Shock Loading Software:

Requirements:

- Needs to be able to calculate shock loads of the rockets when parachutes are deployed
- Needs to be able to measure the altitude to time to measure how long it would take for the parachute to land and how far can it potentially go (x,y)
- Needs to incorporate these external forces: gravitational force, wind, drag (only parachute).
- Needs to incorporate an adjustable velocity of the rocket in regards to in 2 translational motions (x,y)
- Need to have parachute and multiple stages of deployment. The parachute might not be in line with the rocket.
- Model the rope between the parachute and the rocket as a spring and a dampener
- The rocket starts with an initial velocity in the x, which is not negligible. This needs to be easily changeable
- The rocket has different times for inflation
- The rocket parachute has a mass

Because this is 2 DOF in translation, we need to have a third degree of freedom in angle (θ)

Assumptions:

- It can be assumed initially the parachute deploys at an angle against the apparent wind, as mechanical systems have delays in regard to where the parachute is moving and the time it takes to go up the rope and change the direction of the parachute, this can be taken to be 0.5 seconds.
- It can be assumed that the rocket acts as a pendulum with respect to its third degree of freedom θ. Where the initial point depends on the angle of the rocket at deployment, with the length being the shock cord and mass being the rocket, with the rocket acting as a dampener.
- It is assumed that the rocket parachutes have no impact on the rocket when inflating from starting position.
- It is assumed that the rocket has very small drag compared to the parachute, if drag is to be considered this can be modelled as a shape of a cone and cylinder.
- It is assumed that the density of air varies with altitude and temperature and is homogenous. Though temperature difference makes little impact compared to attitude so. Hence, we modelled the air density only changes with altitude.

- It is assumed that the drag force of the rocket acts on the direction of the apparent wind of the rocket

PDS:

- Make 3 DOF system (x, y, θ)
- Model the drag force from the rocket and the parachute
- Model the wind, gravitational force, drag force
- Model the drag of the rocket (this acts as a dampener in the case of the pendulum in θ), the reference area of the rocket stays the same so does the cd when swinging.
- Have a starting velocity at apogee (this needs to be able to change)
- Have incorporated wind – this only changes the apparent velocity of the rocket as a constant addition. For this to be the worst-case scenario, the wind direction is always with the rocket direction and is set to a number on the initial equation
- Needs to be accurate such that it can be used as a reference for Euroc. Potentially withing 5%. Can test in a wind tunnel hopefully (load cell and wind on a parachute)
- Needs to be able to guide other projects regarding loading conditions.