NASA ROVER 2

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NASA Human Exploration Rover Challenge
Competition Background

- Located at the US Space and Rocket Center in Huntsville, AL
- Competition March 30 – April 1
- Students design and manufacture vehicle

Course Obstacles

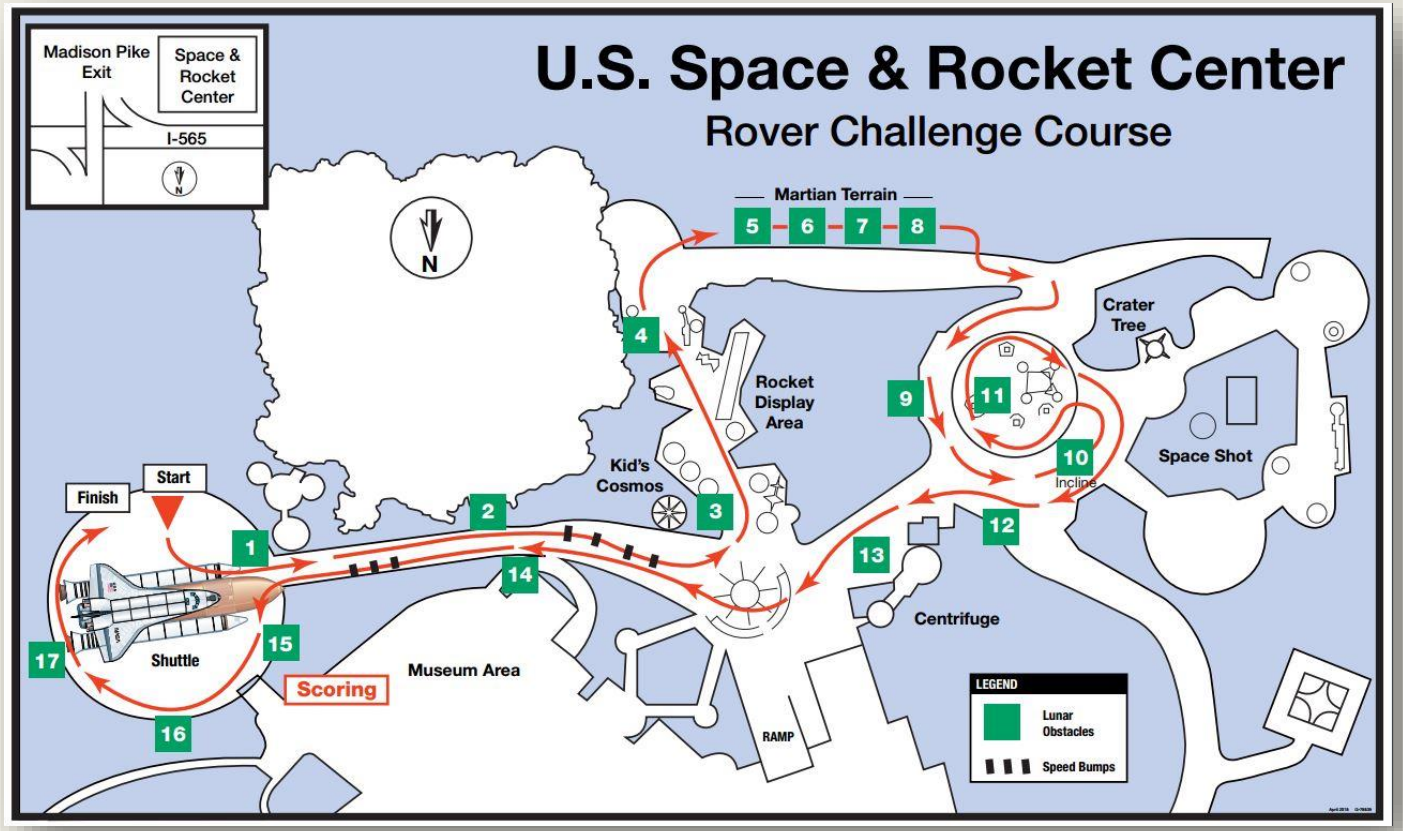
Competition

- Create a human powered vehicle, carried by two students, one male, one female.
- Traverse a half mile obstacle course

Objective

- Vehicle can support load of two team members.
- Ability to fold into 5’x5’x5’ cube
- Pass safety requirements prior to race.

