1991 Kraft Drive,
Blacksburg, Virginia, USA
vishalgautam@vt.edu

Vishal Gautam

(540) 934-8376
vishalgautama.github.io
linkedin.com/in/vishalgautama

Education

M.S. in Aerospace Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia — Aug 2024 – May 2026
B.Tech in Aerospace Engineering, University of Petroleum and Energy Studies, Uttrakhand, India — Aug 2016 – May 2020

Engineering Experience

Research Assistant — **May 2025 — Present**
Nonlinear Systems Laboratory, Virginia Tech — *Blacksburg, Virginia*

- Architected a 6-DOF nonlinear aircraft simulation in MATLAB/Simulink coupling rigid body dynamics, full SO3 kinematics, blade-element momentum theory, and aerodynamic models validated through flight testing (*Advisor: Dr. Craig Woolsey*).
- Designed real-time BIT actuator fault detection embedded directly in the simulation loop, enabling closed-loop fault response validation without hardware risk prior to flight.
- Led system identification campaigns extracting coupled aerodynamic and propulsion parameters from flight data, enabling physics-informed model calibration and reducing simulation-to-flight tracking error.
- Designed low-latency C++/Python ROS 2 middleware for time-synchronized multi-sensor acquisition across GPS, IMU, and barometric sensors, achieving sub-millisecond timestamp alignment critical for state estimation accuracy.
- Doubled platform flight endurance by using simulation-driven propulsion analysis to inform motor reselection, battery reconfiguration, and ESC firmware tuning — validated through before-and-after flight test comparison.
- Took GNC ownership of the DRAGON eVTOL: modified PX4 firmware in C++, designed transition control laws, and demonstrated the platform's first stable autonomous fixed-wing-to-multirotor transition flight.

Engineering Officer — **Nov 2021 — Aug 2024**
VTOL Aviation India Pvt. Ltd. — *Mumbai, India*

- Built high-fidelity MATLAB propulsion models, motor torque-speed curves, battery discharge models, and coupled airframe aerodynamics, replacing empirical estimates with physics-based predictions that became the design authority for eVTOL aircraft.
- Generated flight envelope analysis across 50+ propulsion configurations, converging on motor, battery, and drivetrain selections that met range, payload, and redundancy requirements simultaneously.
- Took end-to-end technical ownership of a 500 lb heavy-lift multirotor UAV — from motor and frame sizing through avionics integration, GNC commissioning, and first autonomous flight.
- Verified all control laws through HITL bench testing before first flight, performing eigenvalue stability analysis and gain scheduling across the full operational envelope to maintain safe stability margins.
- Built a 1 kHz multi-channel propulsion test stand from scratch using NI DAQ hardware, capturing thrust, torque, RPM, phase current, and winding temperature at a fidelity no commercial dynamometer offered at the required scale.
- Wrote Python and C++ post-processing pipelines to systematically calibrate MATLAB propulsion models against test stand data, reducing prediction error to within 3% across the full operating envelope.
- Authored 100+ V&V test cases with direct requirement traceability, establishing the acceptance criteria that formally cleared the platform for autonomous flight operations.
- Led RCA on critical failures across propulsion, avionics, and structural subsystems, identifying root causes and implementing corrective actions that eliminated recurrent failure modes and unblocked key program milestones.
- Drove a 35% reduction in the end-to-end development cycle by restructuring cross-functional workflows and eliminating interface ambiguity between propulsion, avionics, and manufacturing teams.

Research & Development Intern — **Jun 2019 — Jul 2019**
Indian Air Force, Base Repair Depot — *Kanpur, India*

- Led thermal failure investigation of the Rolls-Royce Viper central bearing as project lead, applying aero-thermal modeling to identify heat transfer breakdown at the bearing race as the primary failure driver.
- Developed corrective analysis using gas turbine thermodynamic theory to establish operating temperature and pressure thresholds that prevent recurrence of the identified bearing failure mode.
- Studied overhaul and maintenance procedures for Tumansky R29, Snecma M53, and Rolls-Royce Viper engines, building propulsion system intuition that directly informs current physics-based simulation model development.

Skills

Languages	C++, Python, C, MATLAB, Simulink, Bash, CMake, LaTeX
Platforms	ROS 2, Gazebo, PX4, Ardupilot, FreeRTOS, NuttX, Linux (Ubuntu, Raspbian), MAVLink
Dev & Design Tools	Docker, GitHub Actions, LabVIEW, SolidWorks, ANSYS
Hardware	NI DAQ, Pixhawk, STM32, Raspberry Pi, ATmega, I2C, SPI, CAN, UART, JTAG/SWD