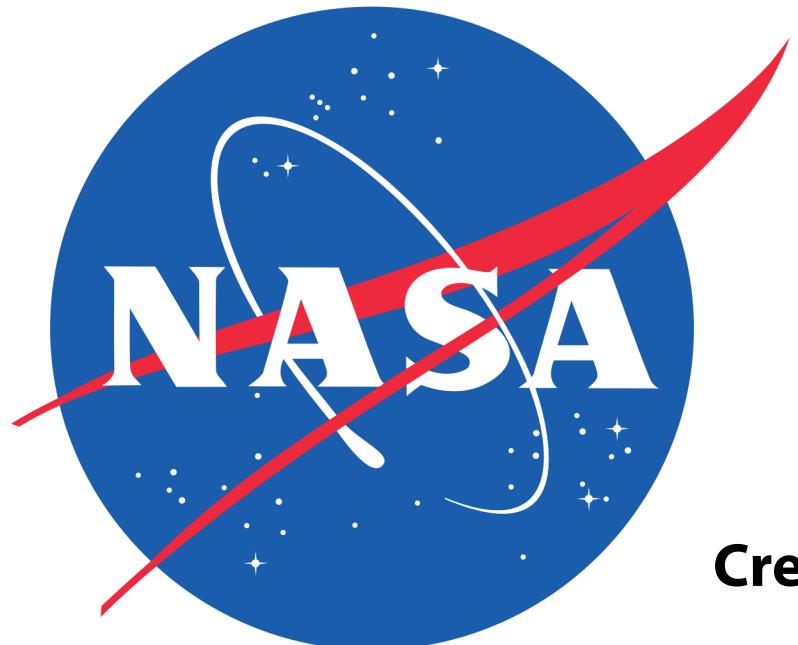
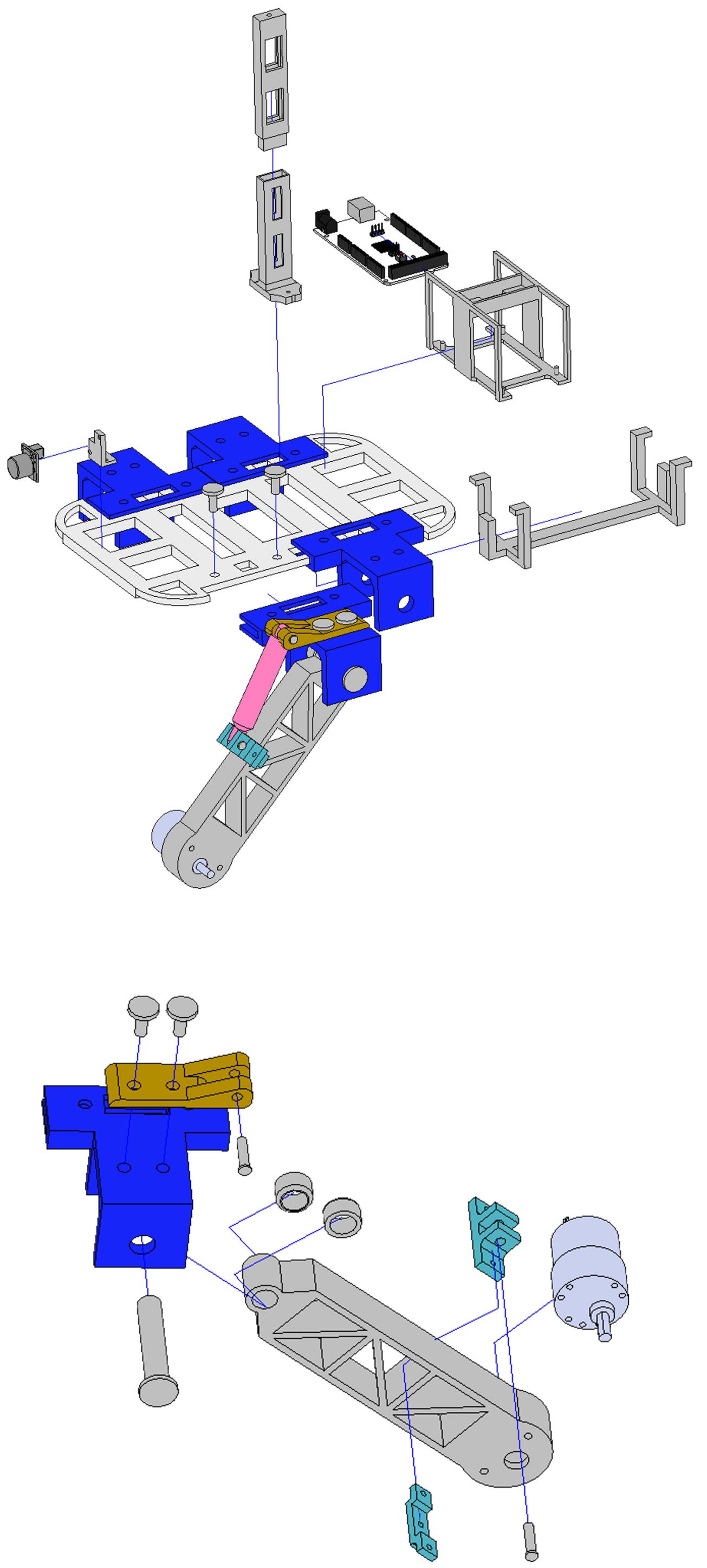


