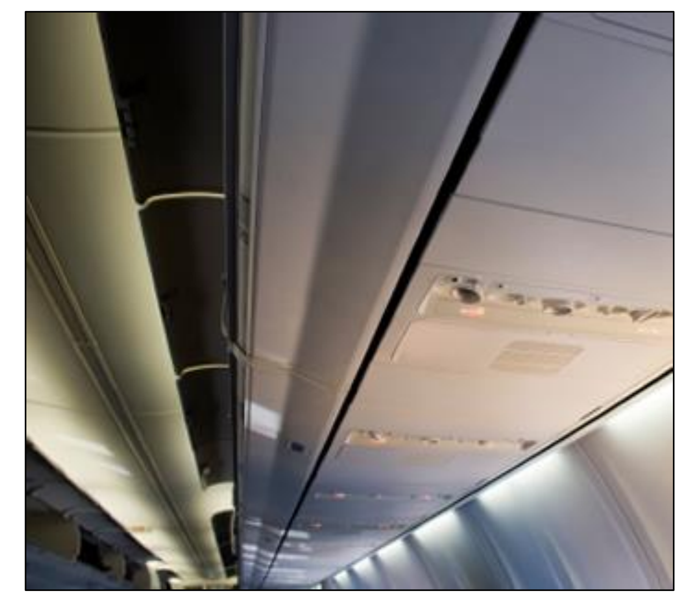
Sustainable Composite Materials for Aircraft Interiors

Project Description:

There is increasing pressure on the aviation industry to move to more sustainable material sources. The commercial aviation industry requires materials that are strong and lightweight to endure the wear and tear of use during an aircraft's lifecycle. Current practice includes synthetic materials and environmentally degrading products that provide challenges to the goal of more sustainable aviation. The goal of this project is to investigate the feasibility of sustainable composite alternatives to address end-of-life and environmental issues without sacrificing durability or product quality.

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Material Considerations:

Fibers	Specific Stiffness (GPa) /(g/cm³)	Specific Strength (MPa) /(g/cm³)	Density (g/cm³)	Elastic Modulus (GPa)	Tensile Strength (MPa)	Tensile Modulus (GPa)	Moisture Absorption (%)
Bamboo[1]	18.65	1229.17	1.44	33.50	1770	26.85	13
Kenaf[2]	5.93	43.57	1.40	53.00	61	8.30	1.05
Sisal[3]	28.57	451.13	1.33	9 - 38	600	9.40-15.80	10-22
Jute[4]	14.31	422.46	1.38	19.75	583	4.00	12.5-13.7
Ramie[5]	6.61	273.61	1.46	9.65	399.47	18.30	19.97
Henequen[6]	23.79	357.14	1.40	13.20	500	33.3	5
Flax[7]	21.74	1086.96	1.38	30	1500	27.60	6.5 (polyester) 7.8 (Epoxy)
E-Glass[8]	28.00	1100	2.50	70	2750	72	Negligible
Thermoplastic[9]	2.32	28.29	1.52	3.52	43	3.52	0.09

Our solution:

