

Build a Simple Electromechanical Device

Difficulty Advanced	Time 2-3 class periods	Type Creative Builder
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Background

A small aerospace support task needs a device that senses or receives an input and produces a mechanical or visual output.

Engineering Problem

Design and build a simple electromechanical device such as an alarm, fan, indicator, mini conveyor, or launcher with a safe, defined function.

Learning Objectives

- Create a system block diagram
- Build a basic electrical circuit
- Integrate electrical and mechanical components
- Test and revise a device

Materials

- Low-voltage power source
- Switch or approved sensor
- Motor, buzzer, LED, or actuator
- Wires and breadboard as appropriate
- Approved mechanical materials
- Multimeter

Procedure

1. Choose an approved task and write a one-sentence function statement.
2. Create an input-process-output block diagram.
3. Draw a circuit diagram and label voltage, components, and polarity.
4. Create a mechanical sketch showing how the output does useful work.
5. Build and inspect the electrical circuit before connecting the mechanical load.
6. Test one subsystem at a time.
7. Run at least five full-system trials and record success, current, speed, or another performance measure.
8. Revise one feature and repeat the test.

Engineering Requirements

- Use only instructor-approved low-voltage components
- Include a user-controlled stop or power-disconnect method
- Show both circuit and mechanical diagrams
- Complete five repeated trials
- Document one revision

Constraints & Safety

- No connection to wall power
- No projectiles, exposed blades, or unsafe pinch points
- Keep current within component ratings
- Power must be disconnected before rewiring

Deliverables

- Function statement
- System block diagram
- Circuit diagram
- Mechanical sketch
- Working device or demonstration
- Five-trial test table
- Revision reflection

Reflection Questions

1. Which subsystem caused the most problems?
2. How did electrical limits affect mechanical performance?
3. What safety feature was most important?
4. How would you make the device more reliable?

Engineering Tip

Test the electrical output before attaching a mechanical load. This isolates faults.

Common Mistake

Randomly changing wiring and mechanics at the same time makes troubleshooting much harder.

Stretch Goal

Add an automatic sensor input or a second operating mode.

Career Connection

Mechatronics engineers integrate electronics, mechanisms, controls, and software into aircraft, robots, and production systems.