## Structural Components



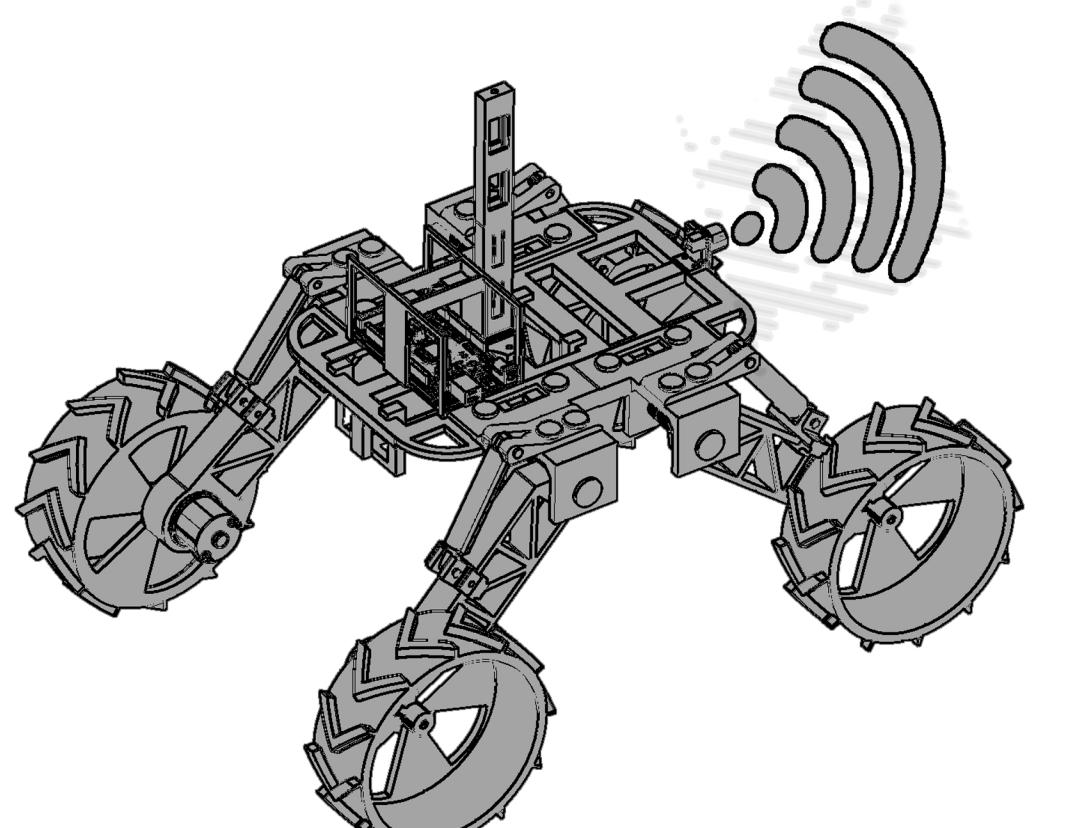
# Ares

Credit: Bruce Bell, Ryan Wade, Hiram Saucedo, and Raechana Hong



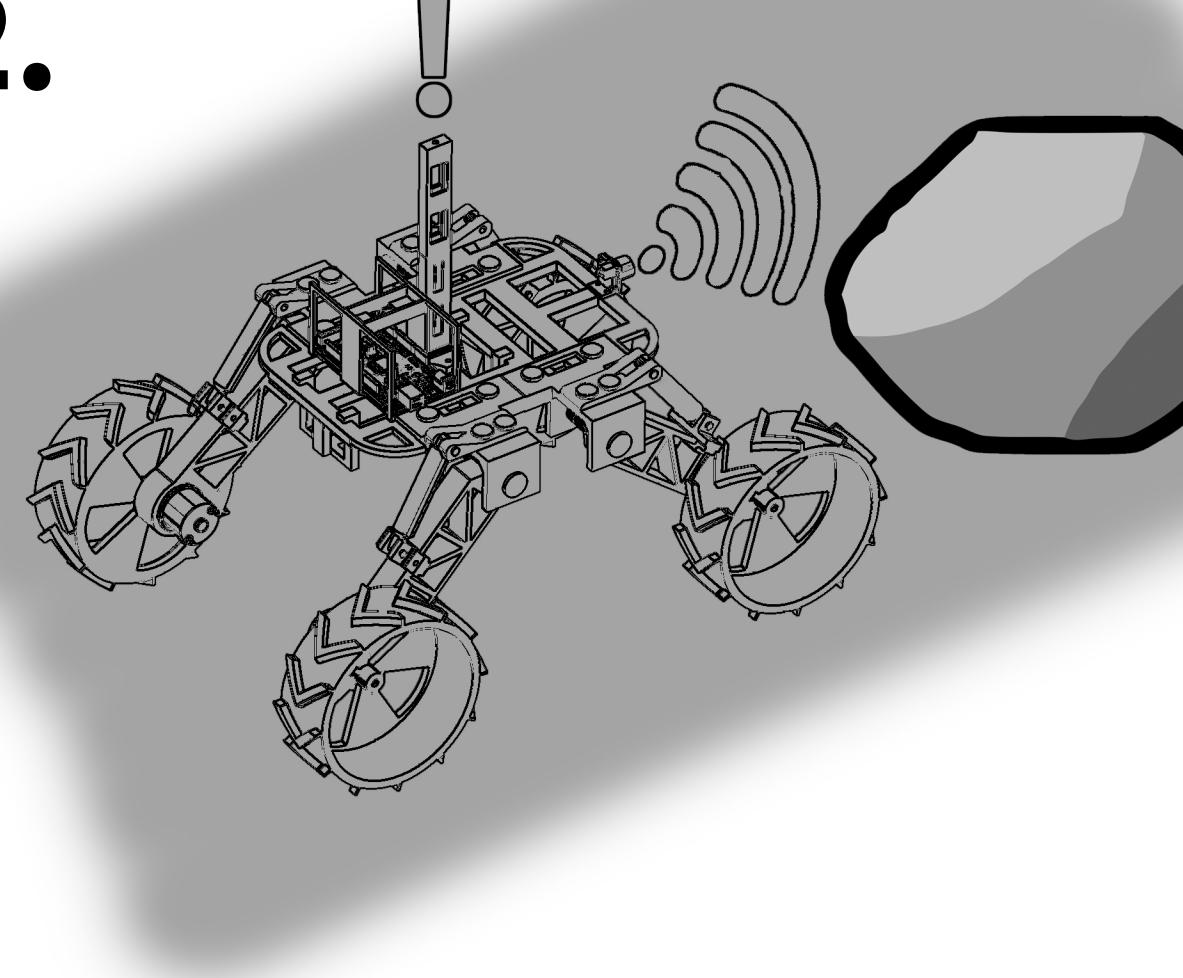
## Method of Autonomous Navigation

1.



Ares attempts to estimate the heading it should drive by recording the signal strength of a rotating directional antenna on a beacon which is broadcasting the heading of the antenna. Ares begins driving forward turning slowly towards the heading of maximum signal amplitude. All the while Ares is emitting an ultrasonic ping to search for obstacles in its path.

2.



When Ares detects an object closer than 45cm it begins its avoidance subroutine. Ares will stop in place and execute a zero radius turn to the left until no objects are detected inside of the minimum range. Ares will then return to its routine in box 1.

