# Scale Replica of a Zero-Emission Electric Aircraft - IZEA

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Integrated Zero Emission Aviation

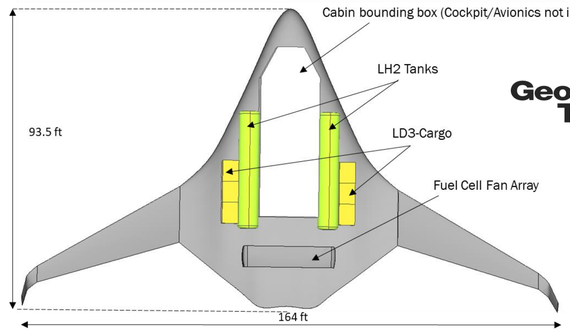
Partner

## Introduction

- Zero emission electric aircraft are being developed as a means to reduce carbon dioxide ($CO_2$) emissions from the aviation industry
- Currently the aviation industry accounts for ~10% of all $CO_2$ emissions
- NASA and other funding agencies have been developing conceptual all electric aircraft such as the N3-X
- All electric aircraft enables new fuselage designs which have greater aero dynamical efficiencies which enable significant fuel reductions
- For all electric aircraft to be a feasible solution it is necessary for the required electrical devices such as generators, fuel cells, motors, cables, power electronics, and protection devices to achieve a certain power density
- Power density refers to power production per weight of the electrical device – for electric aircraft a power density of 14 kW/kg is the current target
- FAMU-FSU College of Engineering was recently awarded a NASA University Leadership Initiative award to develop Integrated Zero Emission Aviation (IZEA)
- As part of my work on the IZEA project I was asked to machine a scale replica of the proposed IZEA aircraft to assist in assessing the location of the electrical components within the aircraft

## NASA N3 –X Conceptual All Electric Aircraft

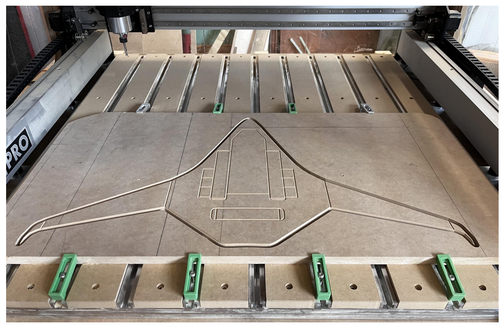
## Proposed IZEA Aircraft Design




- IZEA aircraft design was performed by Georgia Tech's – Aerospace Systems Design Laboratory
- The position of the cabin, fuel tanks, cargo, and motor array are fixed in place
- The team working to fulfill the design requirements is based at The Florida State University Center for Advanced Power Systems (FSU-CAPS). We are responsible for designing the power distribution network that connects the fuel cells and generators to the propulsion motors
- A scale replica model will assist in identifying the physical constraints of the distribution network

## Scale Replica Manufacturing

- A 1/28th scale replica of the IZEA aircraft was produced with a CNC router (below) to model the power distribution network
- The CNC router uses G-code to cut the required shape



## Skills Learnt Through UROP

- Through UROP, I was able to work at FSU-CAPS in an inter-disciplinary team which consists of undergraduate, graduate, postdocs, research faculty and professors
- I learnt to use drawing packages such as CREO and Carbine Create (seen right) for the CNC Router
- Undergraduate electrical engineering coursework has a high emphasis on theory that is not always directly applicable to projects
- My skill development to assist research adds real-world lab experience to the electrical engineering curriculum
- Working as a team at FSU-CAPS taught essential soft skills for future collaborative work

## Conclusion

- Zero emission aviation is an ongoing area of multi-disciplinary research requiring iteration and multi-objective optimization
- I am learning the physical, electrical, and thermal constraints of the IZEA aircraft
- The opportunities provide by UROP allowed me to further my skills as an electrical engineer

## Acknowledgements

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