This week we focused on testing the motor with its new hex nut connection. Figure 1 below shows the scissor jack after it was raised with the motor for the first time. The operation was smooth and without a load I noticed very little torque on the motor since I was physically holding it up. Next, we had Ray (150lbs) stand on top the jack to test the properties of the motor. As expected I noticed more of a torque, but it wasn’t unmanageable which leads us to believe that our steel cage that we brainstormed earlier will work out. Luckily, when raising the jack under load it didn’t draw more than 5 Amps and even less when lowering the load, only about 2 Amps. This helps us a lot with the circuit design because the current will be within a safe range.

We also took note of the maximum speed when operated at maximum voltage. It rose in 12 seconds at 36 Volts which is the most the DC power could supply for the instrument we were using. When we can safely hook up the 48 Volt DC power supply we’ll test it under load again to see if it moves any faster. Still yet, 12 seconds to raise 55 degrees is promising. It allows us to provide variable speeds to adjust the bed back.
Last week we received the bed frame from Affordable-beds. We first made sure the frame pieced together correctly and assembled it as shown below. Upon taking measurements we found it to be 76.5” x 38.75” x 7”. Unfortunately, because of the way the cross bar is in the back end, it gets in the way of the scissor jack. So we spent some time in the machine shop on Monday removing the back joints and re-bolting them to the middle of the bed. Now the bed frame has one cross bar at the foot of the bed and a second in the middle to allow for clearance of the jack (see Figure 2).

![Modified bed frame with scissor jack placement](image-url)
The jack will lift the load vertically, eliminating all angle changes. Since the jack would no longer tilt with the back of the bed, a wheel will be attached to the top of the jack and ride in the track placed on the back of the bed. As the jack rises, the bed back will rise smoothly along the wheel-in-track system. A simple polyurethane fixed castor wheel would be sufficient. Some kind of parallel metal bars can be built around it on the back of the bed to roll straight on track. This will be all ordered by next week. It will consist of a plywood or plastic backing with steel support bars. The vertical lines in the middle represent the track that the castor will glide along.

**Future Work**

In the coming week we will place a purchase order on the polyurethane wheel and take a trip to the hardware store to pick up final pieces to start construction. The construction will begin as soon as we have the hardware. We plan on doubling our efforts in the lab to ensure this device is built in time. Future expenses include labor and cost of welding (~$80), a castor wheel for the track (~$25), plywood to finish framing the bed (~$25), and steel for the framing of the bed back and motor cage (~$150).

**Project Review**

At this point all ordered parts have been received and the bed frame has been modified so that we can start connecting our device together. The DC gearmotor has also been modified so that the there is a nut attached to the rotating shaft for easy connection to the screw jack. We have tested this connection and learned that it can withstand the torque. This boosted our confidence in creating a working model. We are still within budget with about $685 remaining. We have currently spent about $1315 of our $2,000 budget.

**Hours Worked**

12 hours