

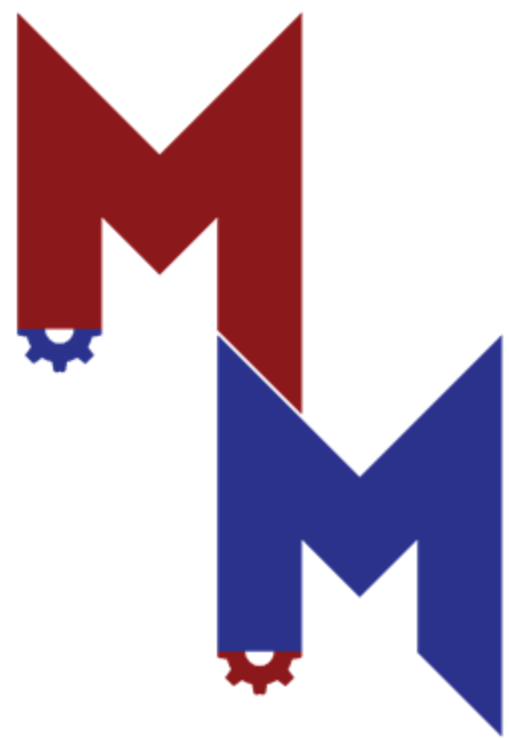


BE BOLD. Shape the Future.
College of Engineering

BattleBots Crimson Team 2024-2025

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NEW MEXICO STATE UNIVERSITY (NMSU)



Mission/SOW

Battlebots Crimson Team will perform the design and manufacturing of a working robot for the MechE Mayhem 2025 for our clients.

- A functioning BattleBot meeting all requirements of the competition.
 - Weight requirement of 3 lbs.
 - Voltage requirement of under 48 V.
- A BattleBot that surpasses the previous BattleBots.
- Compete at the MechE Mayhem 2025.

We worked tirelessly, as a team, pouring countless hours, blood, sweat, and tears into design, fabrication, and testing, ensuring every component was optimized for peak performance in competition.

