

Large Rotary Style Subwoofer for Infrasonic Audio

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Intent

Generate high energy audio below human hearing for resonance trials and practical theatre effects.

Inspiration

TRW-17 Subwoofer:
- 20" Diameter
- 0.74kW AC Motor
- 0.20kW Solenoid
- \$22,000 price.

Objectives

- Minimize Vibrations
- Power Compatibility
- Constrained Blades
- Constant Fan Speed
- Rigid Fan Blades

Design

- 30" Blade Diameter
- 3kW AC Servo Motor
- 1kW Solenoid Drive
- RC Helicopter Hub
- Wired Control Box

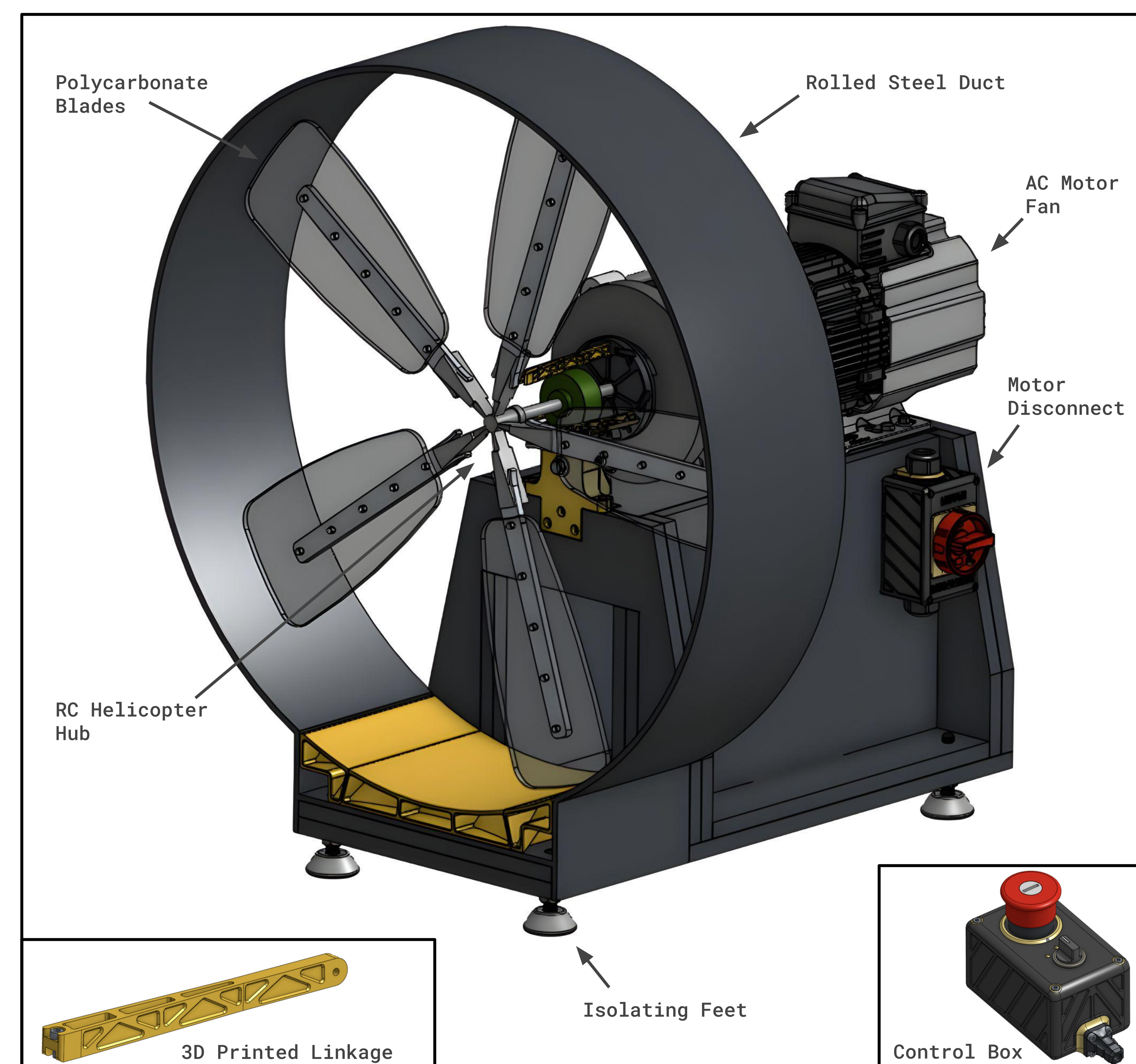
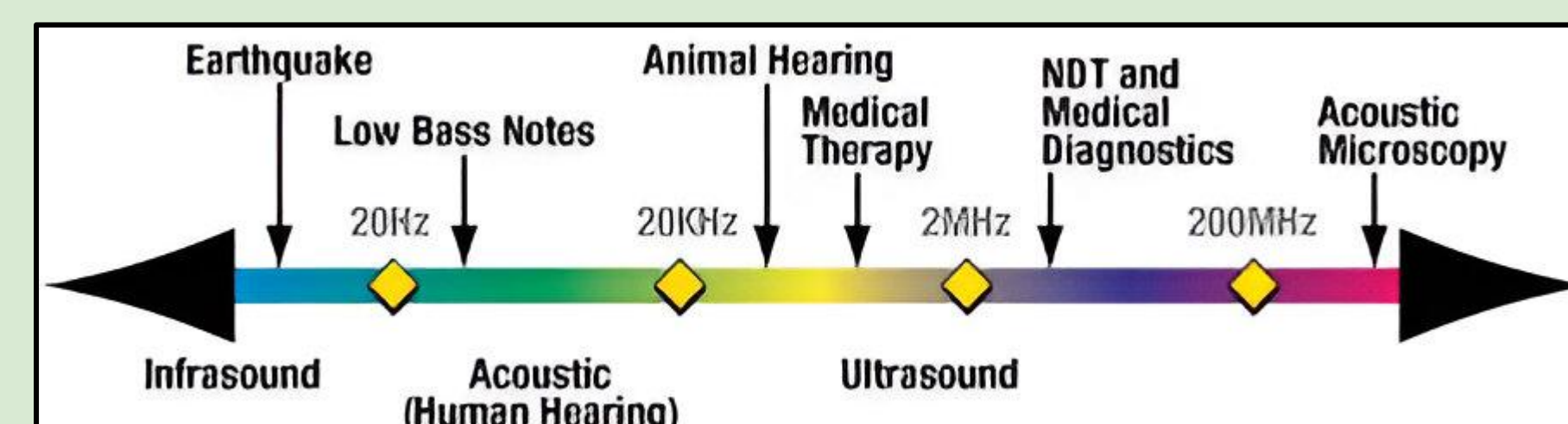
Assembly

