

Jake Li

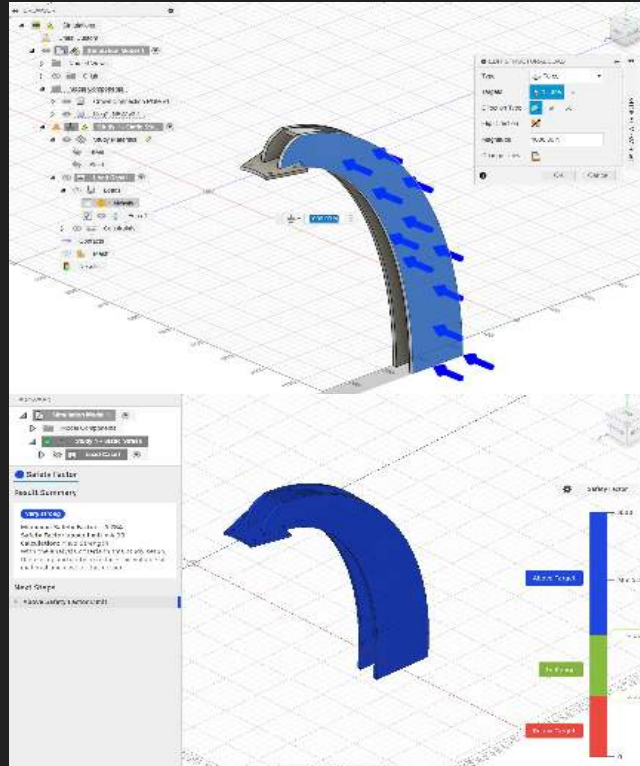
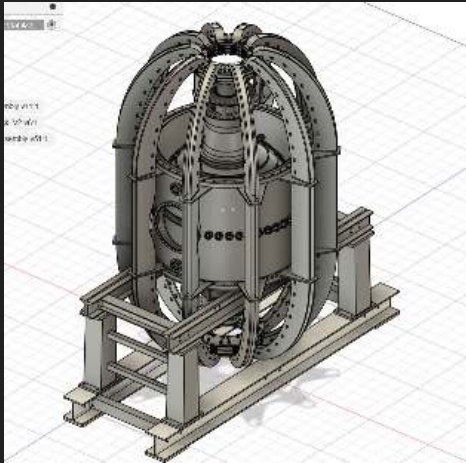
Columbia University, School of Engineering and Applied Science
Bachelor of Science, Mechanical Engineering and Applied Math

jakeli1202@gmail.com

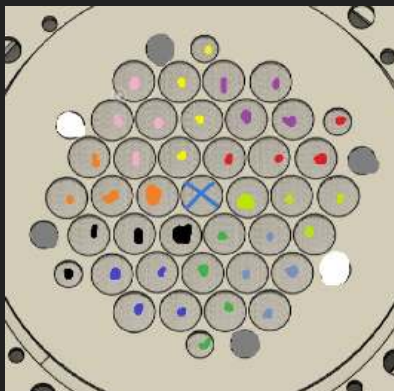
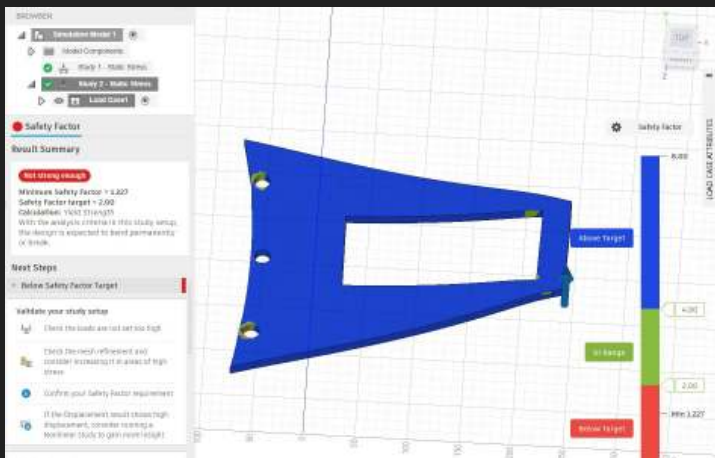
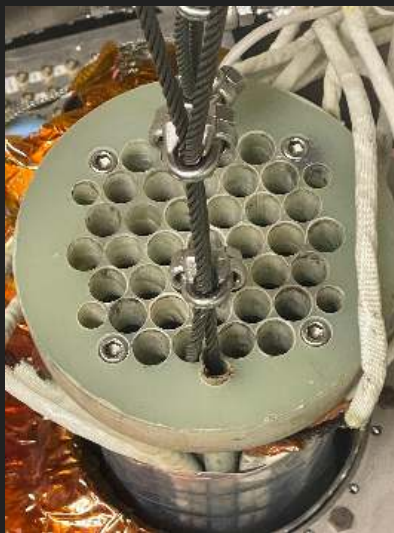
www.linkedin.com/in/jakelio/

