

# Building a 3-Axis Bucky Skull



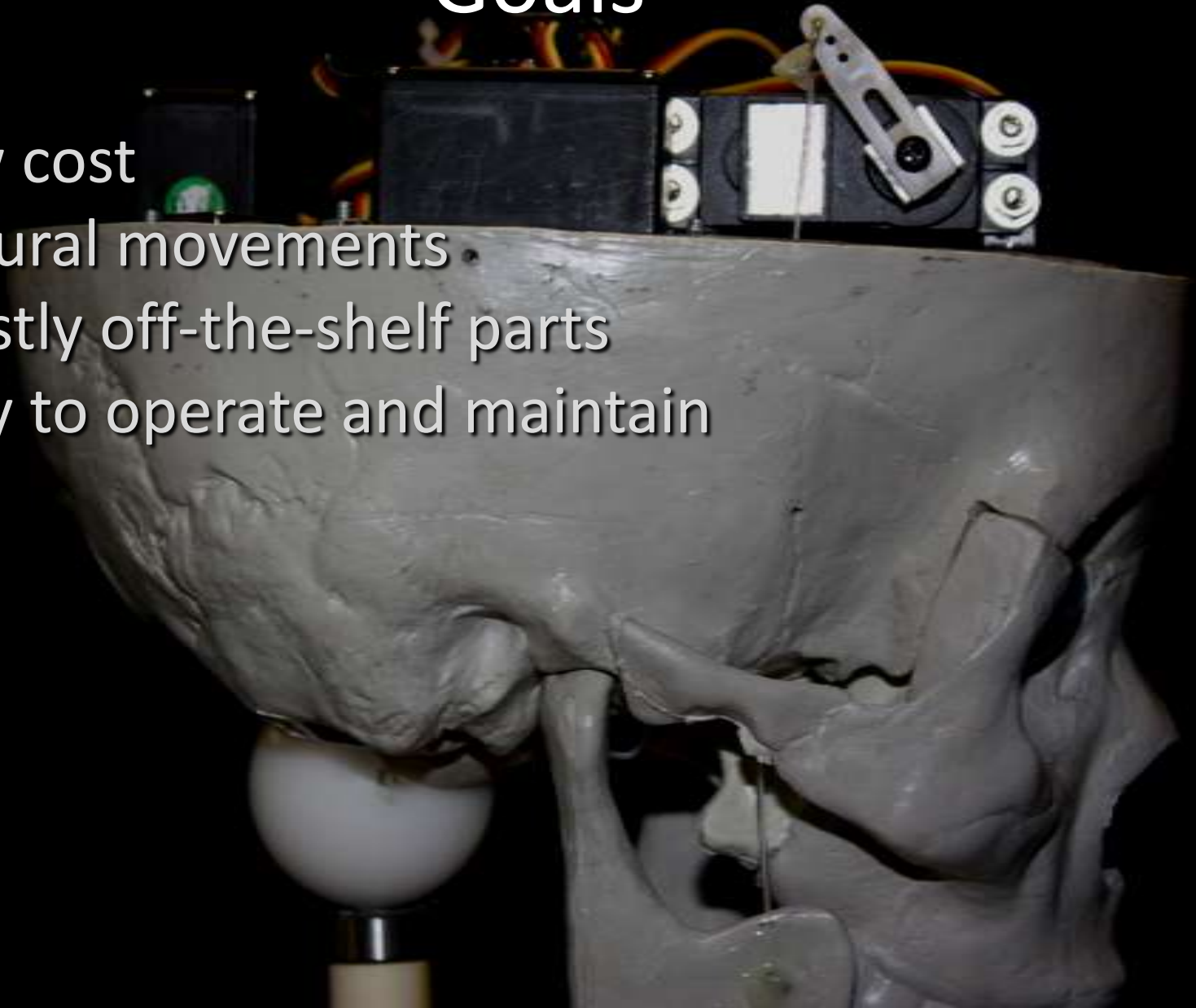
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# Goals