- Billet Motor Spacer
- Rolled Steel Duct
- 3D Printed Linkages
- CNC Routed Base
- Isolating Feet

- Infrasonics -

Environments that we interact with daily have resonance frequencies in the 1 to 20hz infrasonic range. A speaker that can generate sound waves at these frequencies can shake rooms for experimental trials and practical theatric effects.

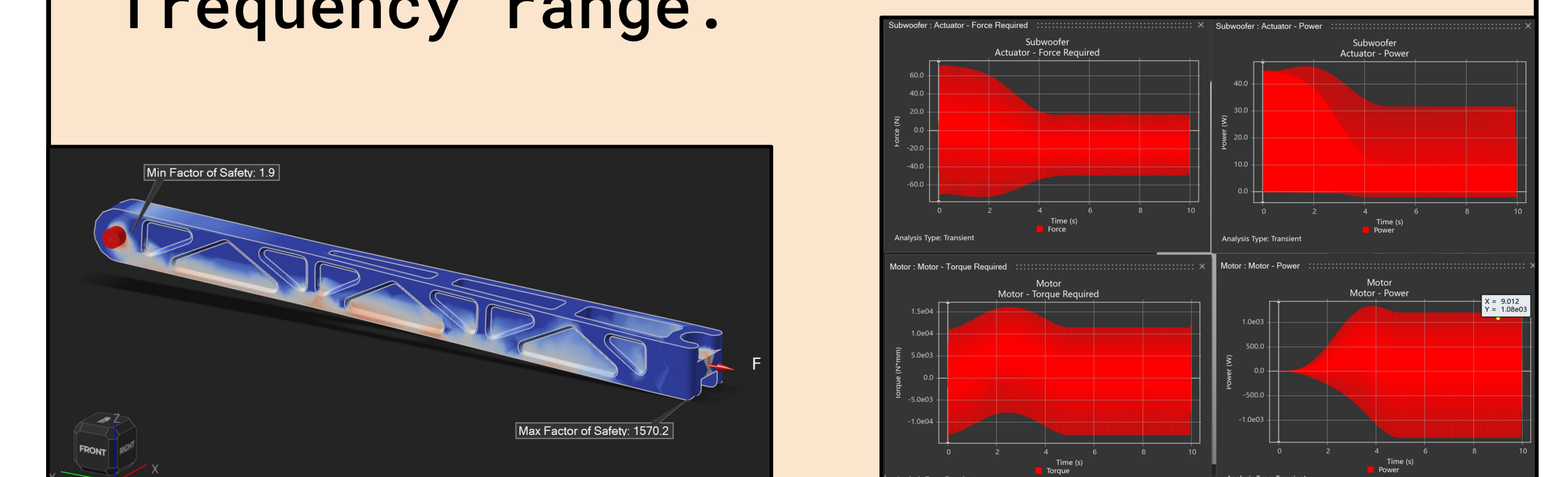
The catch is that infrasonic sound waves are below the frequency range that humans can hear. Instead, the resonance effect on objects can be seen as they rattle against the floor and walls of a vibrating room.