(840)-200-8256

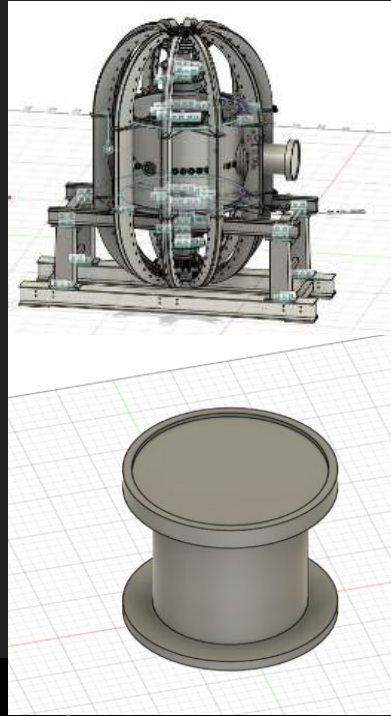
Columbia Plasma Physics Lab - CUTE Tokamak Project Toroidal Field (TF) Legs



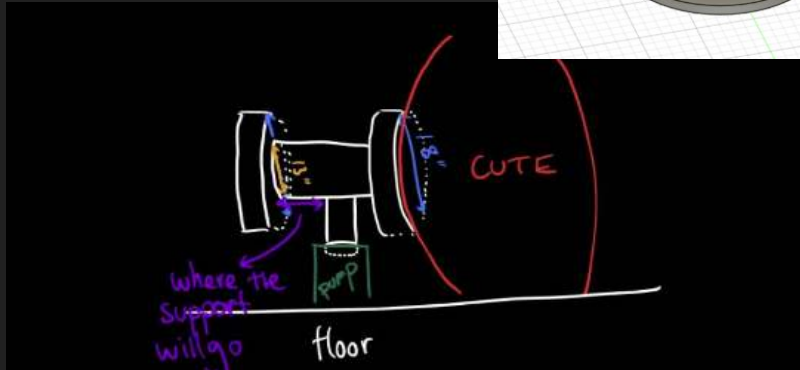
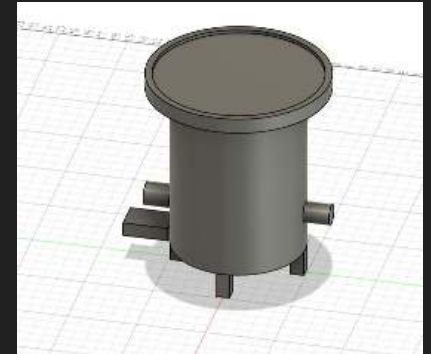
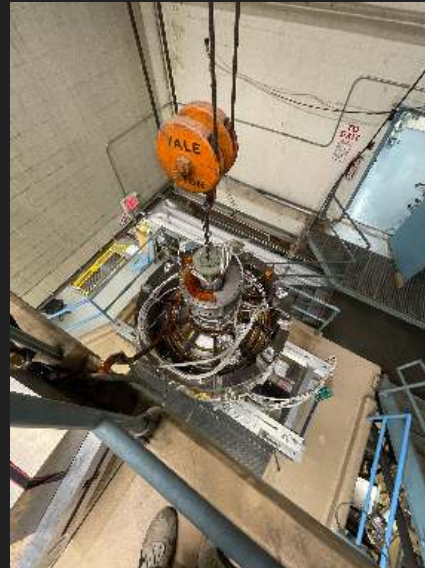
- Full CAD assembly of Tokamak (crown, TF legs, pedestal, and vacuum chamber/vessel) using Fusion360 to ensure TF legs can withstand large shear and tensile forces generated by magnetic fields
- Performed a Finite Element Analysis (FEA) on the TF legs, applying a static load of 1000 N distributed along the structure
- Determined structural weakness points of vacuum vessel