- Low cost
- Natural movements
- Mostly off-the-shelf parts
- Easy to operate and maintain



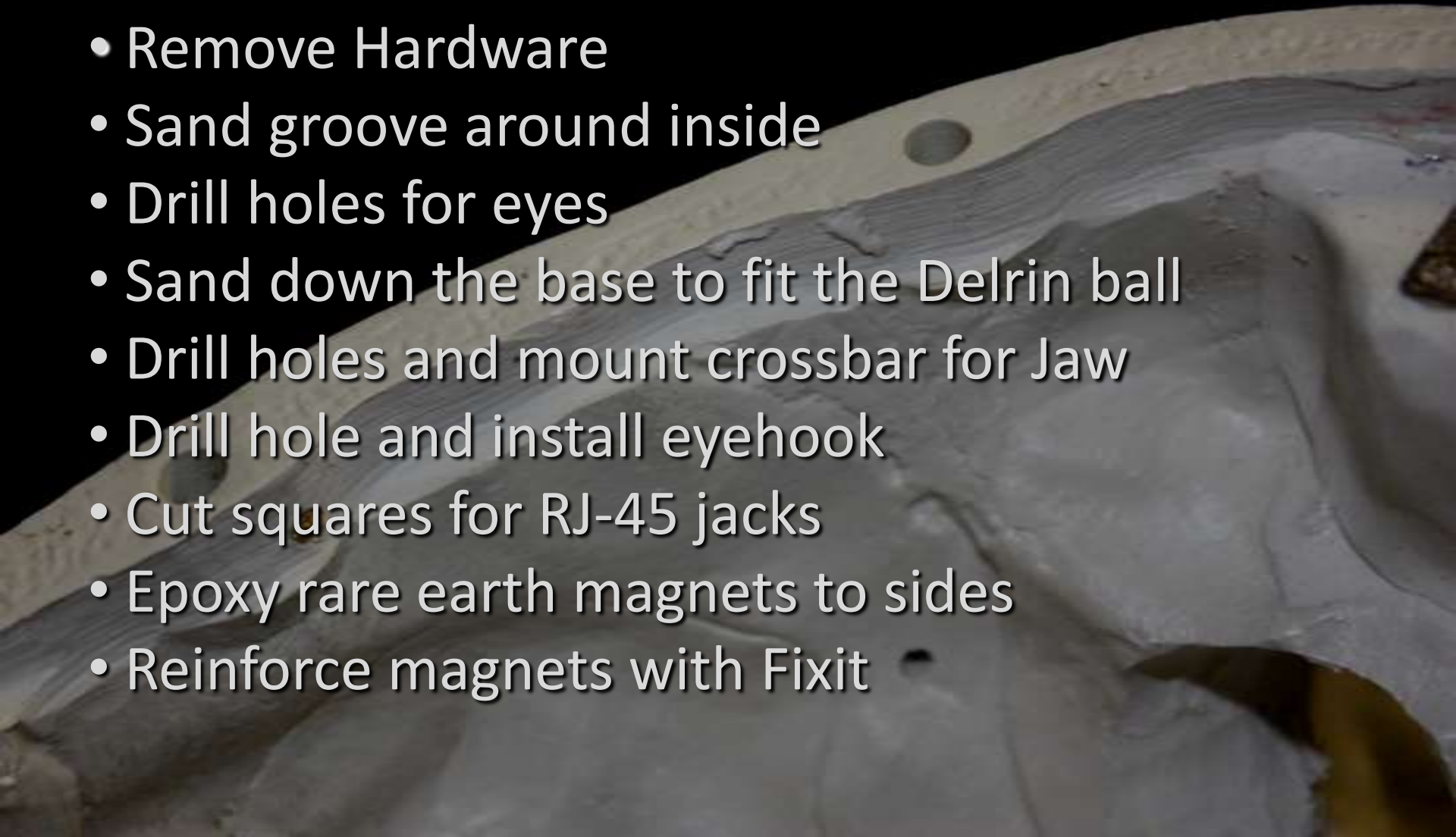
# Parts and Tools

- 5/16" to 10-32 adaptor, 10-32 nut
- 5/16" nut, lock washer, ball bearing
- 1 ½" Delrin Ball
- Servos and connectors
- Spring, nylon washer, eye hook
- 1/8" Plexiglas
- Rotary tool
- Jig saw, band saw, or scroll saw
- Electric drill with assorted bits
- Standard Screw driver
- Needle nose and standard pliers
- 5/16" die for threading rod



