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# Problem

Today the cost of launching a rocket into space is very excessive. This is primarily because of the whopping amount of fuel used in launch. The goal of our team's project is to address this issue and find a low-cost, fuel-efficient, and reusable way to send rockets into space.

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# Mag-Launcher

Our solution, the Mag-Launcher, is a reusable electromagnetic repulsion system. Our plan for a fuel-efficient method of shipping cargo to space is to create a torus-shaped structure – one that incorporates a lot of advanced technologies. These technologies, including advanced electromagnetic repulsion systems, will be used to accelerate a rocket to exceptional speeds. Our hope is to remove most of the cost for fuel, as well as reduce the size or eliminate the need for a first-stage booster. A unmanned rocket will be placed inside the torus and attached to a rail. Then, remotely controlled electromagnets will be turned on at specific times to accelerate the rocket. The outer layer of the rocket will consist of an equally distributed ferromagnetic material. Once the desired speed is reached, a hatch will open on the torus, the rocket will detach from the rail, and it will be launched at upwards.

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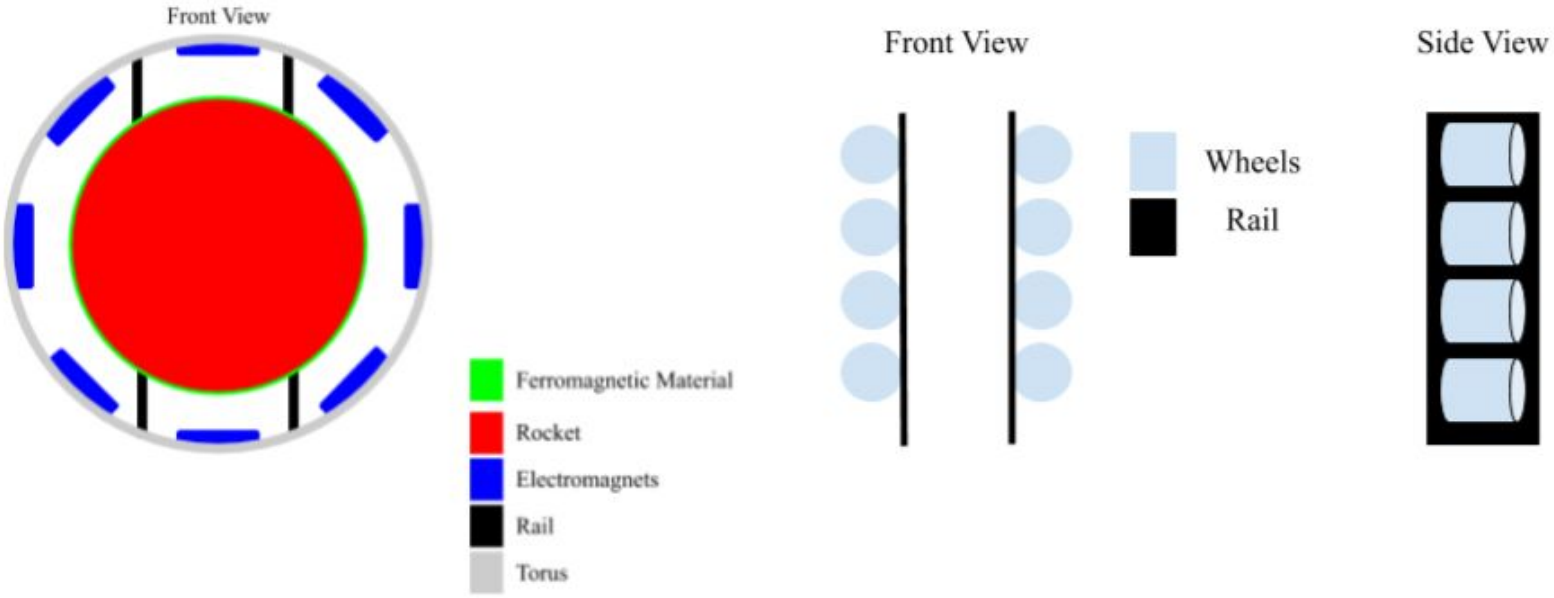
# Mag-Launcher Diagram



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# Testing & Breakthroughs

To determine the optimal circumference of the torus, a miniature-scaled experiment will be used. Other than the the circumference length, all other conditions will remain constant. The primary data collected will be how long it takes for the rocket to reach the desired speed. The following procedures will be followed:

**Design and build a model with a circumference 0.75 and 1.25 of the base model. When starting, the base model will be the control group and have a circumference of 40 feet.**

1. Once built, test the 2 new models while ensuring all variables other than the circumference are constant.
2. Observe and record data for the 2 models.
3. Use the data to compare the 2 models with each other as well as the control model.
4. Select the model with the best results.
5. Repeat steps 1 - 5 until the difference between the data of each model is nearly equal with the best model from the previous 2 being the new base model.
6. Re-run the selected model so ensure the results are in accord with the original test. If not, repeat steps 1-6.
7. Complete further testing with the selected model to eradicate any possible imperfections in the design.

Once the testing is complete, the measurements for the optimal dimensions of the Mag-Launcher will be determined. Scaling up the measurements will provide a design for a life-size system.

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# Consequences

| Positive | Negative |
| --- | --- |
| • Reduces the cost of fueling.<br>• Reduces the size and cost of the rocket.<br>• Possibly eliminates the need for multiple boosters.<br>• Is multi-use<br>• Less greenhouse gases emission<br>• Control over the electromagnets | • Possible malfunction,<br>• Possible weathering<br>• Longer launch time<br>• Large one-time cost<br>• Long construction time |