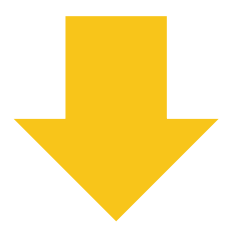


### Problem Definition

When camping, cell phone charge can mean the difference between **life** and **death** in an emergency.

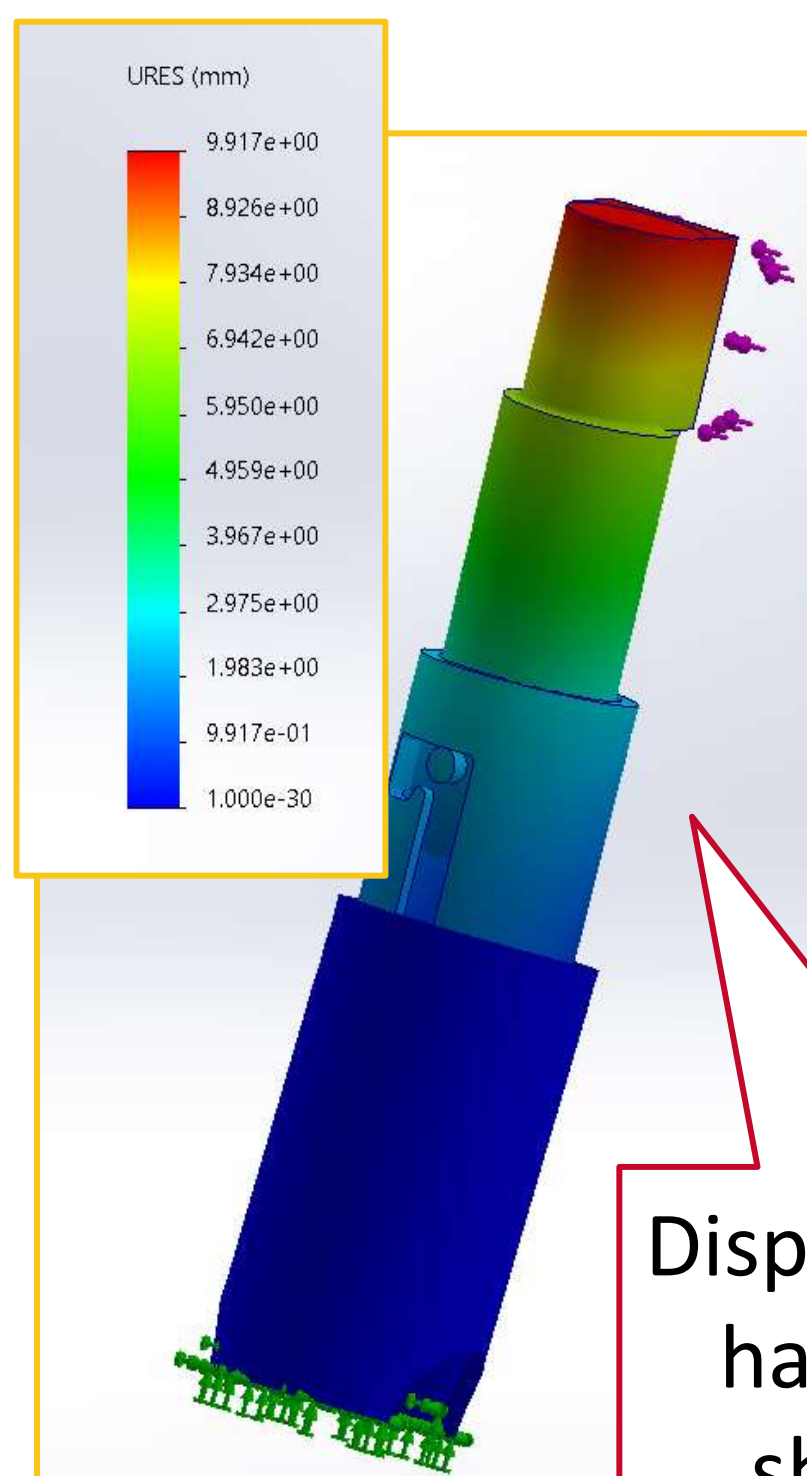


Available portable chargers work only if the user charges them before their trip and provide only a set amount of power.