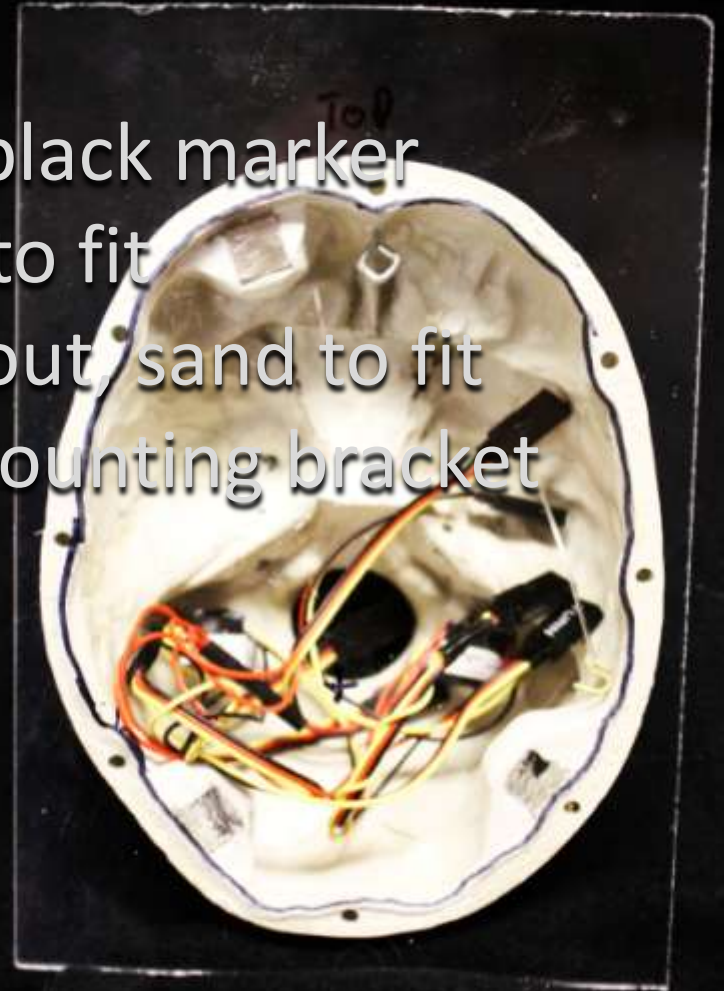
# Modify the skull

- Remove Hardware
- Sand groove around inside
- Drill holes for eyes
- Sand down the base to fit the Delrin ball
- Drill holes and mount crossbar for Jaw
- Drill hole and install eyehook
- Cut squares for RJ-45 jacks
- Epoxy rare earth magnets to sides
- Reinforce magnets with Fixit