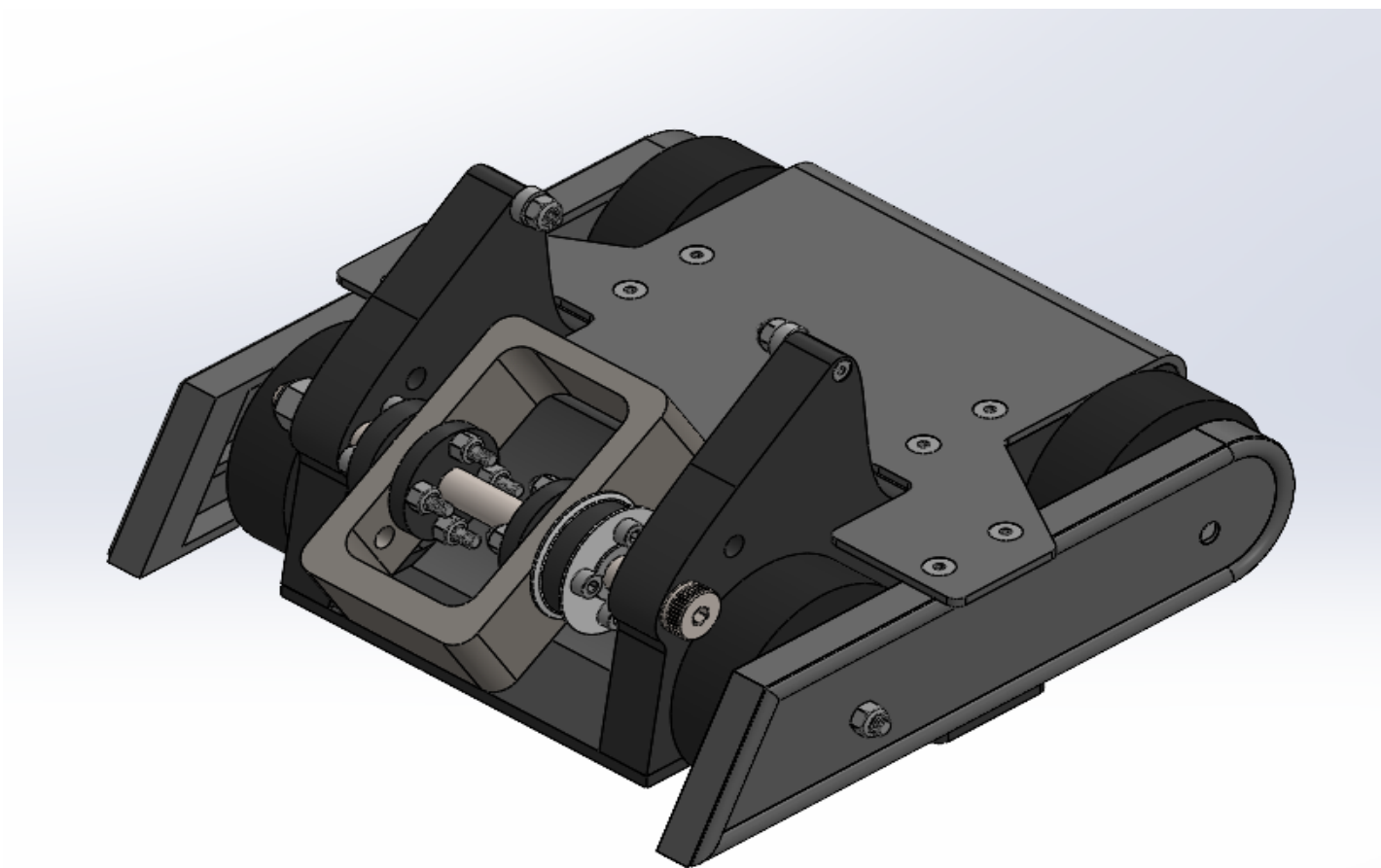
Research

- Research started with revising the SPARC Standard Rule Set to learn the rules and requirements to compete.
- Mainly looked at the 3 lb ruleset and found that demand was much higher for the lower weight classes.
- Research then went into the different types of robots and their effectiveness in combat.
- Drumbots are more compact versions of vertical spinners, with fewer moments of inertia in the weapon.
- Vertical spinners use large diameter disks with very few teeth, or bars, spinning on a vertical plane. This ended up being our weapon of choice.
- Some of the technology involved In battle bots include motors, electronic speed controllers, batteries, and transceivers