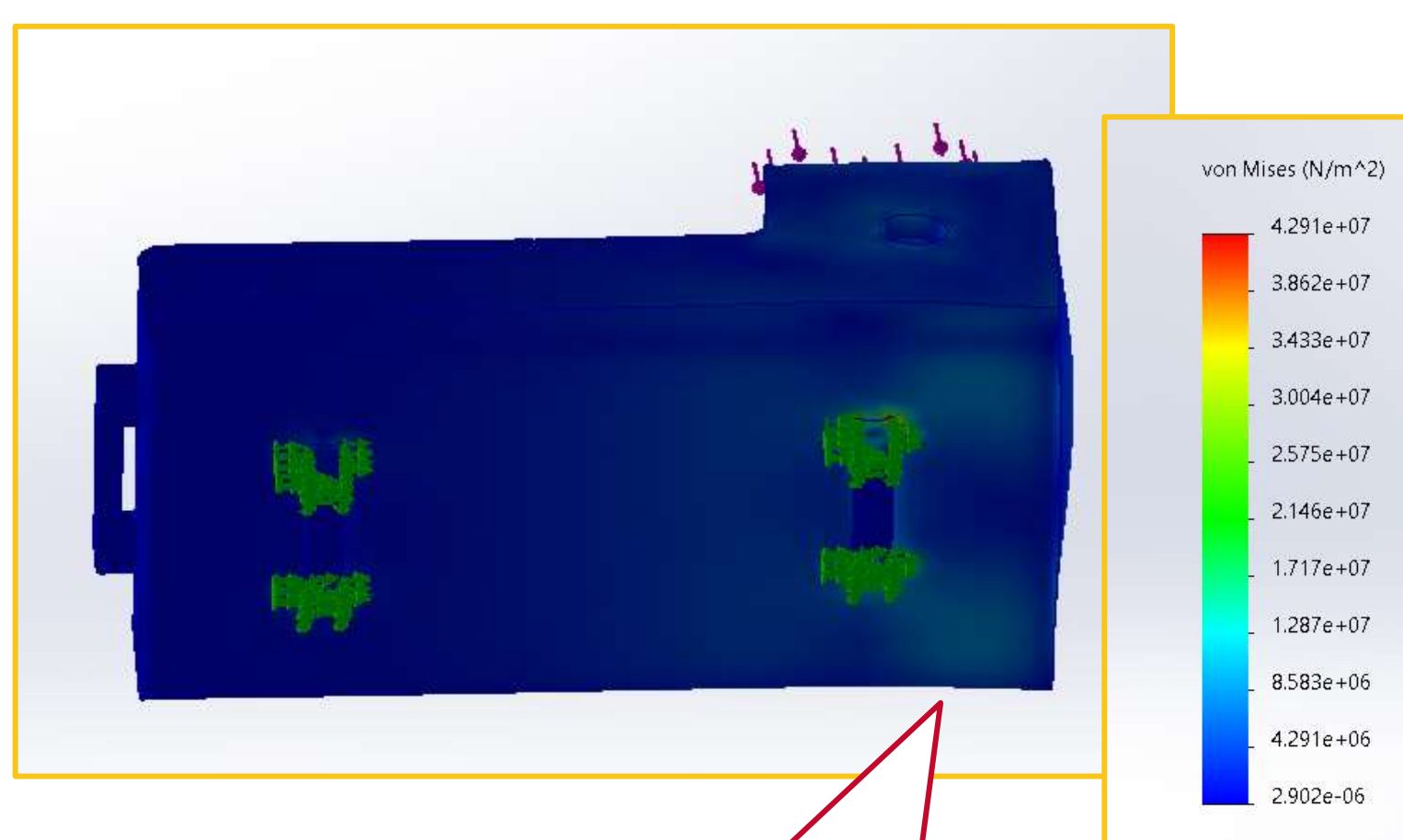


Having access to a device that can **generate power on demand** would **save lives**.