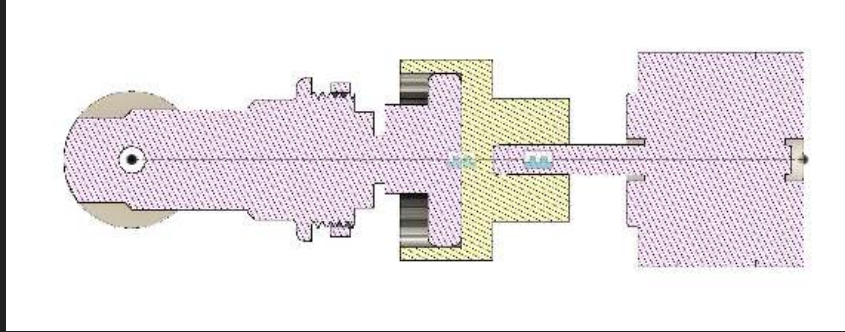
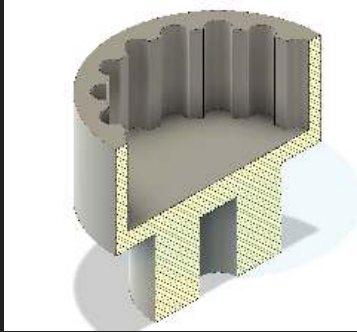
- Ensured current-carrying cables inserted into center stack of Tokamak are all in series to carry the same current; mapped TF leg cables with optimal distance conditions (using average radial distances) for plasma confinement symmetry
- Model approved and cable placement was finalized. Different wire gauge issue addressed by splicing metal cables with CNC machined parts



- Mapping the location of the vacuum pump
- CAD out rudimental design in Fusion for fit-check to orient crane for pump fitting
- Future plans: design and build a support to hold vacuum pump. Will need to address spacing issue and perform FEA analysis