Course Obstacles



1. Undulating Terrain
2. Wrinkle Ridges
3. Crater with Ejecta
4. Rims of Craters
5. **Martian Terrain – Butte**
6. **Linear Gully**
7. **Outcrops**
8. **Sand Dunes**
9. Crevasses
10. Steep Incline
11. Lava Flow with Craters
12. Tilted Craters
13. Asteroid Impact
14. Collapsed Fault
15. Loos Regolith
16. Hummocky Area
17. Erosion Bed

Overall Design

- Lightweight
- Strong
- Cost effective material
- Ease of manufacture
- Cater design to obstacles

Wheels

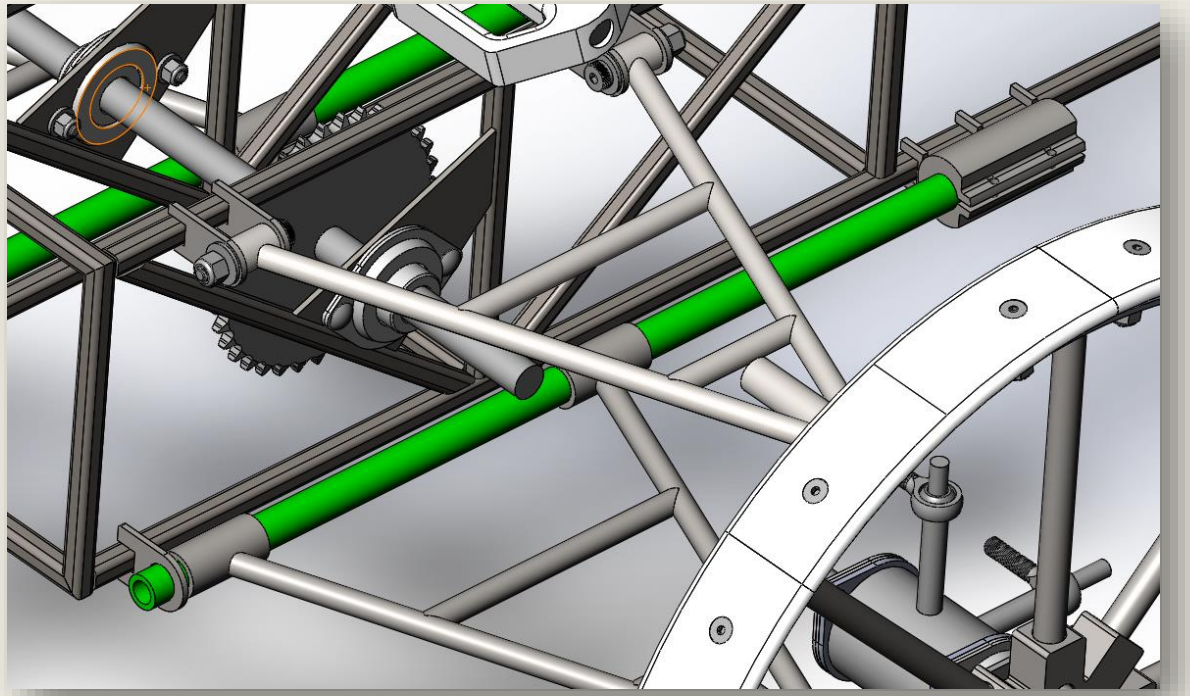
- Modular Design
- HDPE and Steel Construction
- Jig ensured proper construction and roundness

Wheels

- CNC cut HDPE
- Hub cut with plasma
- Used jig to assemble
- Welded and bolted assembly

Suspension

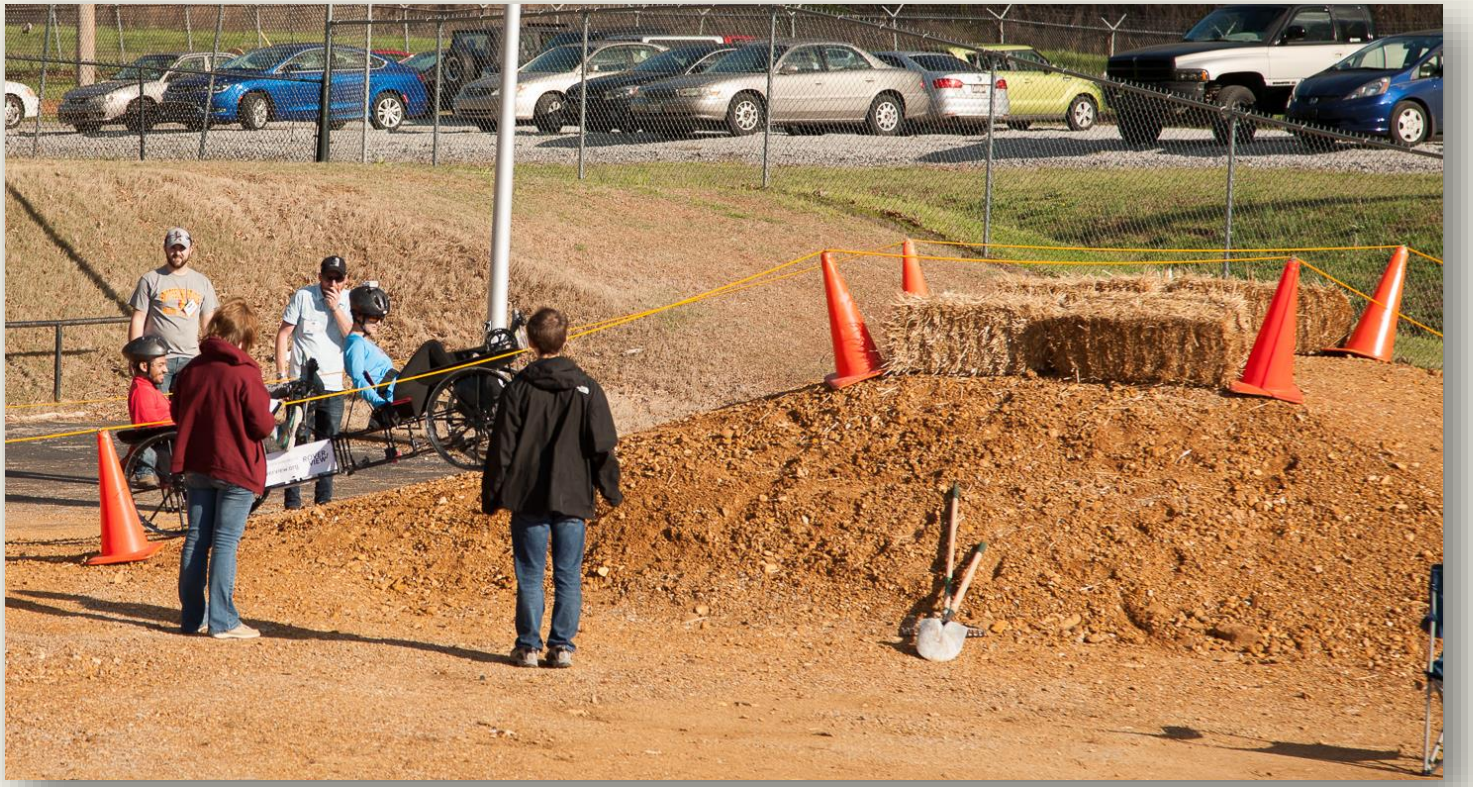
- Torsion bar suspension
- Light weight
- Compact fit
- Ease of manufacture
- Low cost



