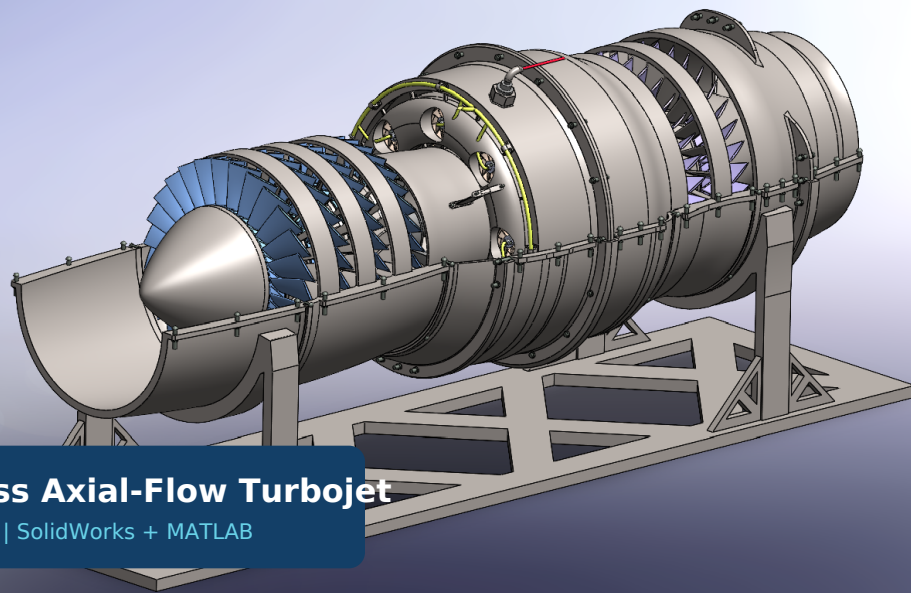


CHASE TURMAIL

ENGINEERING PORTFOLIO

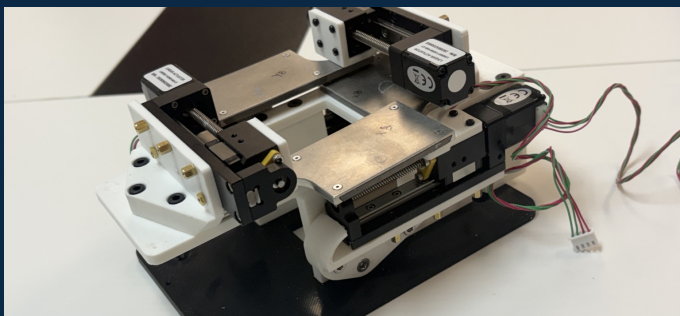
Aerospace Engineering + Mechanical Engineering | University of Florida

PROPULSION | AERODYNAMICS | MECHANICAL DESIGN | HARDWARE DEVELOPMENT

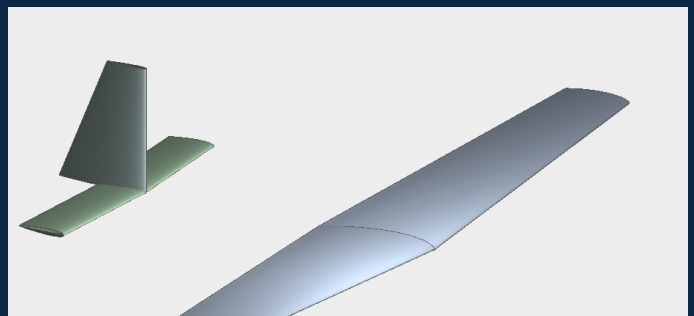


1,000 N-Class Axial-Flow Turbojet

Independent design | SolidWorks + MATLAB



MEDICAL-IMAGING PROTOTYPE



STABLE ELECTRIC UAV

Gainesville, FL | chase.turmail@ufl.edu | (561) 302-0792

chaseturmail.com

[linkedin.com/in/chase-turmail-b65b7a387](https://www.linkedin.com/in/chase-turmail-b65b7a387)

From analysis to hardware

A portfolio built around ownership, quantified design decisions, and physical integration.

