

Zain Ali | Aerospace Engineering | Embry-Riddle Aeronautical University
ALIZ8@my.erau.edu | (510) 366-0485 | U.S. Citizen

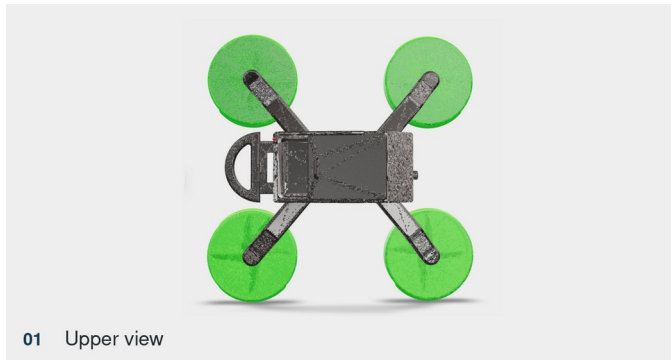
Selected engineering work in UAV design, data evaluation, and propulsion analysis.

01 / AIRCRAFT DESIGN

ZITIN Disaster Response UAV

Conrad Challenge | 2023-2024 | Team lead | Concept and prototype development

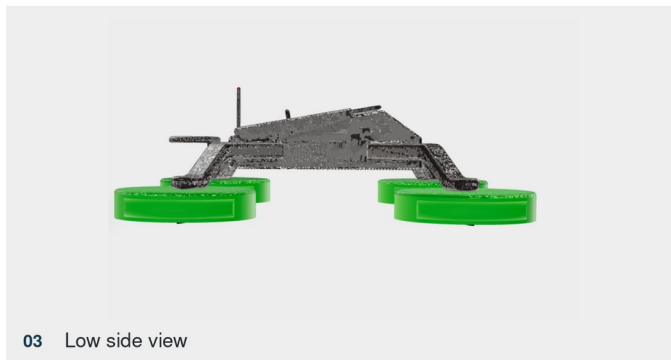
We explored a UAV for first-aid delivery and camera-based assessment where disaster damage limits ground access.



01 Upper view



02 Propeller view



03 Low side view



04 End view

Four views of the ZITIN team CAD model.

[View the team CAD model in Shapr3D](#)

MY CONTRIBUTION

I led the team, researched drone designs and materials, and disassembled and tested existing drones. I created 3D models, helped arrange the medical hatch and tool attachment, and contributed to a physical prototype after the competition submission. I later drafted the technical report.

DESIGN DECISION

Enclosed medical storage and a separate tool attachment addressed different payload needs. Their placement raised questions about added mass, retention, and balance.

NEXT TESTS

I would measure empty and loaded mass, check payload retention, and bench-test the camera and communications before supervised flight tests with progressively representative payloads.

Outcome: Advanced to Conrad Challenge Round 2 and received Conrad Innovator recognition.

Project records: ZITIN technical report, pp. 3-7 and 9; team Shapr3D model and supplied CAD views.

Exoplanet Model Evaluation

Inspirit AI | June-July 2024 | Project lead | Guided team project

Using Kepler light-curve data, our team compared classifiers for identifying stars labeled as having an exoplanet. Positive examples were rare, so missed detections mattered alongside overall accuracy.

MY CONTRIBUTION

I helped lead the project and presented the model comparisons through graphs and explanations. Working in a provided Python notebook, our team used pandas and NumPy for data handling, Matplotlib for visualization, and scikit-learn classifiers. Our presentation received Inspirit AI's Best Presentation award.

COMPARISON ON THE TEST SET

Model	Test accuracy	True positives	False positives
K nearest neighbors	99.1%	0 of 5	0
Logistic regression	65.1%	4 of 5	198
Decision tree	98.6%	2 of 5	5

Baseline model results from the saved notebook outputs. The 570 test samples include five positive examples.



Positive denotes a star labeled as having an exoplanet. Both matrices use the same color scale.

WHAT THE COMPARISON SHOWS

KNN achieved 99.1% accuracy while missing all five positive test examples. Logistic regression found four, but also flagged 198 negative examples. This comparison makes the tradeoff between missed detections and false alarms visible and explains why accuracy alone was insufficient.

NEXT EVALUATION

Only five positive test examples limit the strength of any conclusion. I would evaluate more positive examples, fit preprocessing on training data alone, and retain a consistent record of model settings and results.

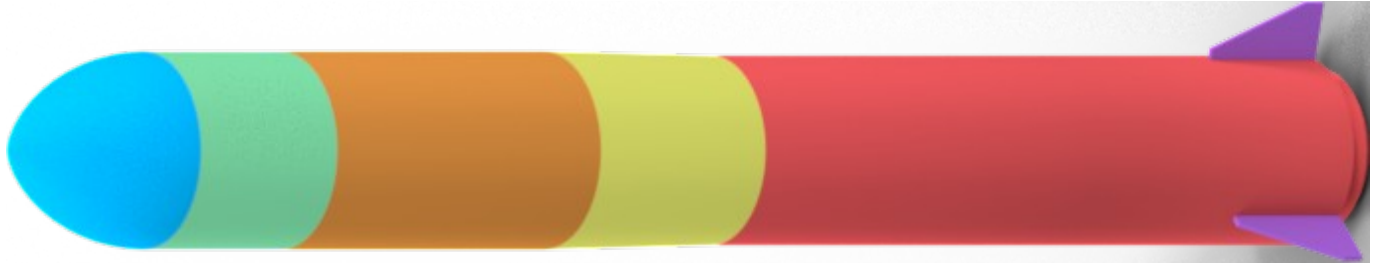
Project records: Planet Hunters Section 2 notebook and Searching for Exoplanets team presentation. Metrics above use the notebook's saved test outputs consistently.

03 / PROPULSION ANALYSIS

Two Stage Launch Vehicle Design

Team Aurora | September-November 2025 | Team leader and motor engineer

Our academic concept targeted a 5,000 lb payload to low Earth orbit at 100-200 nautical miles. I was interested in how motor selection would affect the rest of the vehicle, particularly its mass allocation and packaging.



Team assembly visualization from the final report, Figure 12, created in Autodesk Inventor. My own CAD contribution was component modeling in CATIA.

MY CONTRIBUTION

I led the team and the motor-sizing work, using Castor-120 and M-34 solid motors as reference designs. I applied the course scaling relations to estimate motor dimensions and masses and modeled components in CATIA. I also used an existing MATLAB Stage Optimizer GUI to compare structural coefficients, propellant mass, and stage delta-V, and documented the assumptions and calculations in our report.

ENGINEERING COMPARISON

Required thrust and burn time informed the motor scaling. The resulting dimensions and mass estimates then had to be considered alongside the vehicle layout. I compared estimated motor structural weights with the course criterion of 40-60% of each stage's allocated structural weight.

PROJECT OUTCOME

The team produced a conceptual vehicle design, CAD representations, and a final technical report. My work connected propulsion calculations to the mass and geometry assumptions used by the broader team. This was an academic design and analysis project.

NEXT ITERATION

I would maintain one controlled set of mass and performance inputs across motor sizing, the trajectory model, and CAD geometry, then rerun the comparisons before evaluating the concept further.

Project record: Team Aurora Launch Vehicle Project final report, pp. 9-15 and 32. The vehicle and payload figures are design targets.