Columbia Space Initiative - Rocketry Propulsion Fluids Subteam

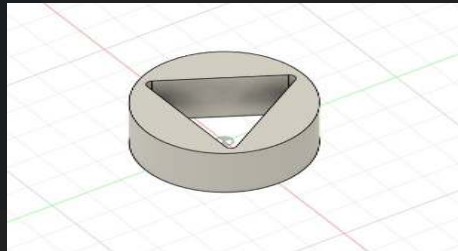
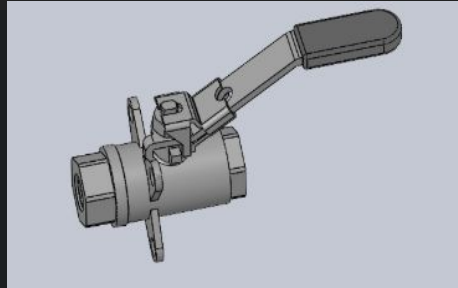


```
def contact_compliance(insert: Material, hub: Material, d_in: float, R_out: float) -> float:
    """
    Diametral contact compliance C for an interference-fit cylinder-in-thick hub (plane strain).
     $p = \Delta d / (d * C)$ . Units: C has [1/psi].
    """
    r = d_in / 2.0
    if R_out <= r:
        raise ValueError(f"hub outer radius R={R_out:.2f} must be > inner radius r={r:.2f}")
    C_insert = (1.0 - insert.nu**2) / insert.E_psi
    C_hub = (1.0 - hub.nu**2) / hub.E_psi * (R_out**2 + r**2) / (R_out**2 - r**2)
    return C_insert + C_hub

def pressure_from_interference(delta_diam: float, d_in: float, C: float) -> float:
    """Contact pressure from diametral interference:  $p = \Delta d / (d * C)$ ."""
    return delta_diam / (d_in * C)

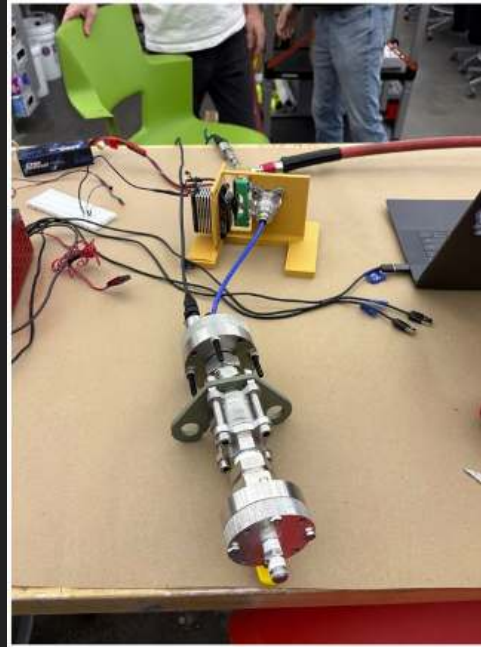
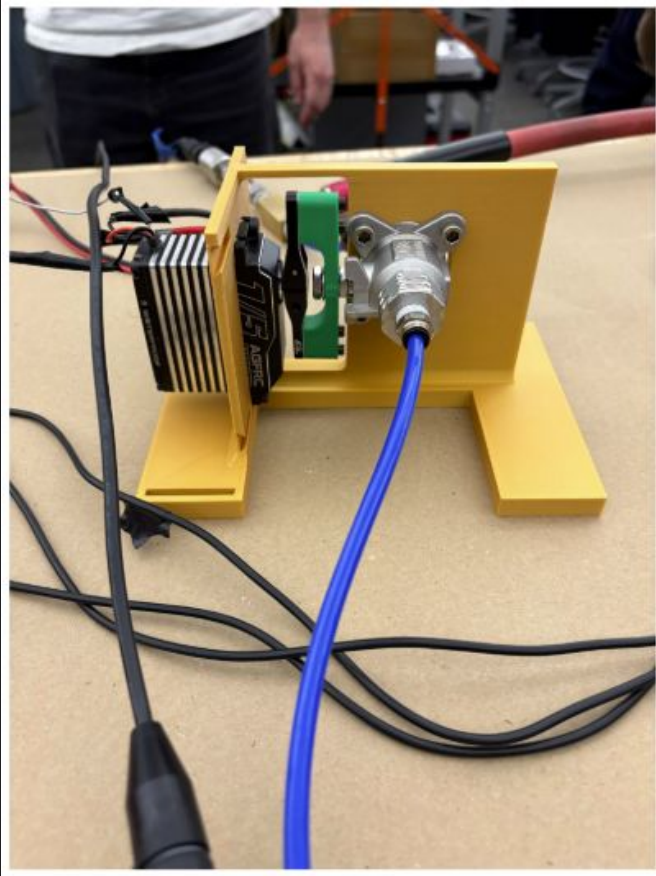
def axial_force(p_psi: float, d_in: float, l_in: float, mu: float) -> float:
    """Friction-based axial retention (push-out) force  $F = \mu * p * (\pi d l)$ ."""
    contact_area = math.pi * d_in * l_in * 2
    return mu * p_psi * contact_area

def od_callout(bore_d: float, i_min: float, i_max: float):
    """
    Given a bore and an interference band (diametral), return nominal OD and ± tol.
    """
    i_mid = 0.5 * (i_min + i_max)
    tol_half = 0.5 * (i_max - i_min)
    return bore_d + i_mid, tol_half
```



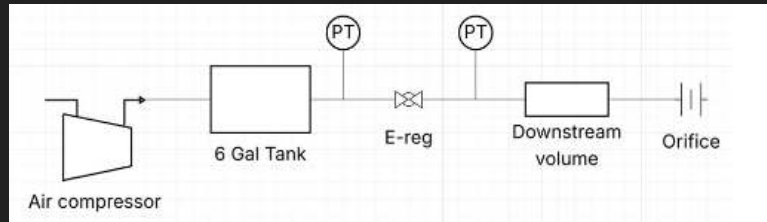
- Finalized PID operated ball-valve to control LOX flow over solenoid valve
- Ran simulations to test if valve can handle 4.5 ksi pressure upstream and maintain the 450 psi internal pressure of LOX tank
- Modifications made to make flow as linear as possible for PID control software
- Plan to use “cascaded control”; two control loops running, with a secondary loop nested in a primary loop of PID