Suspension

- Set screws insufficient
- Welded joints
- Potential improvements:
  - *Ground clearance*
  - *Adjustability*

Drivetrain



- Low gear ratio
- Coaster brake hub
- Two chain drive line
- Four wheel drive
- Splined slip shafts

Drivetrain

- Two wheel drive
- Chain guides and tensioners
- Bicycle chain

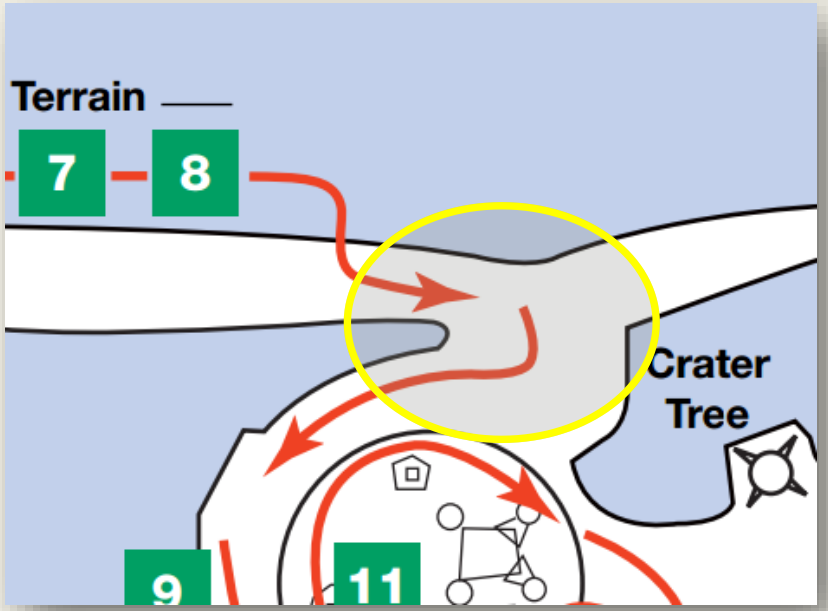
Steering

- Rods connecting handlebars and wheels
- Plastic bushings
- Ball joints at steering column
- Heim joints at wheels
- Two attachment points to frame

Steering

- Original failed design
- Too big of an angle
- Tie rods binding
- Pushed forward rather than linear

Steering



- Linear system
- Handlebar extensions
- 10 ft. turning radius

Overall Result

- 17th place out of 57 Universities
- 184 lbs.
- Schedule strained
- Team communication

Lessons Learned

- Design
  - *Use larger diameter wheels*
  - *Shorter pedal cranks/ability to ratchet pedals*
  - *Smaller gear ratio*
- Manufacturing Plan
  - *Not cut raw material until ready to build sub-assembly*
  - *Better way of keeping track of what is built already*
  - *Communication*
  - *Spend more time aligning drive train*
  - *Spend more time on routing sheets*

Lessons Learned

- Changes to Rover
  - *Not use torsion bar suspension*
  - *Adjust material sizes and thickness*
- Advice for next year
  - *Start fundraising early*
  - *Vote on team captain*
  - *Purchase material ASAP*
  - *Plan for extra time and money*
  - *Be excited. It is a lot of fun.*

Thank you