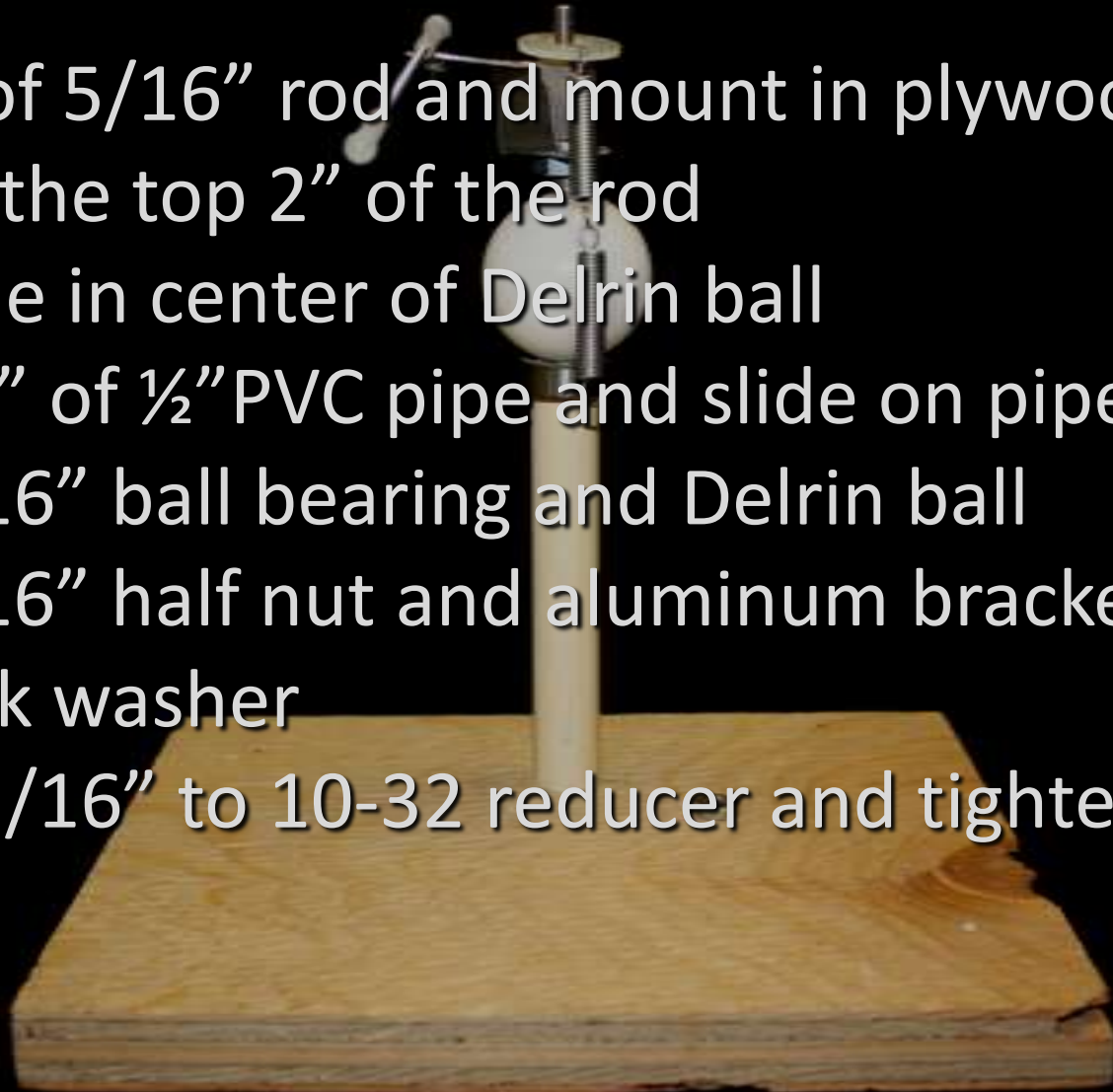
# Making the plate

- Trace inside of skull with a black marker
- Cut out the Plexiglas, sand to fit
- Trace the 3 servos and cut out, sand to fit
- Drill holes for servos and mounting bracket
- Cut 1" access hole
- Cut jaw linkage access hole