- Simulation -

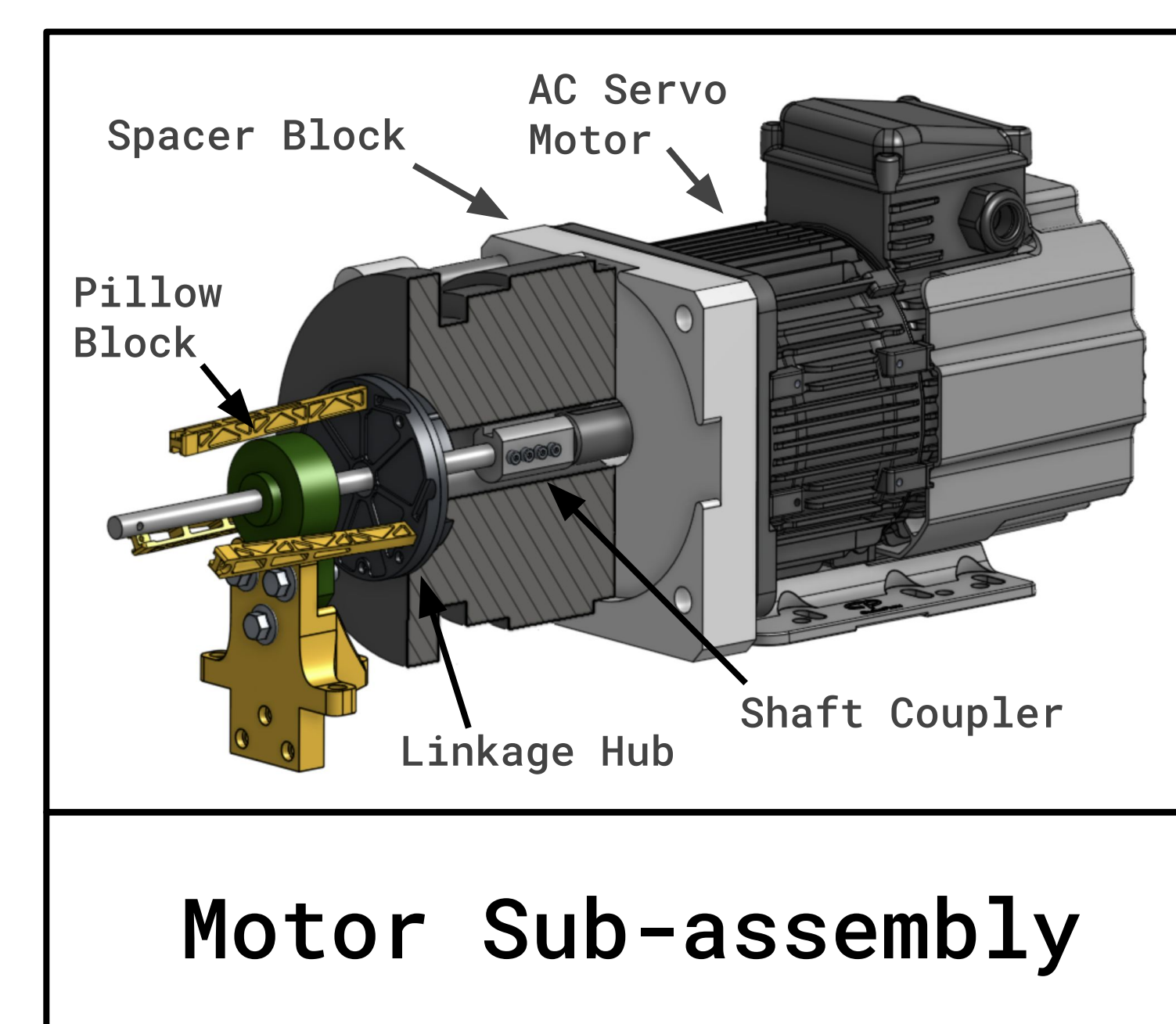
Dynamic force and power requirements of the motor/actuator were predicted using time-based motion simulation. This data streamlined conversations about the scope of the subwoofer.

Supporting components were optimized and validated for the simulated dynamic conditions. Topology and finite element tools simplified the design of rigid, lightweight parts that expanded the projects viable frequency range.



- Performance -

The project has ultimately satisfied design objectives and showcased an impressive energy output. During measurement trials the speaker shook rafters and flexed walls. The rotary has since been used in resonance trials for submerged fossils and will continue to be used creatively.



Audio Engineering Society Project

- Interface -

Standard audio equipment is used to drive the input of the subwoofer. A small wired control box contains two speed presets and a keyed emergency stop button. The load-break capable switch can interrupt motor power. A locking adapter changes the AC motor between 1ph and 3ph power inputs.