

Dear Hiring Manager:

I am writing to express my sincere interest in ESA's intern position within the Propulsion, Aerothermodynamics and Flight Vehicles Engineer Division, with particular interest in the field of aerothermodynamics. As an aerospace engineering student from the University of Michigan Ann Arbor, with hundreds of hours spent in ANSYS and Star CCM+, and personal experience in leading a complex engineering project, I know I would make a valuable addition to your team.

Being a project lead at the University of Michigan rocketry team, MASA, I led a group of 10 to design, analyze, and manufacture the fins for a hypersonic, spacefaring rocket. A hypersonic rocket presents a few unique challenges rarely seen anywhere else in the aerospace field. These include lowering weight, high aerothermodynamic load, and potentially destructive aeroelastic flutter.

Thankfully, as a team, we were able to provide a few creative solutions to these problems. The main achievements that I made in my design teams are:

- Reducing the overall rocket mass by 10% while maintaining the same safety factor under identical loading conditions (2-degree AoA at Mach 2.77) through consistent optimization via CAE software (ANSYS Structural and Fluent).
- First person to transiently couple ANSYS 3D Thermal and Fluent to analyze the fins' thermal behaviors during hypersonic flight. I was the first person on the team to converge such a high-fidelity simulation using the university's Great Lakes HPC Cluster.
- Optimized team design cycles, shifting design process from looping high-fidelity simulations to quick and roughly accurate hand calculations. This allowed us to iterate through all potential designs quickly and efficiently using MATLAB and focus more attention on physical prototyping and testing.

To add to my passion for aerodynamics and numerical modeling, I single-handedly coded a CFD solver using MATLAB that employs the famous SIMPLE method to solve the incompressible Navier-Stokes equations. In addition, I also wrote a miniature CFD program leveraging potential flow theory to investigate the spread of COVID-19 within an air-conditioned classroom in the height of the pandemic.

Aerodynamic is my passion, and nothing could produce greater joy in me than solving the Navier-Stokes equation. To me, air is a substance of great variability. At low speed, it is a calm, relaxing breeze, an excellent addition to a clear, hot summer afternoon. At extreme speed, it can result in scorching fire, capable of melting almost all materials ever known to men. Therefore, being an aerodynamic engineer, a person who utilize or even take advantage of such a variable substance, is my major goal in life, hence the reason of me applying to ESA's aerothermodynamic intern.

A passionate aerospace engineer and an independent worker, I believe my skill sets align perfectly with your listed opening. Thank you so much for considering me as a potential candidate, and please do not hesitate to contact me if you require any further information.

Sincerely
Andi Zhou