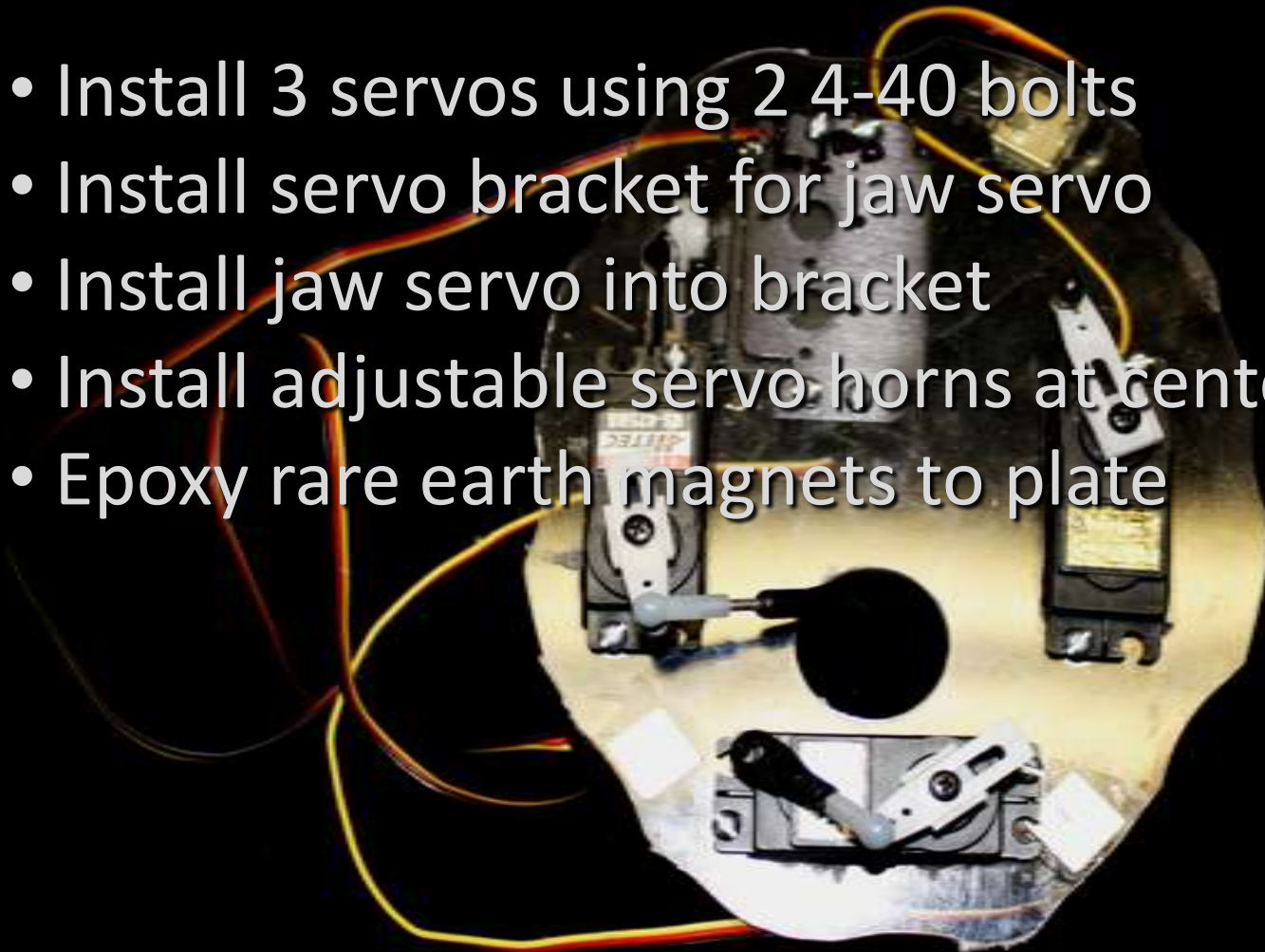
# Building the stand

- Cut 7" of 5/16" rod and mount in plywood
- Thread the top 2" of the rod
- Drill hole in center of Delrin ball
- Cut 3 3/4" of 1/2" PVC pipe and slide on pipe
- Add 5/16" ball bearing and Delrin ball
- Add 5/16" half nut and aluminum bracket
- Add lock washer
- Install 5/16" to 10-32 reducer and tighten