Aerospace + Mechanical Engineering, applied end-to-end

University of Florida dual B.S. student (GPA 3.92) with experience in mechanical design, propulsion, aerodynamic analysis, manufacturing, and hardware integration. I connect analysis to CAD and prototypes.

3.92

GPA / 4.00

2

Engineering degrees

3

Major portfolio projects

CSWA

SolidWorks certification

HOW I WORK

1

Requirements

2

First-principles
analysis

3

CAD + trade studies

4

Build + integrate

5

Test + iterate

CORE CAPABILITIES

Mechanical Design

- SolidWorks (CSWA)
- Fusion 360
- Assemblies + drawings
- GD&T + tolerance design
- DFM/DFA + BOMs

Analysis

- MATLAB + Python
- Compressible flow
- Aerodynamics + stability
- Structures + vibrations
- Numerical methods

Build + Test

- FDM 3D printing
- Manual mill + lathe
- Welding + fabrication
- LabVIEW + strain gages
- Dimensional inspection

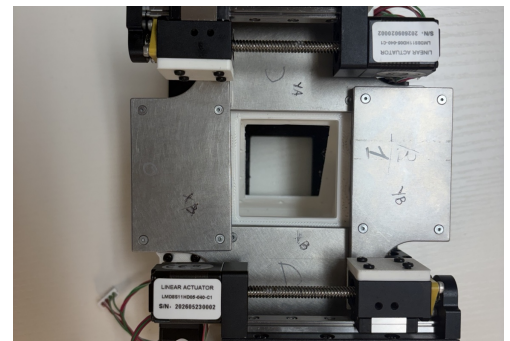
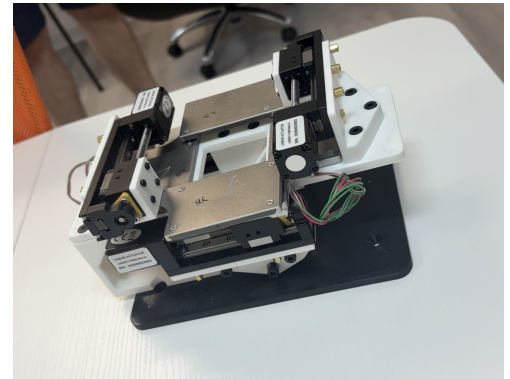
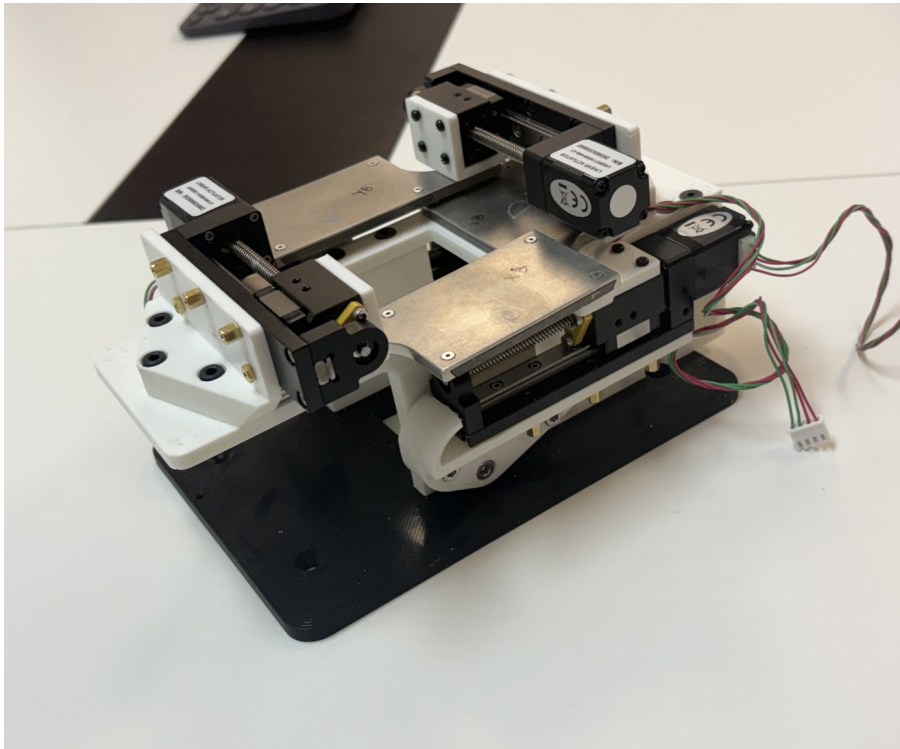
EDUCATION

