JKUAT primary
INNOVATION ST.
JKUAT assembly hall
JKUAT AVE. RD.
MURAMATI ROAD
Leaflet | © © MapTiler © OpenStreetMap contributors contributors
filtered velocity
11:25:10 PM
11:25:12 PM
11:25:14
filtered acceleration
ax
ay
az
Acceleration (m/s^2)
1.0
0.8
0.6
0.4
0.2
0
PM
11:25:06 PM
11:25:08 PM
11:25:10 PM
11:25:12 PM
11:25:14

CHALLENGES

- Misalignment of the traces during fabrication of the pcb
- Amplification of voltage from the load cell. (load cell may be different)

WEEK 7 TASKS

- Solder components on the PCB
- 3D printing of the piston holder
- Simulation and 3D printing of ejection cap