## Great Sand Dunes Test

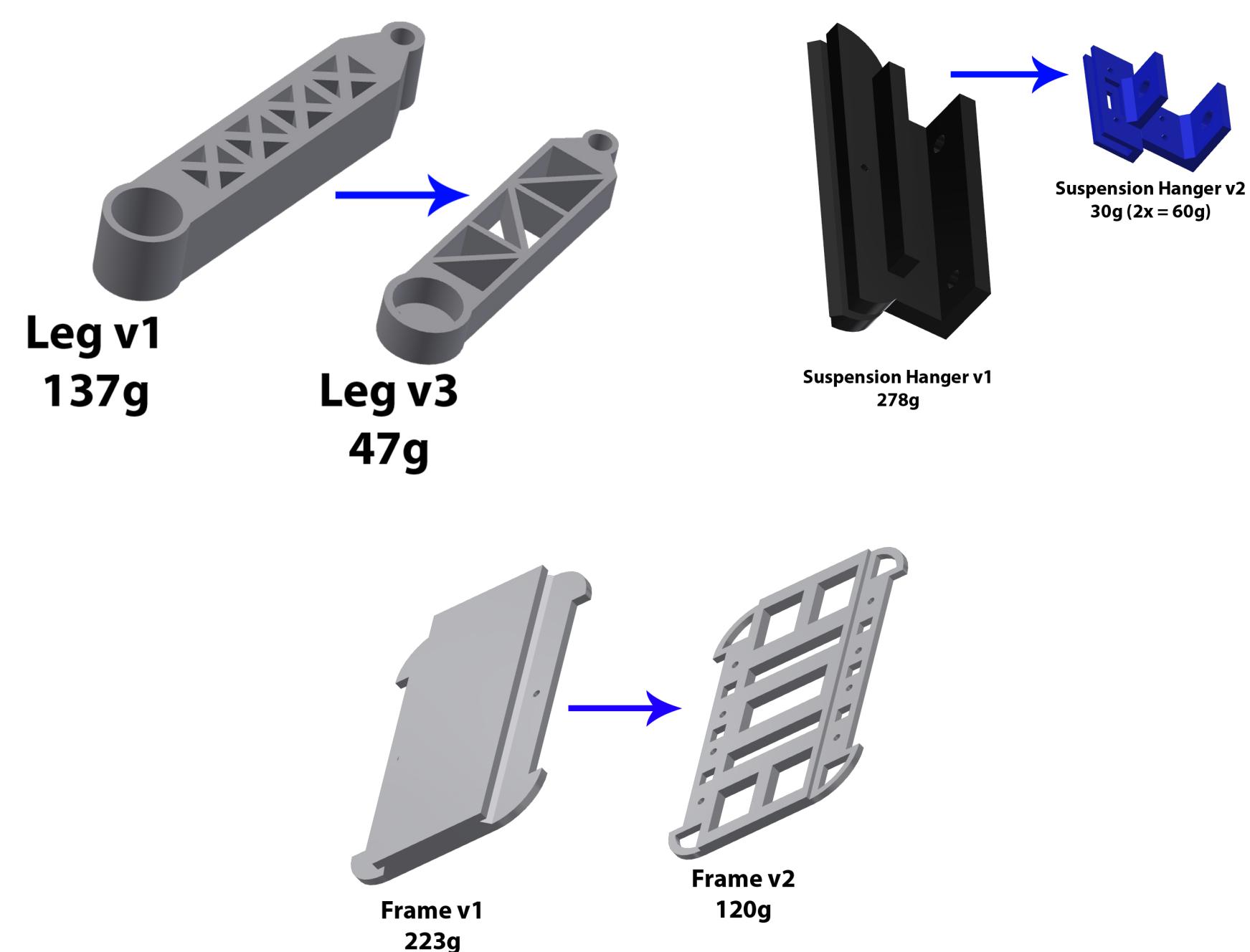
- Ares overall exceeded expectations
- Suspension system functioned beyond expectations and was able to articulate over large objects, allowing for continuous wheel contact with a surface for traction
- Ares was able to demonstrate it could detect various objects, in both size and composition as expected
- Ares demonstrated that it was correctly receiving beacon output and calculating a heading
- Unfortunately Ares' internal compass was malfunctioning, hindering expected navigation but did provide some great lessons learned