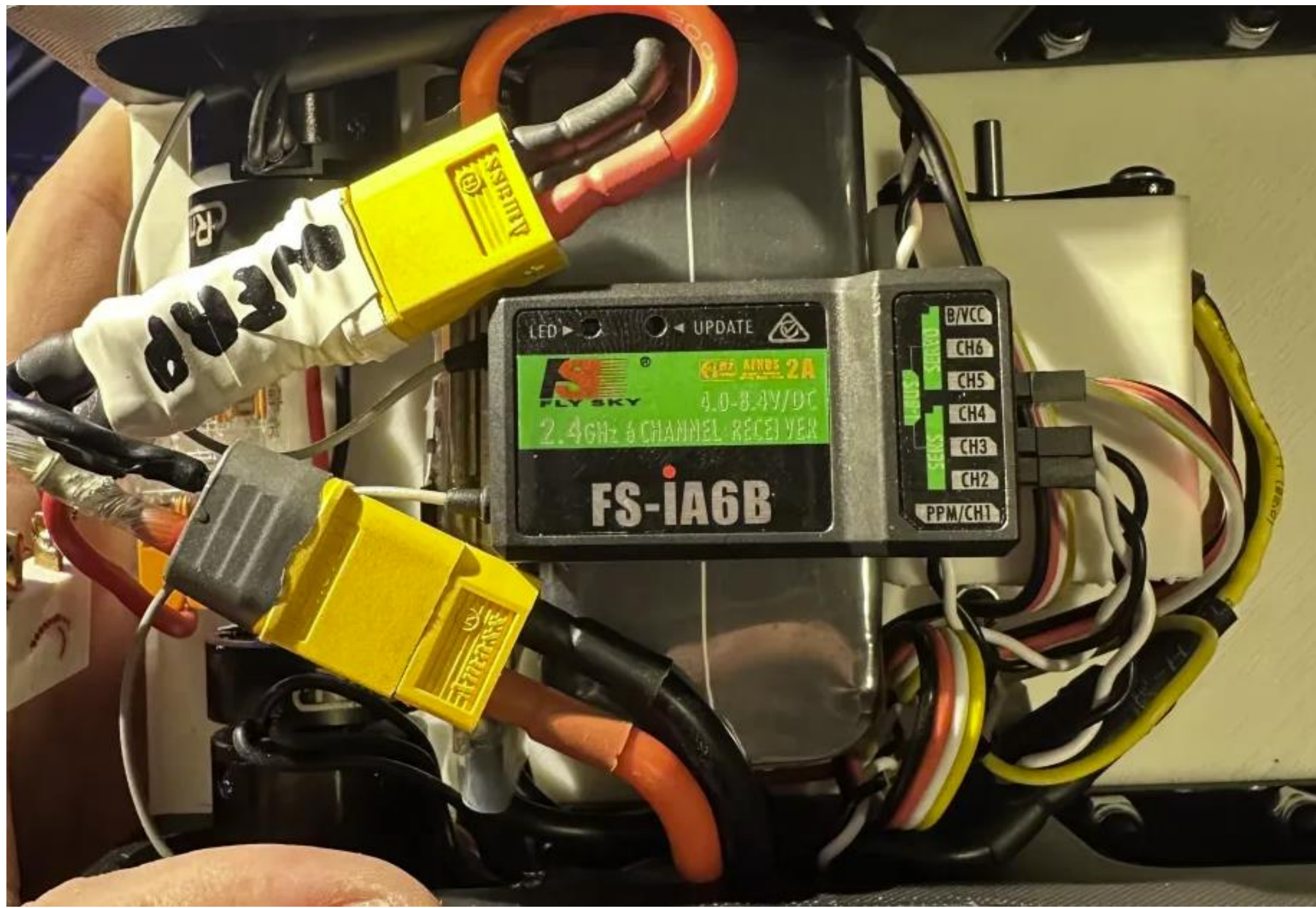
Final Design

- Featured wheel guards that connected the top and bottom plates to keep wheels safe.
- Wheel guards connecting to top and bottom plate also added better structure to the body.
- Weapon stand included bearings to act as wheels if the bot is flipped upside down.
- Top plate included panels to guard electronics from weapon.



Electrical

- **Preliminary Experiment Tests:** Assembled wiring on a test bed to assure connectivity and test motors before assembling
- **Signal Integrity Checks:** Validate signal transmission between receiver, motor controllers, and weapon activation systems.
- **Load Testing:** Apply electrical loads to battery and ESCs to test power delivery under peak conditions.
- **Fail-Safe Testing:** Simulate loss of connection or voltage drops to ensure the bot safely powers down or enters a safe mode.
- **Redundancy Trials:** Test backup systems like dual power lines or backup signal receivers for fault tolerance.



