

Felipe Alexander Borja

ROBOTICS HARDWARE ENGINEER

U.S. Citizen | Eligible for Secret Clearance

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Proficient hardware design engineer with 5+ years of experience conceptualizing, fabricating, integrating, and testing robotic systems, sensor payloads, compact mechanisms, and autonomous systems for government-facing R&D and academic research. As part of a small team, leads end-to-end full-cycle development from requirements and CAD through fabrication drawings, rapid prototyping, integration, experimental validation, and iterative redesign.

CORE SKILLS

Mechanical Design & Fabrication: SolidWorks, AutoCAD, Fusion 360, Alibre, Onshape | mechanism design | actuator sizing/selection | load, force, torque, speed, energy, and duty-cycle calculations | fabrication drawings | machining | FDM/SLA 3D-printing | laser cutting

Robotics & Systems: ROS | UAVs | LiDAR SLAM | sensor fusion | robotic perception | system architecture & integration | test-rig design | experimental validation | performance analysis

Electronics & Software: KiCad PCB design | camera/sensing payloads | analog & digital electronics | Arduino | Raspberry Pi | Python | C++ | C | MATLAB/Simulink | PlatformIO | OpenCV | Linux | Git

Credentials: FAA Part 107 Remote Pilot | English and Spanish (native), Portuguese (fluent)

EXPERIENCE

Centeye, Inc. — Robotics Engineer | Washington, D.C | Sep 2023–Present

- Led mechanical and electrical design of a deployable bicopter UAV for a DTRA marsupial-drone platform, taking the vehicle from concept and CAD through fabrication, assembly, integration, and build-test-redesign cycles.
- Designed and built a small indoor lighter-than-air robotic platform for tunnel exploration, integrating propulsion, sensing, power, payload packaging, and lightweight structural components.
- Fabricate and modify custom Centeye vision sensors and micro-camera assemblies using precision soldering, electronics rework, and small-scale fabrication processes.

Carnegie Mellon University, Microrobotics Lab — Graduate Researcher | Pittsburgh, PA | Aug 2021–May 2023

- Independently conceptualized, designed, fabricated, integrated, and experimentally validated a 15 g bio-inspired, latch-actuated, spring-powered tether launcher for a sub-100 g robotic system.
- Engineered the spring energy-storage and release mechanism, latch geometry, structural load paths, and actuation timing to handle transient and impulsive loading. Sized components using force, torque, speed, energy, and duty-cycle analyses while meeting strict mass, volume, and power constraints.
- Modeled mechanism dynamics and tether-projectile ballistics using Python and MATLAB. Integrated the launcher with a Crazyflie 2.1 platform and presented the system at ICRA 2023 and ICRA 2024.

Virginia Tech, Unmanned Systems Lab — Graduate Researcher | Blacksburg, VA | May 2019–Dec 2022

- Developed ROS-based autonomy and perception tools for UAV mapping and indoor navigation, including LiDAR SLAM, sensor fusion, and semantic segmentation of aerial imagery and 3D data.

MIT Lincoln Laboratory, Group 107 — Graduate Intern | Lexington, MA | Summers 2021 & 2022

- Developed semantic-segmentation workflows for UAV-generated imagery and 3D point clouds.

NASA Ames Research Center / USRA — Engineering Intern | (remote) | Jun–Aug 2020

- Designed a search-and-rescue payload UAV concept and SolidWorks RGB/thermal-camera gimbal for the U.S. Coast Guard. Sourced and documented an NDAA-compliant component supply chain for scalable deployment.

EDUCATION

Carnegie Mellon University — M.S. Mechanical Engineering, Robotics Research Track 2023

Virginia Tech — M.S. Mechanical Engineering, RADS 2022

Harvey Mudd College — B.S. Engineering, Mechatronics Focus 2019

SELECTED PROJECTS & PATENT

Aquatic Swarm Robots, WET Design: Designed, built, and tested a compact inductive-charging system for a mobile aquatic robot constellation. | **Autonomous Stair-Cleaning Robot, CMU:** Designed and built a sensor-rich mechatronic platform with mechanical drive and lift mechanisms. | **U.S. Patent US11851847B2:** Co-inventor, Localized Navigation System Controller for Power Machine; issued Dec. 26, 2023.