### Design Calculations & Analysis



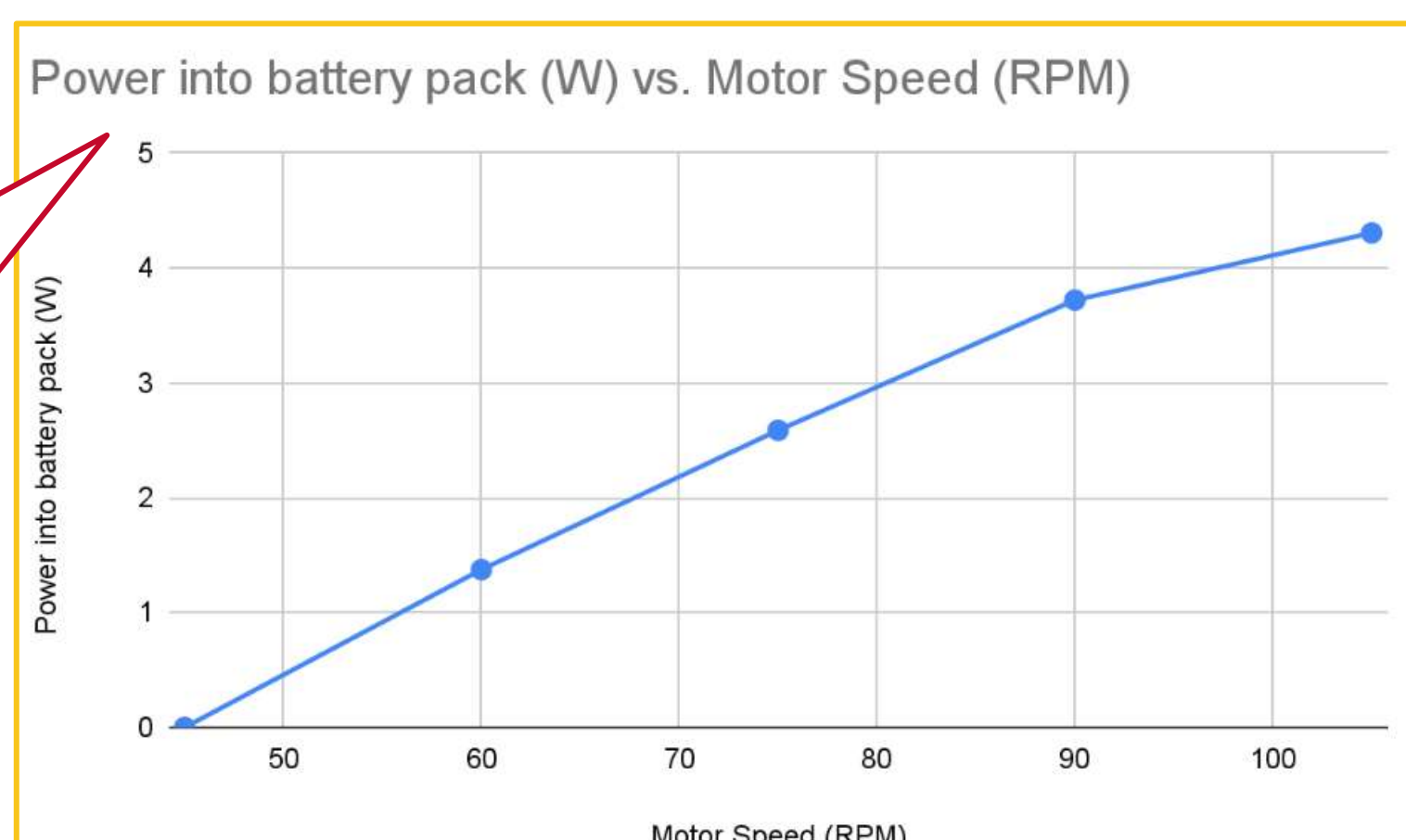
Displacement FEA of hand crank shaft shows greatest displacement risk at the top end