Columbia Space Initiative - Rocketry Propulsion Fluids Subteam



Subscale Testing objective: run the E-reg at a lower pressure to determine its precision and accuracy with the PID control software

- Connected to air compressor with 6 gal tank (rated @ 200 psi)
- Drains air through E-reg into downstream volume with an orifice at the end

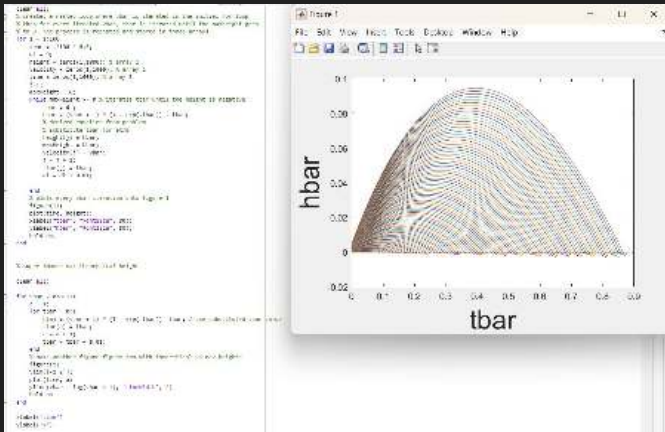


Glenair Internship - Summer 25'

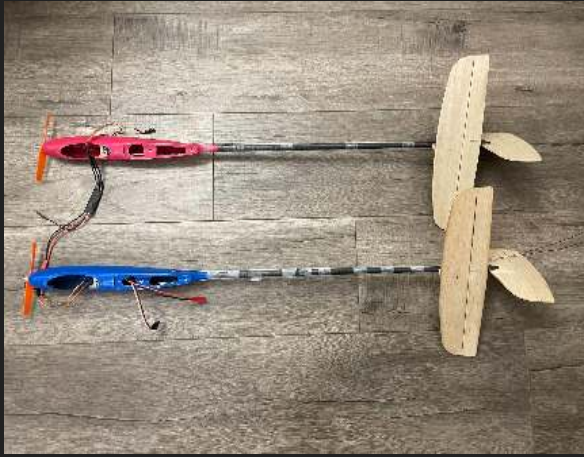


- Created fiber optic cable connector toolings to hold contact pins while assembled and cured
- Had multiple iterative designs to be compatible throughout each same-shell diameter model
- 3D printed prototypes; learned critical tolerances and machining feasibility for tooling parts
- Saved company over \$20,000 and 300 hours by redesigning cross-compatibility toolings to be machined

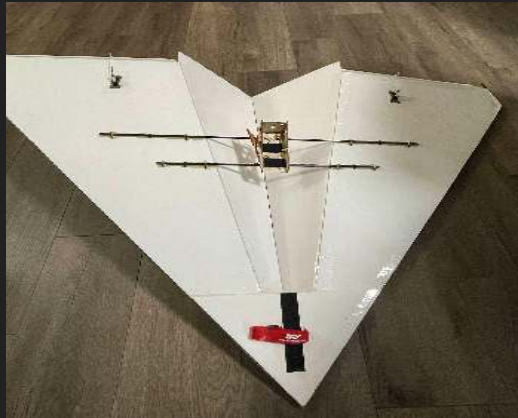
Fiberglass Model Rockets & Remote Controlled Gliders | [Video](#)



- Modeled rockets in SolidWorks. Initially tried running rocket trajectory simulations in OpenRocket but switched over to MATLAB
- Finalized a 4 gram model with 40% less body mass compared to other competitors. Competed on the US National Space Modeling Team
- Preparing for HPR L1 Certification through the National Association of Rocketry

