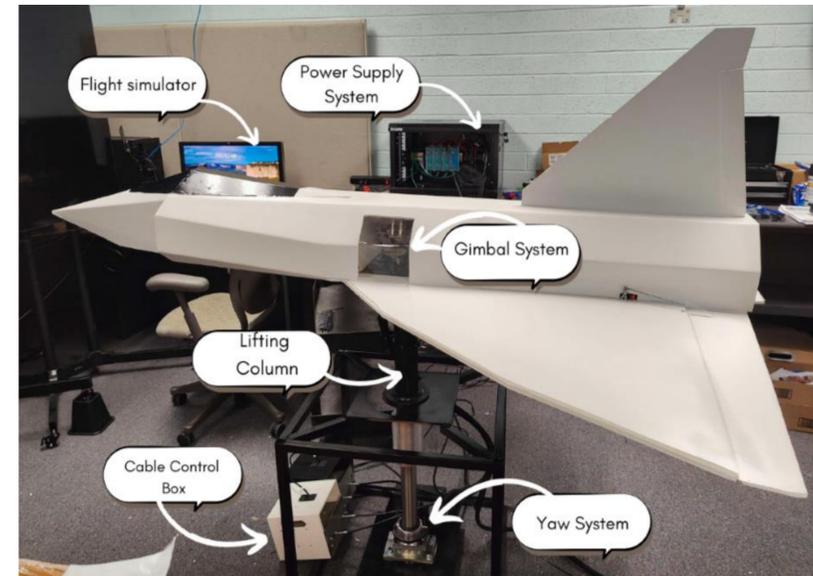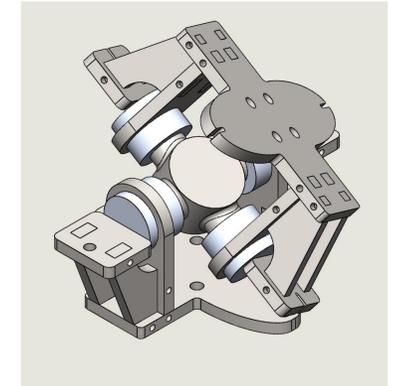# THE SUPERSONIC EXPERIENCE

Project Description

The Flight Sim Team is tasked to design and combine a flight simulator which interfaces with a physical, motion-driven plane model. The team is to provide a code-driven, visual flight simulator and create a physical motion control system which drives the modeled plane motion in 3D space. The flight simulator inputs drive the motion control system and ultimately moves the modeled plane correspondingly with the flight simulation in the pitch, roll, yaw and vertical lift directions. Ultimately, the project will be transported to the Leonardo Museum to inspire young engineers and teach the community basic aerodynamics.
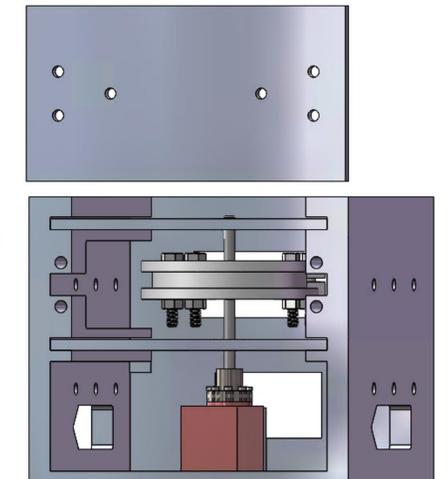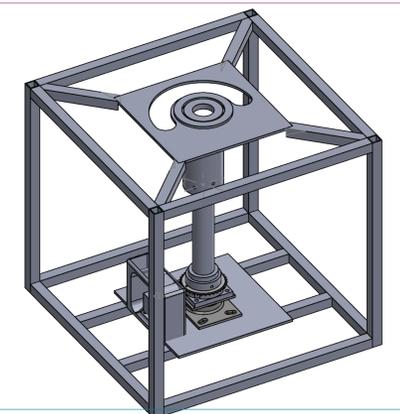
Performance Review

- The team performed interface testing connecting the virtual flight simulation to the motion control system using serial inputs and outputs.
- The coded flight simulation received inputs from a user to pitch, roll, yaw, and lift which would then be replicated by the plane model.
- The test methods were verified by inspection of the pitch, roll, yaw and vertical lift achieving their required motion thresholds.

Requirement/ Constraint	Target	Threshold	Predicted Performance	Actual Performance	Method of Verification
Sync of Model and Flight Sim	True	True	True	True	Simulation
Sync Inputs and Outputs	True	True	True	True	Simulation
Energy Efficient(W)	750	2000	-	1175	Inspection
Easy to Start Simulation	True	False	True	True	Inspection
Pitch axis motion (°)	± 15	± 5	± 35	± 30	Inspection
Roll axis motion (°)	± 30	± 10	± 35	± 30	Inspection
Yaw axis motion (°)	± 90	+ 90 (min)	+ 90	± 90	Inspection
Vertical distance from table (in.)	20	5 (min)	31	31	Inspection
Vertical distance from ground (in.)	72	114 (max)	72	79	Inspection
Model motion corresponds to simulator graphics	Pass	Not Pass	Pass	Pass	Simulation

Design Description

Gimbal Subsystem

Cable Control Box Subsystem

Yaw Subsystem

Conclusion

Key Requirements Met:

- Pitch and Roll Plane Model Motion ± 30 degrees
- Vertical Lift and Yaw Plane Model Motion during flight
- Flight Simulation and 3D Motion Control System Interface

Lessons Learned:

- **Systems Engineering:** Direct client engagement was beneficial, but absence of interaction with external key players, such as the model maker proved challenging. *Future action: Increase direct communications with all stakeholders to better integrate systems.*
- **Design:** Regular client meetings provided project insight but developing project goals led to many design revisions. *Future action: establish clear requirements before designing.*
- **Project Management:** Each team member managed a subsystem, resulting in expertise, but team collaboration could be helpful. *Future Action: include backup members for design assistance.*

Recommended Future Work:

- Control box becomes modular components for easier assembly and maintenance.
- Gimbal is machined out of lightweight aluminum material
- Higher load DC Motors used to drive plane motion

Payton Taylor, 385-381-9700, payton.m.taylor1@gmail.com Bostin Preisler, 801-819-2525, bostin.preisler@gmail.com
Spencer Adams, 801-885-6165, spencer.j.adams22@gmail.com Daniella Rivera, 801-834-3302, ddaniellarivera@gmail.com
Derick Johnson, 907-385-8381, derickjinalaska@gmail.com

College of Engineering
UtahStateUniversity