Stress FEA of housing shows increased stress where straps pull on the device

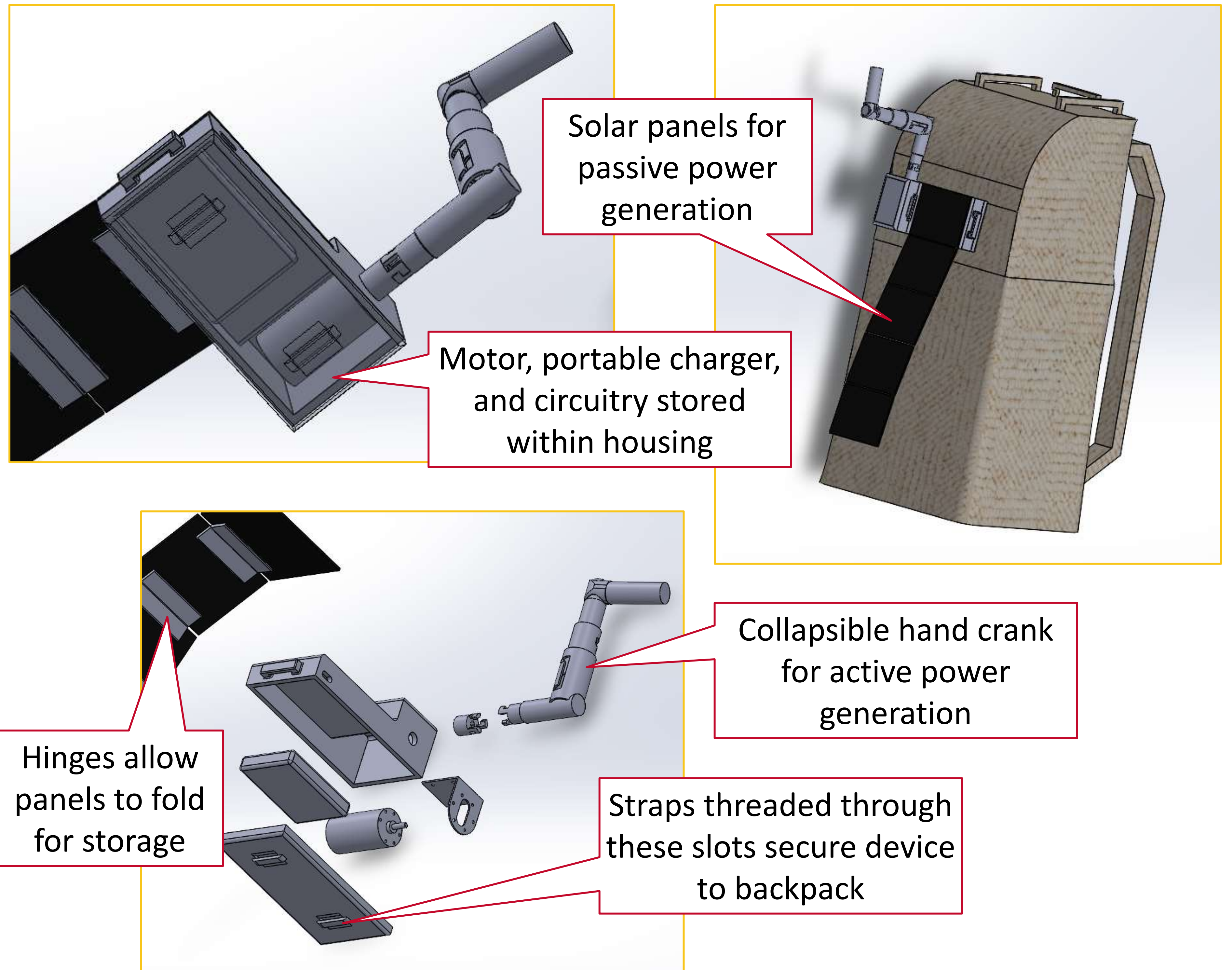
Motor Speed (RPM)	Current into battery pack (A)	Voltage into battery pack	Power into battery pack (W)
45	0	4.5	0
60	0.3	4.58	1.374
75	0.56	4.62	2.5872
90	0.8	4.65	3.72
105	0.92	4.68	4.3056