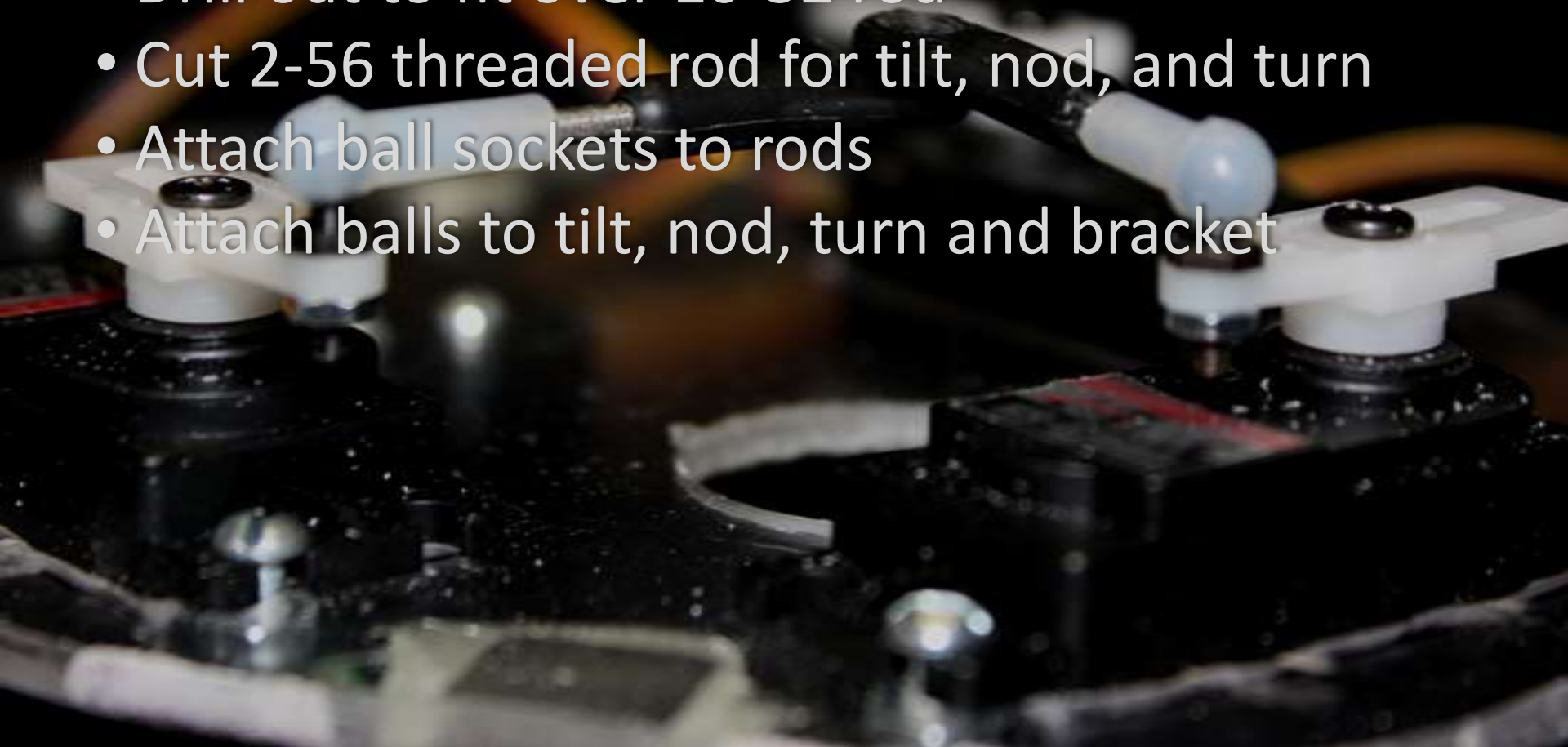
# Installing Servos

- Install 3 servos using 2 4-40 bolts
- Install servo bracket for jaw servo
- Install jaw servo into bracket
- Install adjustable servo horns at center
- Epoxy rare earth magnets to plate