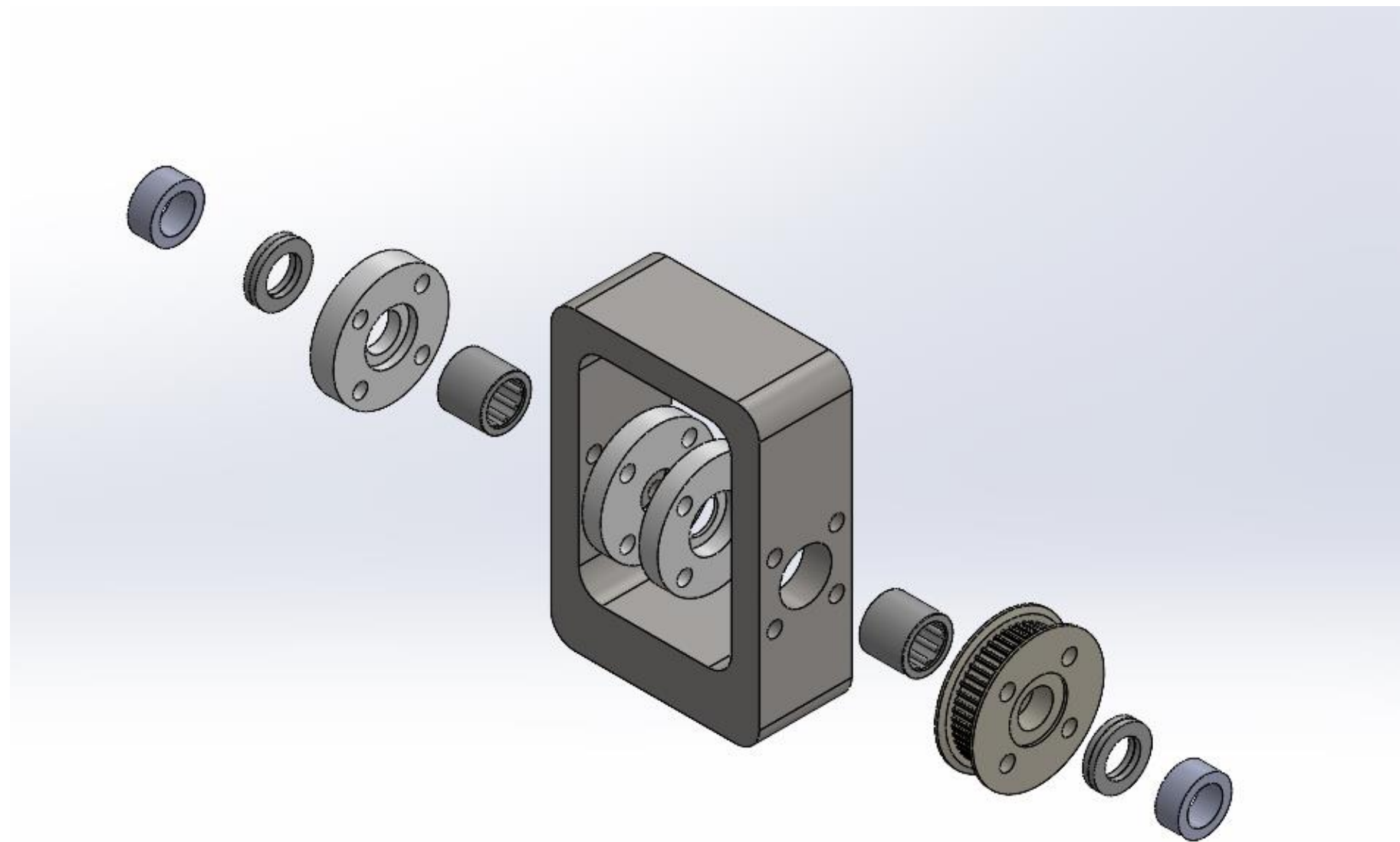
Competition

- Our center of gravity was too far forward causing the rear wheels to lose traction on the ground.
- Weapon hit its own motor and deactivated itself.
- Drastically had to reduce weight to accommodate new wheels by drilling and cutting material off.
- Due to weight reductions, we lost the ability to drive while flipped upside down.



Mechanical

- **Chassis Stress Testing:** Apply static and dynamic loads to simulate impacts and ensure the frame can withstand collisions.
- **Weapon Spin-Up Testing:** Measure torque, rotational speed (RPM), and balance during spin-up and shutdown sequences.
- **Drop and Impact Testing:** Simulate falls and hits to assess durability of armor, joints, and weapon mountings.
- **Drive System Endurance:** Run continuous motion tests to validate drivetrain reliability and thermal limits of motors and gearboxes.
- **Modular Part Swaps:** Test ease and speed of replacing damaged parts for field repairs between rounds.