University of Florida - Herbert Wertheim College of Engineering

Dual B.S. Aerospace Engineering + Mechanical Engineering | Expected December 2027 | Dean's List Every Semester

Medical-Imaging Collimator Prototype 1

Mechanical Engineering Intern | Imaging Engineering, LLC | Fusion 360



Independent ownership from CAD to physical prototype

I independently redesigned and integrated a new version of a medical-imaging collimator subsystem, moving the project from iterative CAD into a complete electromechanical prototype. The work required continuous resolution of fit, alignment, packaging, motion, serviceability, and manufacturability issues.

SYSTEMS INTEGRATED

- Linear actuators + lead screws
- Linear guides
- Optical / electronic interfaces
- Custom mounts + aluminum plates
- FDM structural parts

ENGINEERING WORK

- Part + assembly CAD
- Fastener interfaces
- Tolerance / clearance decisions
- BOMs + drawings
- Hands-on fit and alignment

WHAT HARDWARE TAUGHT ME

- CAD conflicts surface in assembly
- Access matters as much as geometry
- Alignment drives interface design
- Revision speed matters
- Simple, serviceable hardware wins

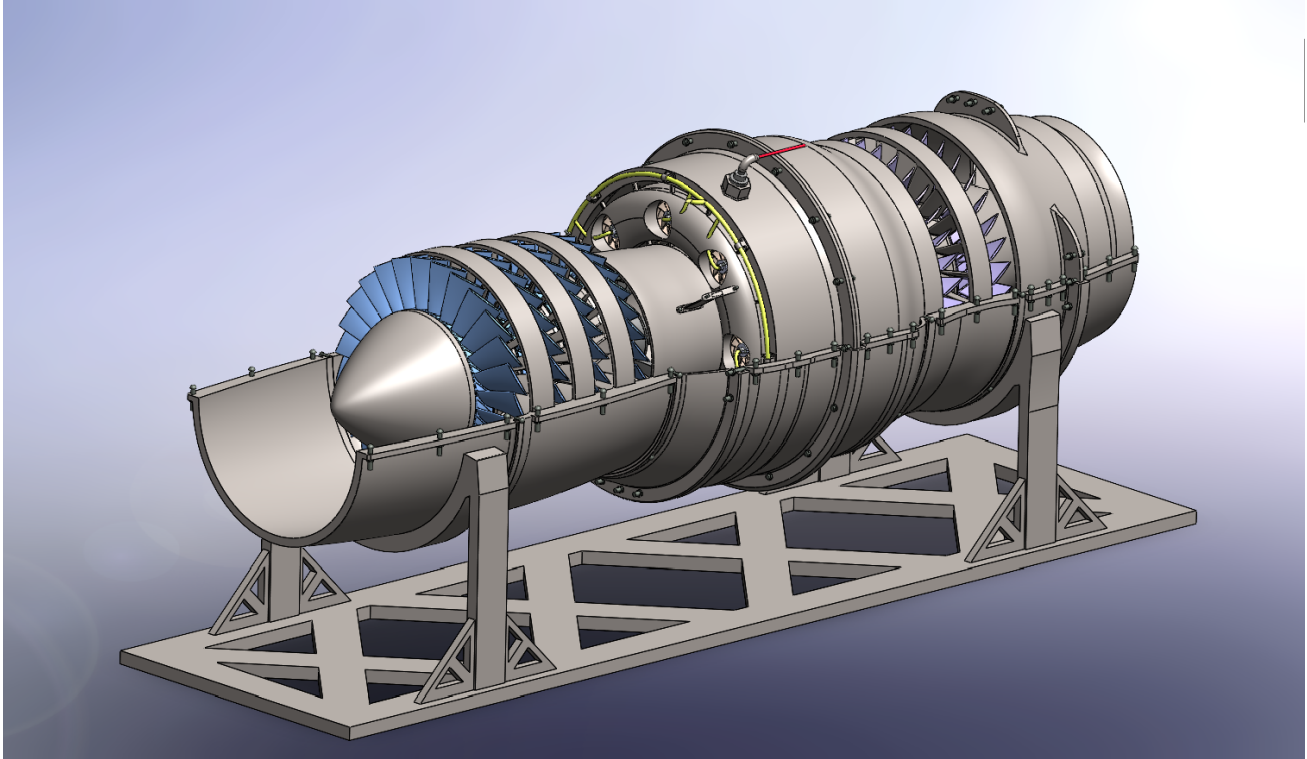
PHYSICAL PROTOTYPE

FIT + ALIGNMENT

ELECTROMECHANICAL

1,000 N-Class Axial-Flow Turbojet

Independent propulsion + mechanical design | SolidWorks + MATLAB | 2026 - Present



1,000 N

THRUST TARGET

~1.91 kg/s

MODELED AIRFLOW

3.0

COMPRESSOR PR

28,500 rpm

SHAFT SPEED

DESIGN INTENT

Design a compact conceptual turbojet around a Mach 0.75 / 10 km operating point, then translate cycle and meanline requirements into a mechanically integrated architecture that can be broken into manufacturable modules and eventually prototyped.



4-stage compressor

Velocity triangles + stage loading



Annular combustor

8 swirler cartridges



2-stage turbine

Calculated shaft-power match



3-bearing shaft

Locating + floating supports



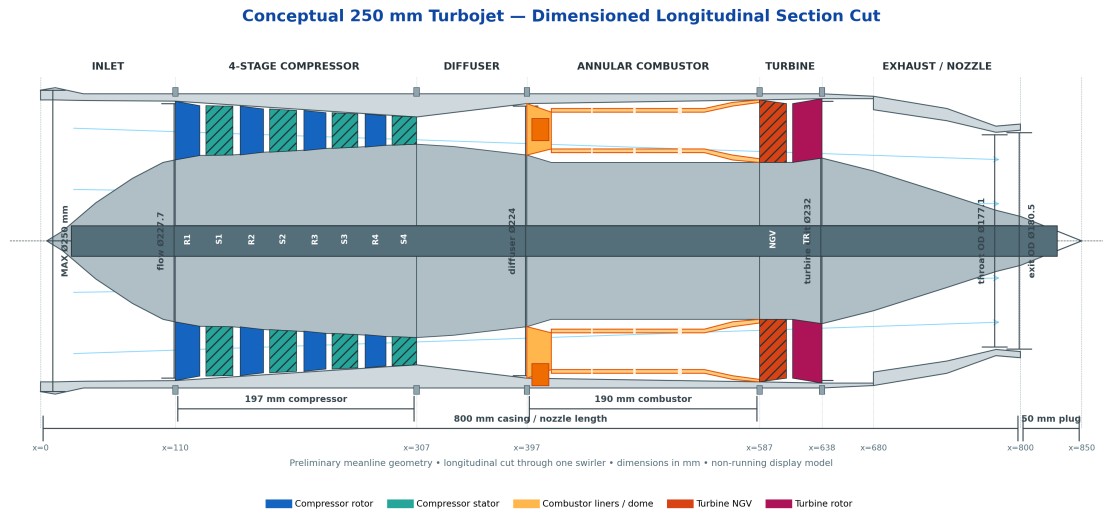
Modular casing

DFM/DFA + serviceability

PRELIMINARY CYCLE CHECK | 1.954 kg/s hot gas yields ~216.0 kW gross turbine power. ~213.8 kW reaches the compressor after assumed 99% mechanical efficiency; modeled compressor demand is ~213.8 kW. Operating performance remains unverified.