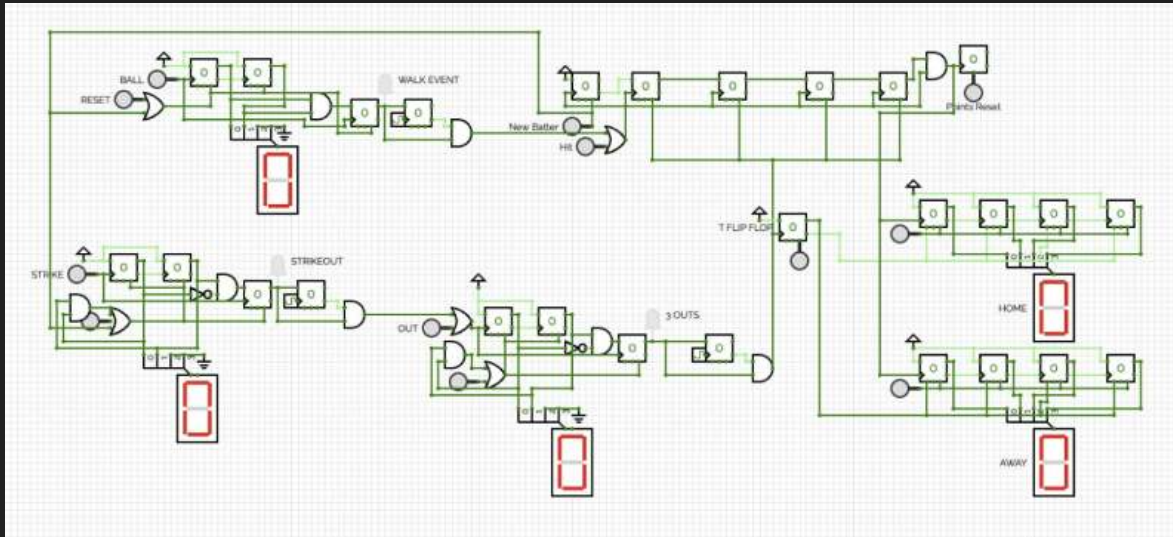


- Prototyped folded wings that increased thrust height by 20% (30 meters) and reduces drag by 15%
- Designed and built racing drone paired with FPV goggles
- Created paper airplane prototype; practiced 100 hours in Microsoft Flight Simulator and city RC airfield
- Modeled with SOLIDWORKS and constructed main body with polycarbonate plastic and fiberglass (1500 grams)
- Flight Controller, Powerboard, ESC, Battery, RC Receiver (RX)/Transmitter (TX), Chassis, Brushless motors, propellers
- Communication Protocols: SPI, UART