# Installing Linkages

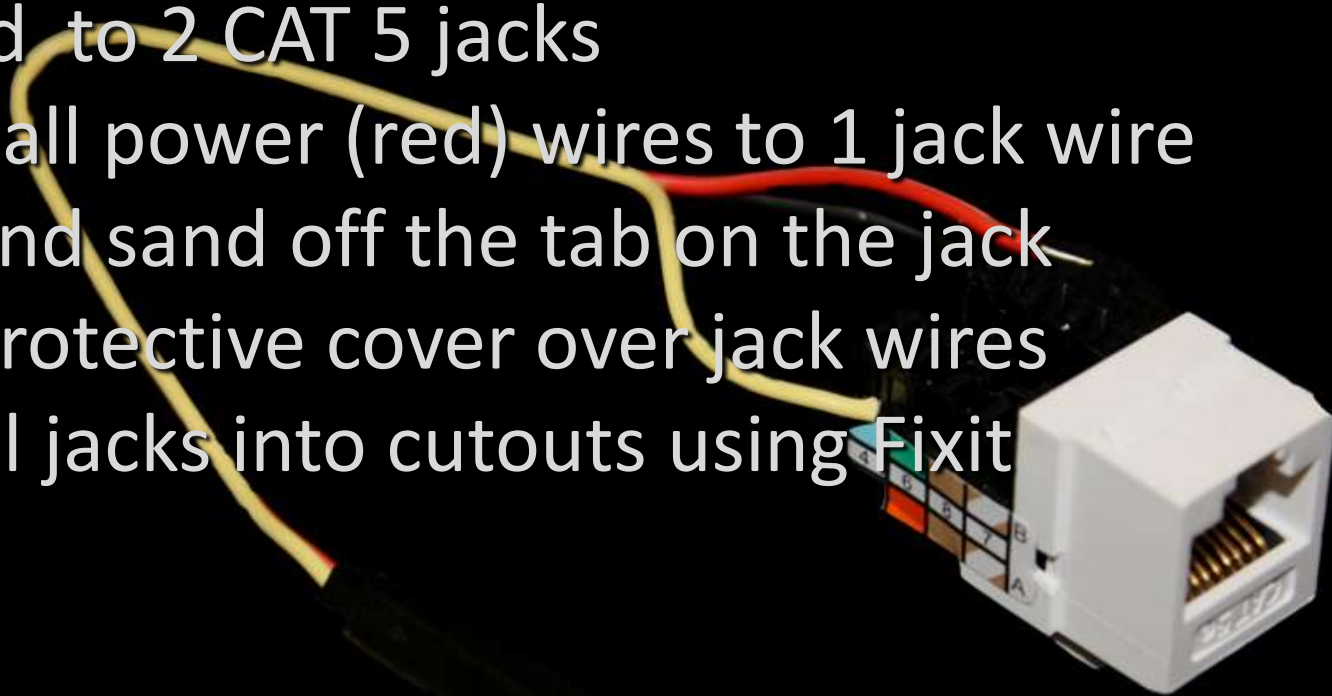
- Pop out swivel from the 2-56 swivel ball
- Drill out to fit over 10-32 rod
- Cut 2-56 threaded rod for tilt, nod, and turn
- Attach ball sockets to rods
- Attach balls to tilt, nod, turn and bracket





# Wiring

- Use seven 6" female servo connectors
- Wired to 2 CAT 5 jacks
- Wire all power (red) wires to 1 jack wire
- Cut and sand off the tab on the jack
- Put protective cover over jack wires
- Install jacks into cutouts using Fixit