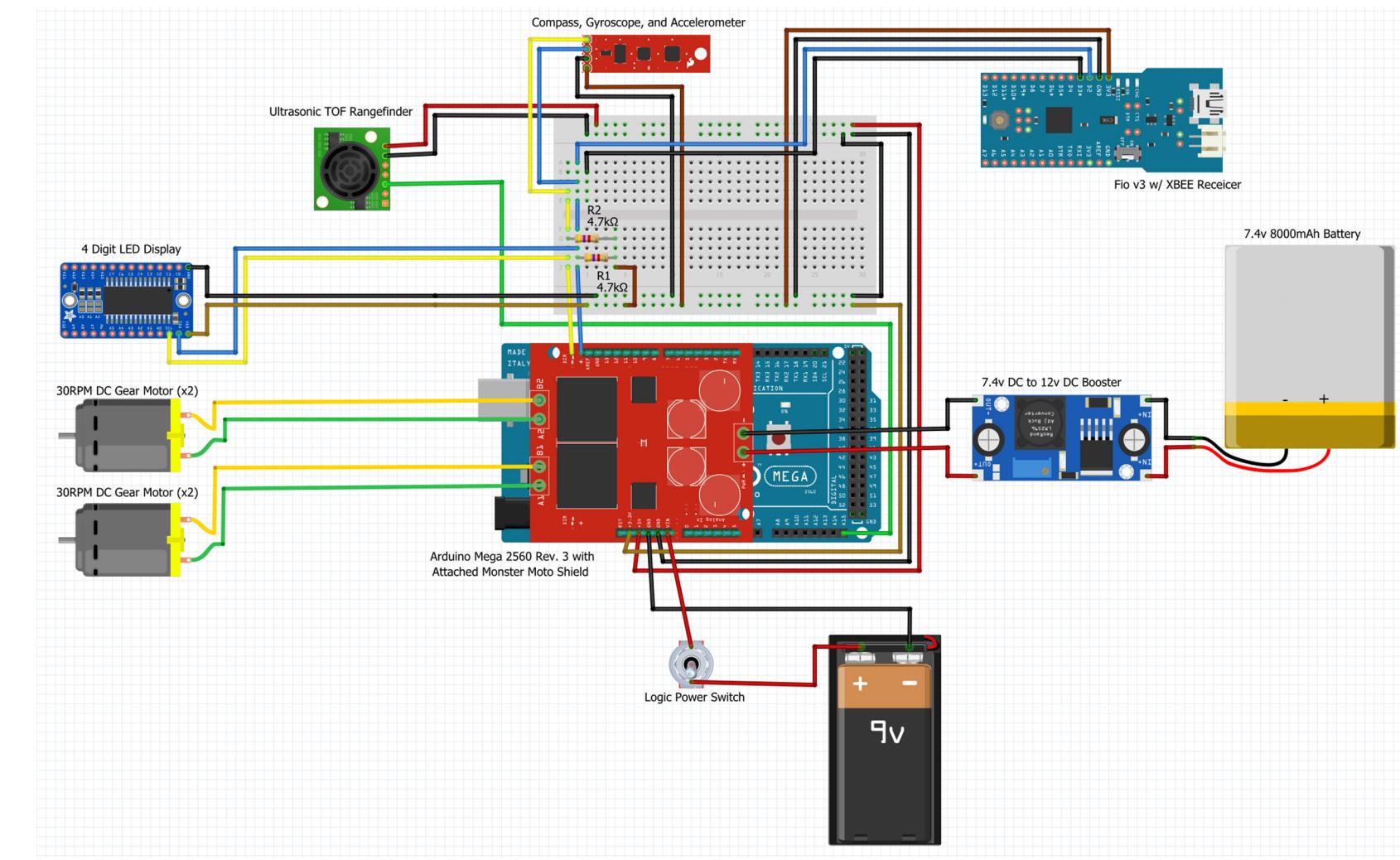
## Structural Considerations

- Some parts were revised multiple times for reductions in mass after prints provided more strength than needed
- The majority of the parts were designed to be easily printed with minimal supports or features that are difficult for a 3D printer to replicate accurately
- Design goals were a large ground clearance and a square footprint to allow Ares predictable skid steer style steering
- A shock suspension was used to allow Ares to maintain ground contact with all 4 wheels in difficult terrain

## Mass Reductions/Design Refinements



## Control Systems



- Two power sources were used, one for logic and one for drive systems. This was to avoid a low power condition on the logic board when motors are activated.
- A DC-DC converter was used to step up the motor power supply voltage from the battery to 12v, allowing for the maximum rated torque output of the DC motors