Power resulting from cranking at different speeds

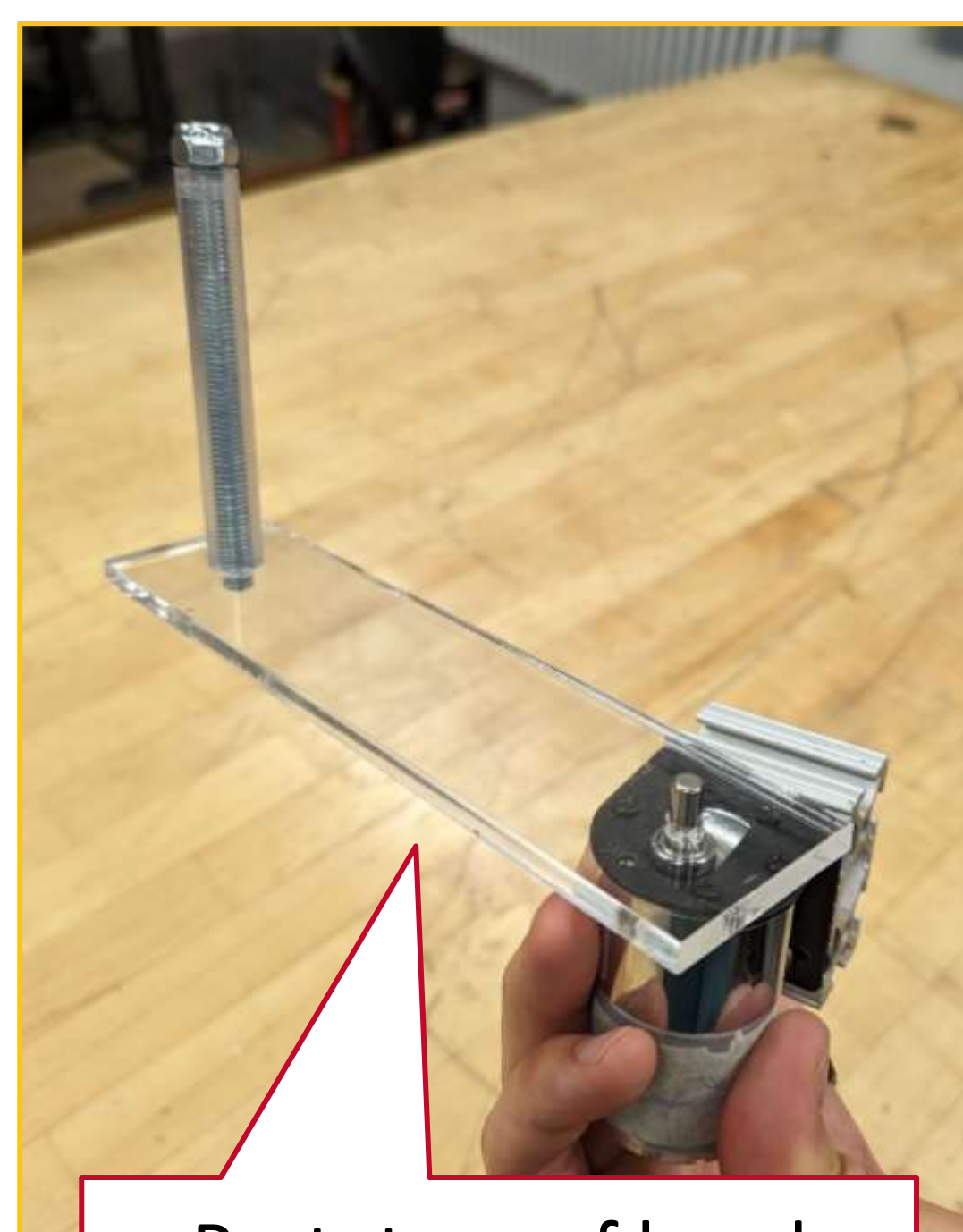


Graph showing power input to the portable charger vs. motor speed