Turbojet Mechanical Integration

Packaging connected the bearings, shaft retention, casing, fuel routing, and running clearances.



MECHANICAL ARCHITECTURE

Shaft + bearings

25 mm shaft with three-bearing support architecture; front locating bearing and floating downstream supports.

Rotor / stator stack

Keyed rotor interfaces, spacer sleeves, modular stators, controlled rotor-tip and pocket clearances.

Casing + assembly

Split modular casing, accessible fasteners, serviceable interfaces, and a 300 mm FDM manufacturing envelope.

COMPRESSOR

Four stages, 12 blades/row, detailed rotor and stator integration.

COMBUSTOR

Annular layout with 8 swirler cartridges and liner-hole patterning.

TURBINE + NOZZLE

Two stages feeding a mild C-D nozzle; exit/throat area ratio about 1.07.

DESIGN STATUS

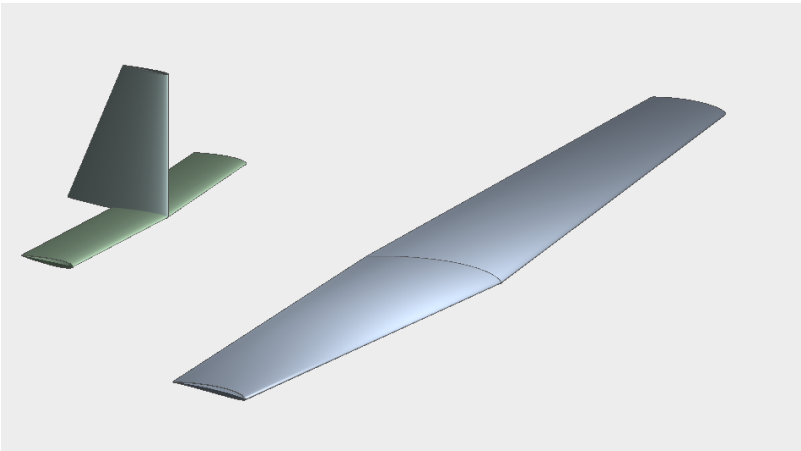
Detailed CAD complete; continuing structural, thermal, aerodynamic, fit, and prototype validation.

KEY ENGINEERING TRADEOFFS

Performance <-> packaging <-> manufacturability <-> bearing support <-> serviceability <-> rapid prototyping

Stable Electric UAV: Design & Analysis

Independent aircraft design | XFLR5 / XFOIL / MATLAB | 2026 - Present



DESIGN REQUIREMENTS

Mass	5.0 kg
Cruise	18.0 m/s
Wing area	0.500 m²
Aspect ratio	8.0
Taper ratio	0.55
Washout	-2°

FROM REQUIREMENTS TO A TRIMMED, STABLE CONFIGURATION

The project began with analytical wing sizing and low-Reynolds-number airfoil selection, then used VLM2 trade studies to converge wing geometry, tail sizing, CG location, and trim. The final preliminary lifting-surface model satisfies the target static-margin range while maintaining strong cruise efficiency.