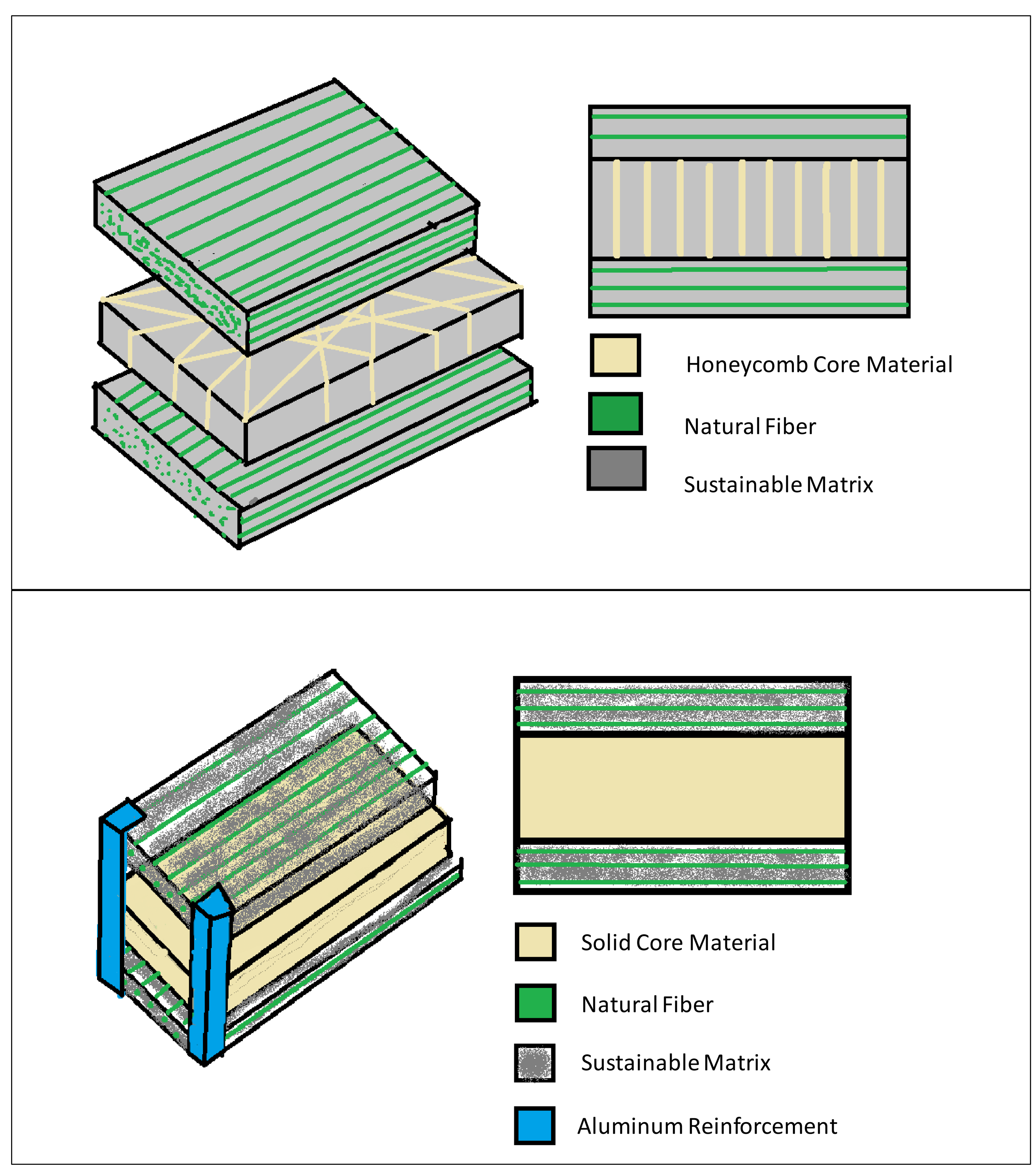
In order to answer this call, the team's design goals are to research, design, and synthesize an aircraft tray table or interior panel from a bio-composite derived from natural fibers and sustainable components that are manufactured using environmentally friendly processes. Our current trade study and material research has yielded **bamboo** and **flax** fibers as promising candidates for the fiber of choice in our design.

Composite designs also include research into environmentally friendly matrices that can hold the composite together without compromising its recyclability. In addition, possible structural reinforcements such as aluminum framing or additional filming on the composites are being investigated to make sure that the new composites can endure the wear of use in civil aviation.

Trade Study:

Fiber	Specific Stiffness	Specific Strength	Density	Elastic Modulus	Tensile Strength	Tensile Modulus	Moisture Absorption	Total
Bamboo	3	5	2	4	5	4	2	**25**
Kenaf	1	1	3	5	1	2	4	17
Sisal	5	3	5	2	4	3	2	24
Jute	3	3	4	3	4	1	2	20
Ramie	1	2	2	1	3	3	1	13
Henequen	4	2	3	2	2	5	3	21
Flax	4	5	4	4	5	4	3	**29**
E-Glass	5	5	1	5	5	5	5	31
Thermoplastic	1	1	2	1	1	1	5	12

