

Vikram Pratap Singh

Mechanical & Aerospace Design Engineer

CAD · FEA · CFD · Structural Analysis · Augmented by AI

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SUMMARY

Mechanical and aerospace design engineer with more than eight years of experience, from automotive body structures at Honda and Maruti Suzuki to aircraft and wind-energy structures at Aerotrope. I take a design from early concept through CAD, hand calculations and FEA to a validated prototype. Structural analysis is my strongest area: static, modal, fatigue and buckling work in ANSYS Workbench and NASTRAN. I hold an MSc from Cranfield University, where I won the Newell Prize, along with two patents. Lately I have started building my own software, using AI to take the slow, repetitive work out of meshing, solving and reporting, so analysis that used to take days can be done in minutes.

SKILLS

CAD and design: CATIA V5, Siemens NX (UGNX), SolidWorks, body-in-white structures, airframe design

Analysis and FEA: ANSYS Workbench (static, modal, fatigue, buckling), MSC NASTRAN and PATRAN, ANSYS Fluent, XFLR5

Methods and standards: GD&T, tolerance stack-up, design for manufacturing, bolted and flange joints, structural analysis

Software and AI: Python, JavaScript and Node.js, Docker, Google Cloud Run, AI-assisted development, building and automating applications, LLM integration

PROFESSIONAL EXPERIENCE

Aerotrope Ltd

April 2022 – Present

Design and Development Engineer · Brighton, UK

- Designed the internal steel structure for the three 3D-printed bronze flagpoles at JPMorgan Chase's new headquarters, 270 Park Avenue, New York. The tallest pole is 51 feet.
- Sized that structure for wind-class loads with the flags flying, designed the bolted flange joint at the base, and ran static, modal, fatigue and buckling analysis in ANSYS Workbench.
- Sized the fin and tailplane for Kitemill's 100 kW airborne wind-energy aircraft so it could hold a vertical loop and reach a 30-year fatigue life.
- Designed the tower and checked flange-bolt fatigue for the SenseWind self-installing wind turbine, setting ultimate and fatigue strength from bending theory and stress-concentration factors.
- Backed every project with ANSYS FEA to confirm the hand calculations and find stress hot-spots before anything was built.

Maruti Suzuki India Ltd

May 2019 – March 2021

Deputy Manager, Body-in-White (roof systems) · Gurugram, India

- Led a team of five to design Suzuki India's first sunroof, launched on the Vitara Brezza in 2022.
- The tricky part was an assembly where nine pins had to seat into nine holes at once. I solved it with GD&T stack-up analysis and kinematic studies in CATIA and Siemens NX.
- Designed a 50 kg loading roof-rail reinforcement that the company patented. I ran the stress, dent and weld-spot analysis and reused parts from the standard roof to keep tooling cost down.
- Picked up Siemens NX and NASTRAN in a month with no formal training, then delivered 17 production drawings for the first 50 Vitara Brezza models.

Executive, Body-in-White · Greater Noida, India

- Led two engineers on the full body-in-white roof structure for the Thailand model in CATIA V5, designed around real formability and joining limits.
- Designed a pedestrian-safety bumper beam, and replaced an imported noise-cancellation seal with a local design that saved around ₹15M.

PROJECTS

JPMorgan HQ flagpoles (Aerotrope, 270 Park Avenue, New York). The hidden steel structure inside three 3D-printed bronze flagpoles, the tallest 51 feet. The hard part was keeping the core slender enough to sit inside the bronze while it still had to survive storm winds with the flags attached. I confirmed the design with modal, fatigue and buckling analysis, including the effect of a large service cut-out.

eVTOL aircraft (MSc thesis, Cranfield; Newell Prize). A one-person tilt-wing eVTOL at 286 kg with a range of about 50 km and 24 minutes of endurance. I chose the airfoils and sized the wing and tail in XFLR5, checked lift and drag with CS-23 methods and ANSYS Fluent, and built the full CATIA model. The battery pack sits on an actuator so the centre of gravity can be trimmed between hover and cruise.

Liquid-hydrogen aircraft tank (MSc group project, Cranfield). A rear-fuselage LH2 tank rated to $-253\text{ }^{\circ}\text{C}$ and 2.06 bar, with a double skin and carbon-fibre supports. I checked the ply layups against a crash-landing case and verified the tank in NASTRAN and PATRAN. The finished design came out at about 256 kg.

Kitemill airborne wind energy (Aerotrope). Empennage design for a 100 kW tethered kite that makes power by flying loops. I sized the fin and all-moving tailplane for the loop loads, modelled the assembly in SolidWorks, and checked the fatigue life against a 30-year target in ANSYS.

SenseWind self-installing turbine (Aerotrope). A wind turbine that raises itself up its own tower, so no crane is needed. I designed the tower structure and worked out the flange-bolt fatigue life under changing wind load.

DFDC Cloud (live at connectvikram.com/DFDC). I took an old MIT ducted-fan solver that only ran on the command line and put it on the web, so anyone can run a case in a browser in about a minute. The Fortran runs in a Docker container on Google Cloud Run, with an AI assistant to help with the inputs.

CFD Studio (connectvikram.com/CFD). A browser tool for a first look at external aerodynamics. You upload a 3D model, and it meshes the geometry, runs an OpenFOAM solve and returns drag, lift and a pressure map in minutes, instead of the days a specialist would normally spend on setup.

India's first solar e-trike (patented, 2014). Nine 40 W panels on an e-rickshaw with a 48 V battery, giving roughly 50% more range and 10,000 km driven on Delhi roads. The work was covered by The Hindu Business Line.

EDUCATION

MSc Aerospace Vehicle Design, Cranfield University, UK (2021 – 2022)

Newell Prize for the best aircraft design project; graduated top of the cohort at 82%.

BEng Manufacturing Process and Automation, NSIT, Delhi University, India (2012 – 2016)

Final-year project: designed and patented India's first road-going solar electric vehicle.

PATENTS, AWARDS AND OTHER

- Newell Prize for the best aircraft design project, Cranfield University.
- Patent for the design of India's first road-going solar electric vehicle (2014).
- Patent for a 50 kg loading roof-rail reinforcement at Maruti Suzuki.
- Featured in The Hindu Business Line for the solar-vehicle work.
- Languages: English (fluent), Hindi (native).