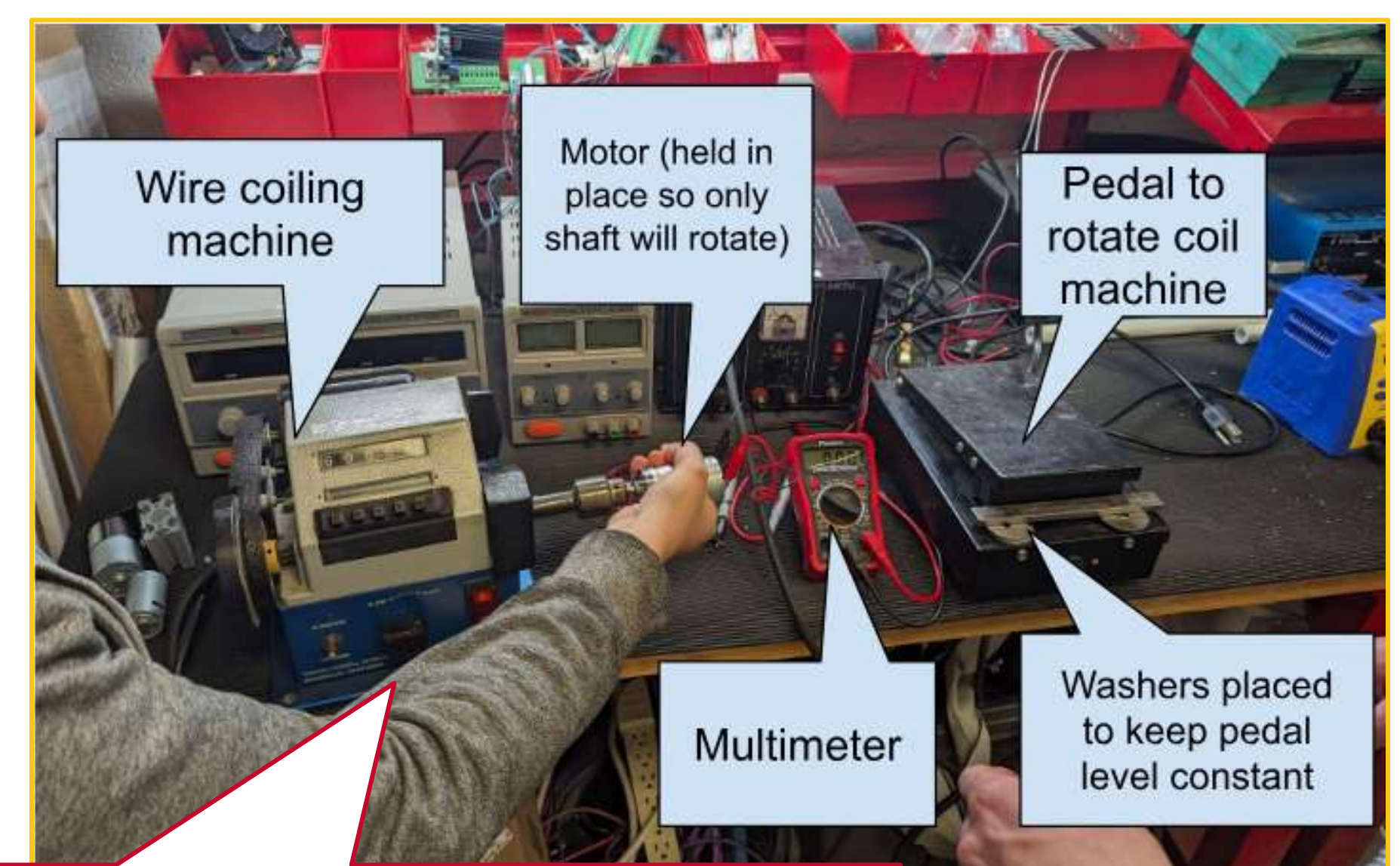
### Final Design



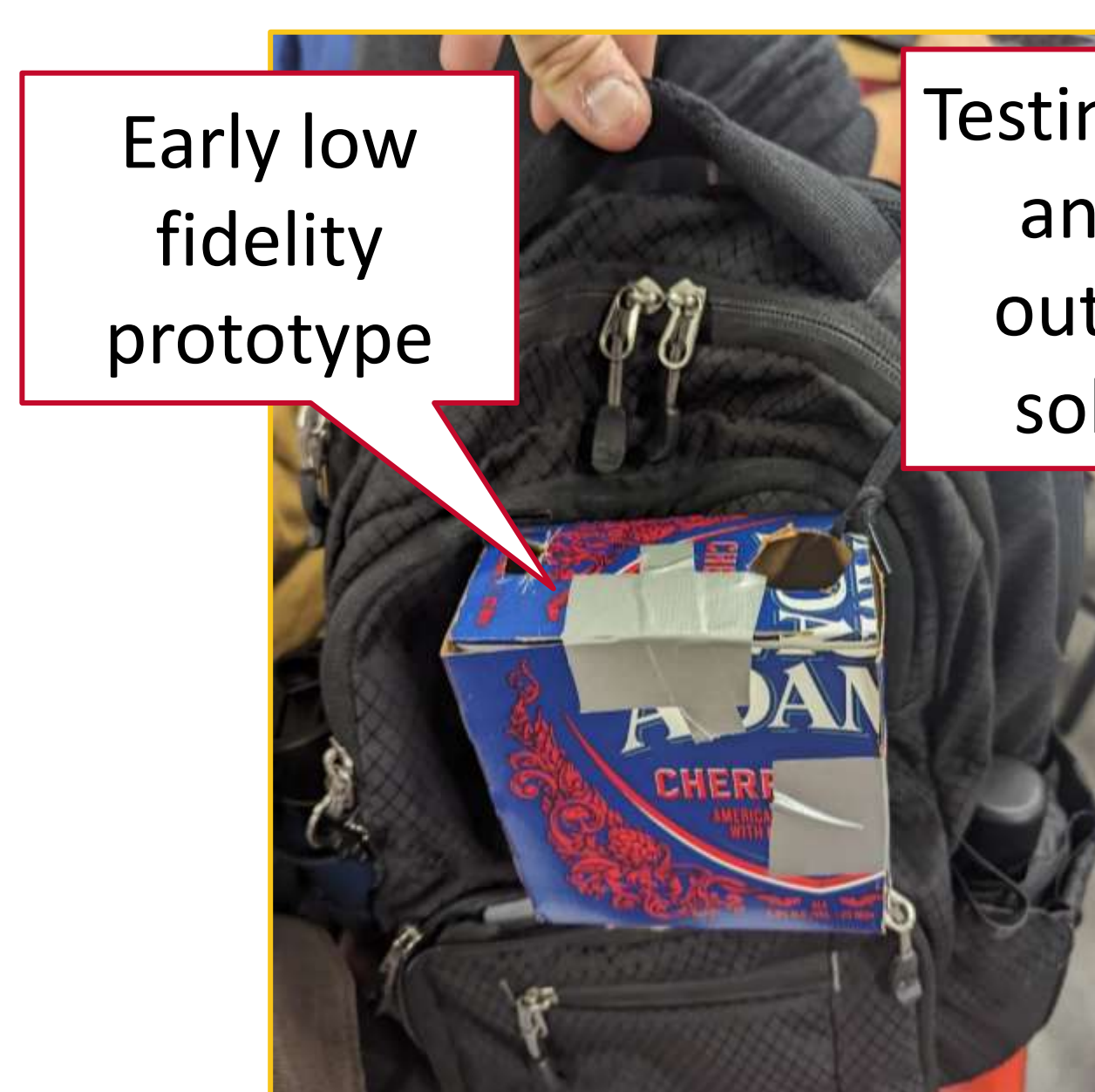
### Prototype & Test Results



Prototype of hand crank used for all hand crank circuit testing



Setup for motor testing. Results indicated use of 100 RPM motor rather than 150 RPM



Early low fidelity prototype

Testing of voltage and current outputs from solar panels