Concept Development

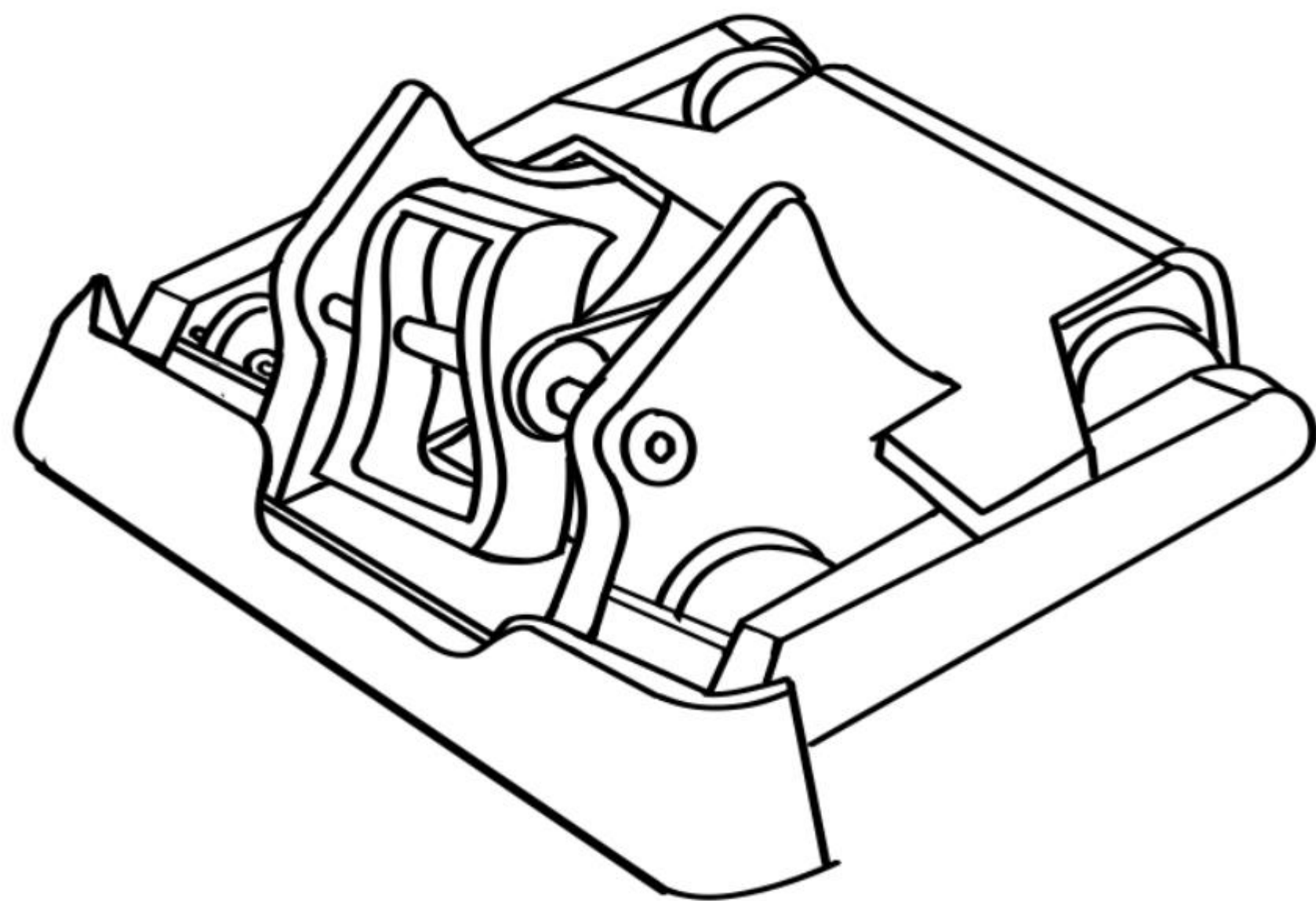
From our concept classification tree, we selected our weapon.

- Dual flap flipping wedge
- ``Hydraulic flipping wedge
- Spring loaded flipping wedge
- Inclined ramp wedge
- Vertical spinning sawblade
- Vertical "eggbeater" spinning bar
- Vertical drum spinner
- Horizontal full body spinner
- Horizontal dual spinners
- Horizontal extended spinner

Using previous BattleBots competitions and designs for reference we chose the eggbeater weapon.

Our chassis designs were sketched by three of our teammates:

- Designs incorporated the vertical spinner
- Design initially had four-wheel drive system, later switched to two-wheel upon outside advice



References

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