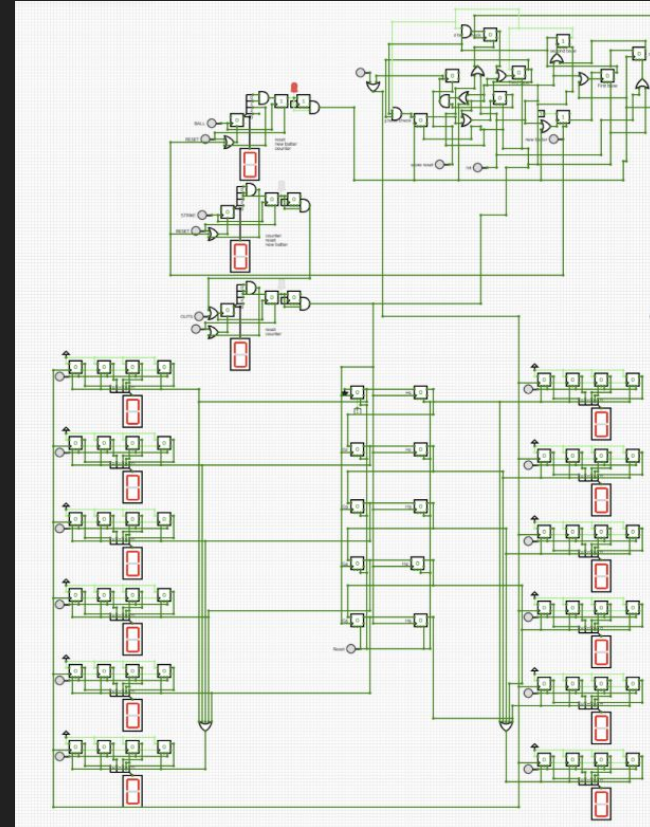


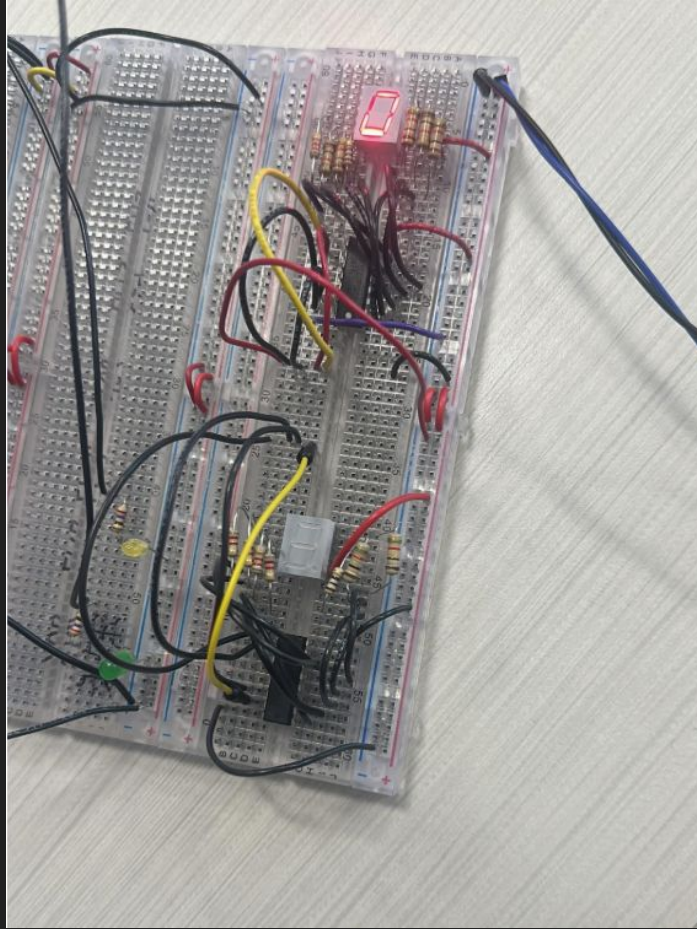
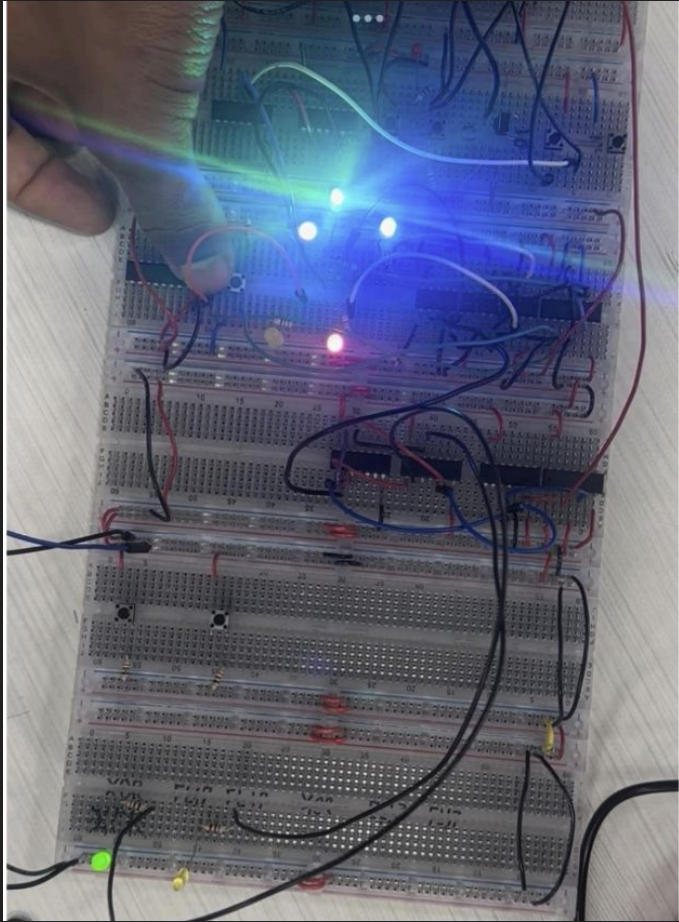
BALL 2		STRIKE 1		OUT 2			
VARSITY							RUNS
1 2 3 4 5 6 7							
GUEST 0 0 2 0 3 2 1							
HOME 2 1 0 3 1 0 2							8
							9