Composite Design Drafting:



Deliverables:

1. Extensive research on sustainable composite materials/patents in this area
2. Review government standards/regulations for aircraft interiors
3. Demonstrate viability of design using engineering calculations and simulations
4. Build and test a prototype tray table or interior panel
5. Document all engineering work - deliver in final report

Poster Sources:

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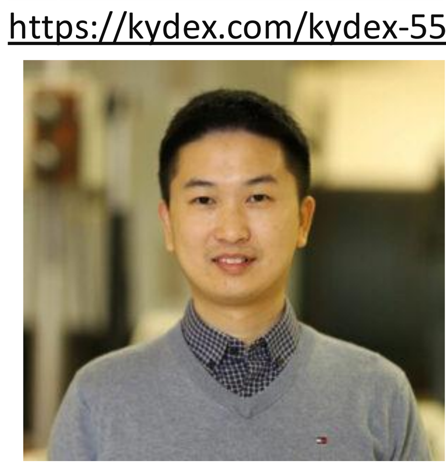

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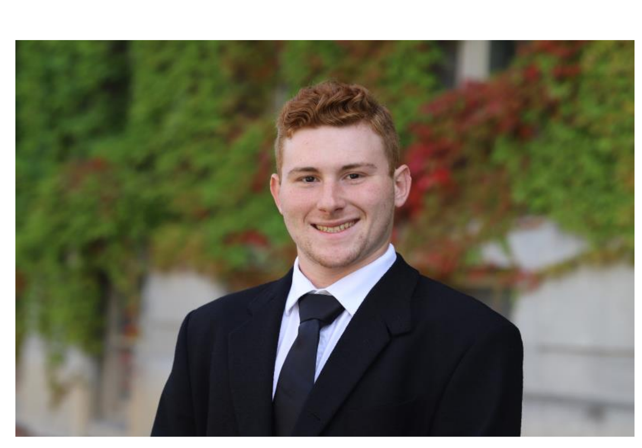
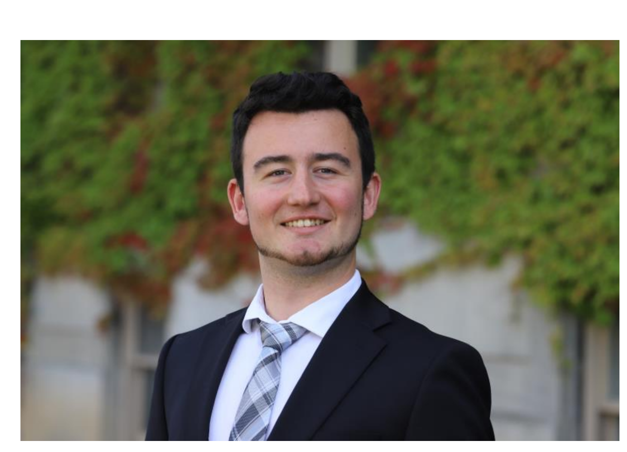
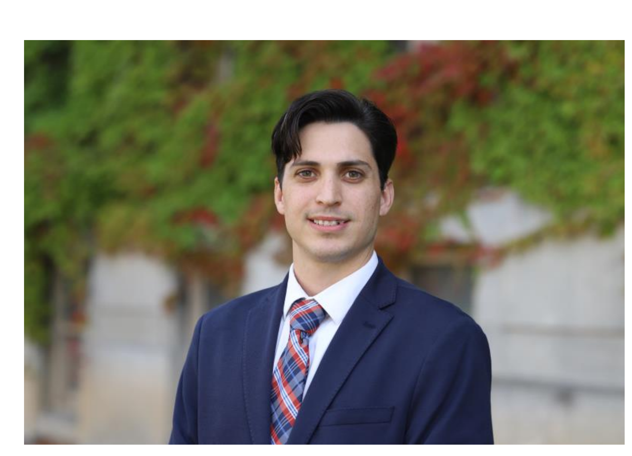


Mr. Joseph Hassid



Mr. Marco Svolinsky



Mr. Mason Weber