

# FAZLE RABBI ZAKI

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## Education

### University of Michigan

*B.S.E. in Aerospace Engineering*

*Ann Arbor, MI*

*May 2026 (Expected)*

- Relevant coursework: Attitude Determination & Control Systems; Spacecraft Dynamics; Aircraft & Spacecraft Structures; Propulsion; Aerospace Engineering Laboratory; Thermodynamics; Intro to Solid Mechanics;

## Engineering Projects Experience

### Autonomous ADCS Imaging Testbed (CubeSat scale, 1U)

*ADCS and Systems Engineer*

*Ann Arbor, MI*

*Sep 2025 – Present*

- Built a flight-like 1U observation platform under 1 kg integrating compute and power, structure, IMU, magnetometer, star, infrared, and science cameras, and actuators (reaction wheel and magnetorquers) to autonomously detumble, point, and image.
- Implemented and verified ADCS: TRIAD and extended Kalman filter estimation, B-dot detumble, PID and LQR pointing, and momentum management; validated closed-loop pointing and wheel desaturation in Python and MATLAB and on a 1-axis hardware-in-the-loop testbed; met an imaging requirement of at least 1 mm features at 5 m.
- Led systems engineering: defined mission, Level 1, and ADCS requirements; created mass, power, and volume budgets and interface control documents; designed a Helmholtz coil testbed (at least three times Earth's field) with starfield and infrared targets and ground-station logging for mode transitions.

### Wind-Powered Generator – HAWT Prototype

*Mechanical Design and Test Lead*

*Ann Arbor, MI*

*Sep 2024 – Dec 2024*

- Built a self-yawing horizontal-axis wind turbine using accessible wood, PVC, and 3D-printed parts; three 80 cm blades; turntable yaw bearing with vane; trap-door hub for maintenance; routed wiring through the hollow shaft; delivered a working prototype within a \$110 budget.
- Passed five rooftop safety checks (300 N lateral load, high-wind disassembly attempt, passerby test, technical requirements, roof integrity) and powered the lightbox to reveal the message.
- Instrumented tests across resistive loads and phase configurations; observed maximum efficiency 1.2% at about 1.12 m/s (average 0.546%), average tip speed ratio 2.5 (maximum 7.2), power around 0.10 to 0.17 W with maximum 6.453 V; recommended a higher gear ratio and a larger rotor radius to increase shaft speed and power.

### Hovercraft Prototype

*Mechanical and Electrical Design and Test*

*Ann Arbor, MI*

*Mar 2023 – Apr 2023*

- Designed and built a Milano-shaped RC hovercraft under NASA constraints (under 800 g,  $55 \times 55 \times 22$  cm); delivered a 490.62 g system with servo-driven thrust vectoring and a 3D-printed inlet motor mount to prevent motor shift and organize wiring.
- Ran STAR-CCM+ internal and external flow simulations; computed 4.22 N lift at 2 m/s and a drag coefficient of 1.09 with frontal area 0.0262 m<sup>2</sup>; added a skirt with an open trailing edge and removed a rear wall to improve lift and control on rugs.

## Work Experience

### Grow Detroit's Young Talent (GDYT)

*Participant*

*Detroit, MI*

*Jun 2022 – Aug 2022*

- Completed a 6-week program focused on workplace readiness, professional communication, and team collaboration.
- Facilitated small-group activities and presentations; delivered a community service project with a peer team.

## Skills

- **Controls and estimation:** rigid-body dynamics (quaternions), ADCS (B-dot, PID, LQR), TRIAD, EKF, numerical modeling.
- **Programming:** Python, C++, MATLAB.
- **Tools:** SolidWorks, CATIA, STAR-CCM+, Simulink, Git.
- **Lab:** DAQ, multimeter, oscilloscope.
- **Languages:** Bangla (fluent), English (fluent), Hindi/Urdu/Arabic (conversational).
- **Activities:** Michigan Aeronautical Science Association (MASA) Member 2025 – Present