0.494

CL @ cruise

0.02043

CD @ cruise

24.18

L/D

10.4% MAC

Static margin

FINAL CONFIGURATION

SD7037 main wing

2.00 m span

NACA 0012 tail

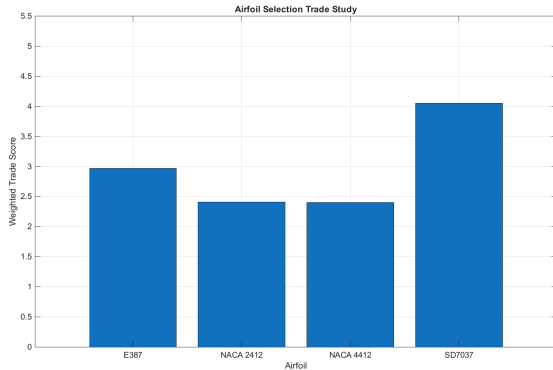
CG at 40% MAC

Tail incidence -0.8°

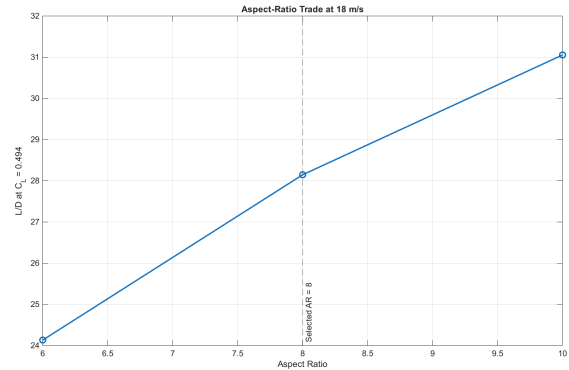
3° dihedral

Trade Studies, Trim & Stability

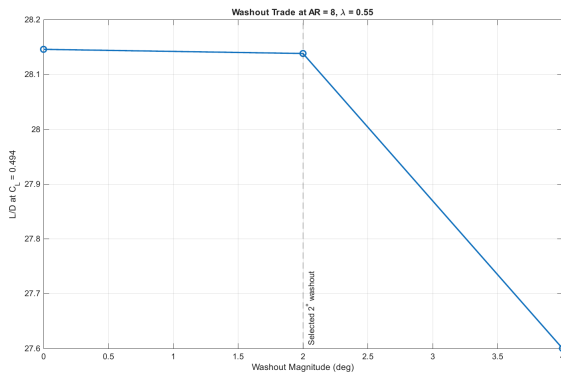
Quantified iteration rather than a single-point design.



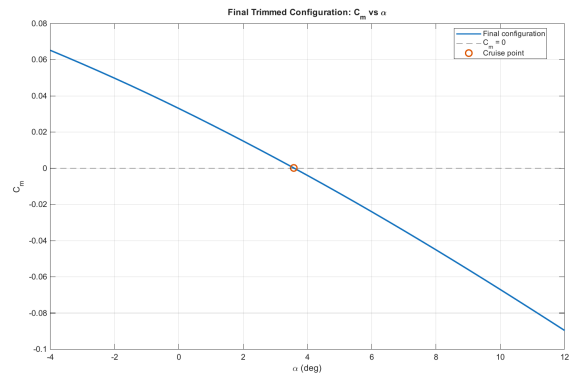
Airfoil selection



Aspect-ratio trade



Washout trade



Final trim

METHODS

Analytical sizing -> XFOIL / airfoil comparison -> XFLR5 VLM2 geometry trades -> CG + tail trim -> lateral / directional stability checks -> MATLAB result synthesis.

LIMITATIONS / NEXT STEPS

Results are preliminary lifting-surface predictions, not CFD or flight-test validation. Next steps are detailed SolidWorks CAD, structural sizing, propulsion/battery integration, and a scaled physical prototype for validation.

Additional Engineering Experience

Breadth across mechanical analysis, experimental measurement, and hands-on manufacturing.

1

Two-Stage 40 hp Gearbox

MATLAB + Shigley / AGMA

Completed gear-force, bending/contact-stress, fatigue-life, shaft, bearing, housing, sealing, and thermal analyses while tracking 28 design requirements.

2

Experimental Mechanics & Data Acquisition

LabVIEW + strain gages

Built a two-channel quarter-bridge strain-gage system to measure pressure-vessel strain, estimate internal pressure, and propagate measurement uncertainty.

3

Functional Air Engine

Mill + lathe + welding

Machined, welded, assembled, and troubleshot a functioning compressed-air engine using dimensional tolerancing and fit checks.

CERTIFICATIONS

Certified SolidWorks Associate (CSWA) - Mechanical Design

BACE - Technical Lab Documentation

FULL PROJECT DOCUMENTATION

chaseturmail.com

chase.turmail@ufl.edu | [linkedin.com/in/chase-turmail-b65b7a387](https://www.linkedin.com/in/chase-turmail-b65b7a387)