Final schematic (below)

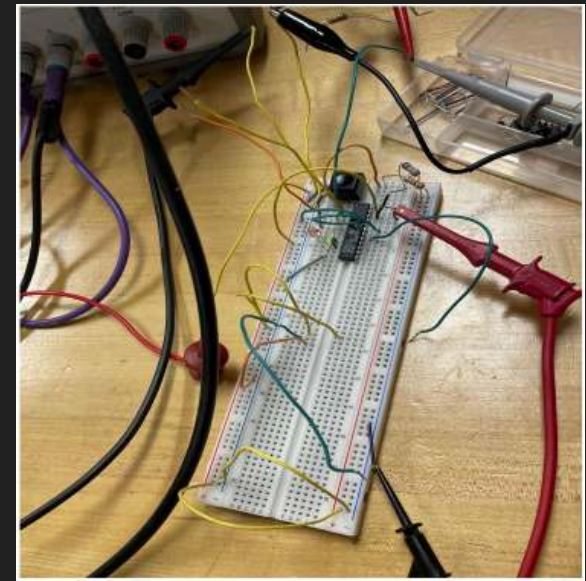
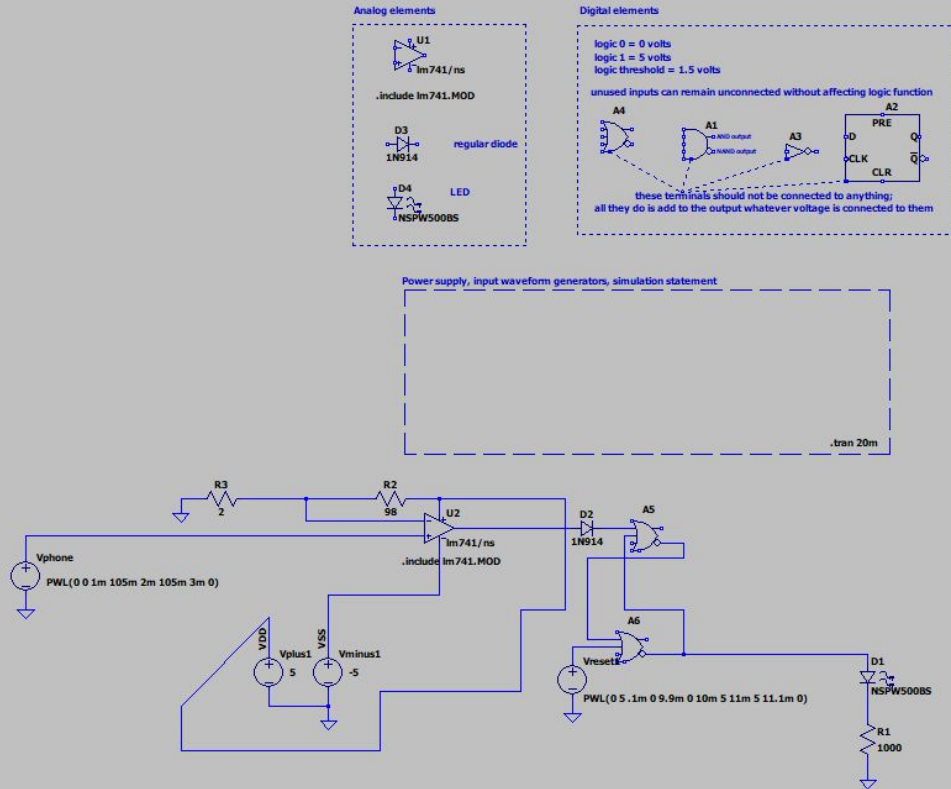


Initial schematic (below)





- Hardware issues: multiple T toggles despite 1 button click
- Used multimeter (DMM) to test for toggle issues/noise



Designed a circuit that monitors the audio output jack of a phone and, if any signal above 100mV peak is detected, caused an LED to light and stay lit until manually reset.

- Used oscilloscope to verify circuit operation (Scopi & ADALM2000)