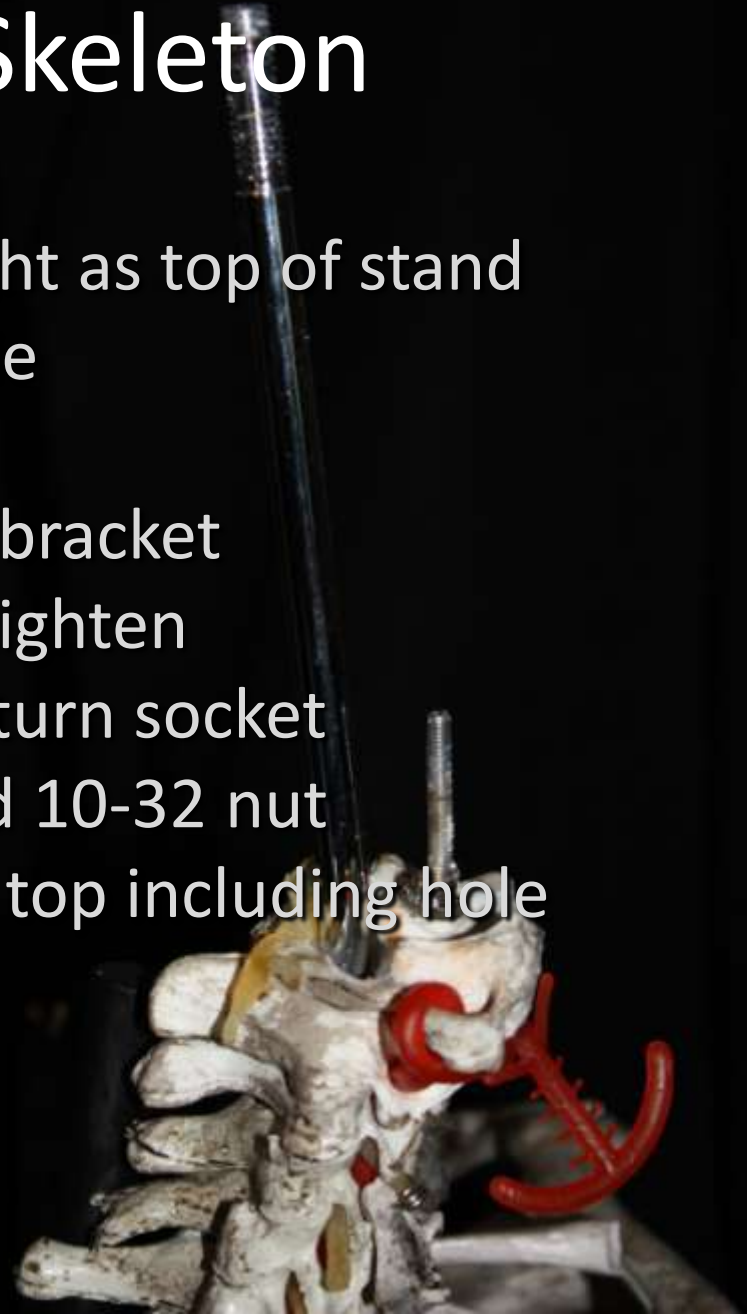
# Final Assembly

The image shows a white skull model mounted on a wooden stand. On top of the skull, there is a mechanical assembly. It includes a battery pack with a red and black label, a small motor or actuator, and various linkages and wires. The skull is shown in profile, facing right. The background is dark.

- Attach turn linkage
- Set Plexiglas plate into position
- Insert tilt and nod linkage to 10-32 rod
- Tighten nut through access hole
- Epoxy fishing line to jaw
- Insert line through drilled hole in skull
- Tie wire hook and epoxy in closed position

# Attaching to Skeleton

- Cut the rod down to same height as top of stand
- Thread 1" of rod using 5/16" die
- Insert bearing and Delrin ball
- Thread 5/16" half nut and add bracket
- Add lock washer, reducer and tighten
- Install head, attach spring and turn socket
- Attach tilt and nod linkages and 10-32 nut
- Use silicone sealer to seal skull top including hole



# Controller Options

- 8 channel RC Transmitter and receiver
- EFX-TEK Prop2 or PropSX
- Vex Transmitter
- EFX-TEK EZ 8 & Vixen
- Any Servo Controller that works with VSA



Questions?