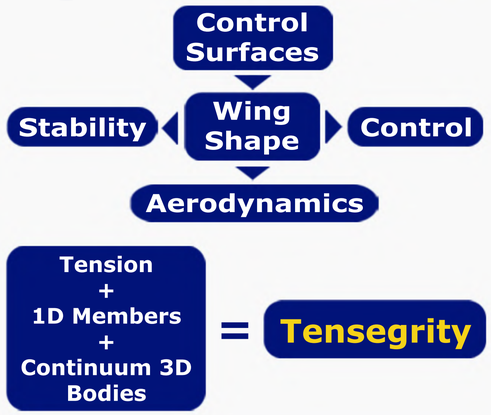
Spring 2019 Design Review

TENSEGRITY WING

UCI Samueli School of Engineering

Background



Goal

Become the first UCI Senior Design Project to design, manufacture, and test a morphing wing.

Objectives

Spring Quarter
- Finalize Solidworks models of Demo Wing and Wind Tunnel Wings (WTWs)
- Construct Demo Wing
- Fabricate WTWs
- Test WTWs with 0°, 2.5°, 5°, 7.5°, and 10° of twist in the wind tunnel
- Compare CFD and analytical solution results from wind tunnel results for each WTW

Requirements

Demo Wing Specs
- Airfoil Profile: Falcon
- Chord Length: 500 mm
- Wingspan: 650 mm
- Number of Ribs: 5

Optimization Variables
- Minimization of mass
- Maximization of achievable aerodynamic parameters

Wind Tunnel Wing
- Wingspan: 200 mm
- Chord Length: 80 mm
- Max Weight: 400 g
- Max Pitch Moment: 500 N•mm

Current Status

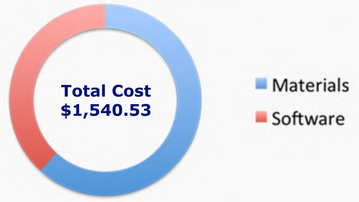
Demo Wing

Wind Tunnel Wing

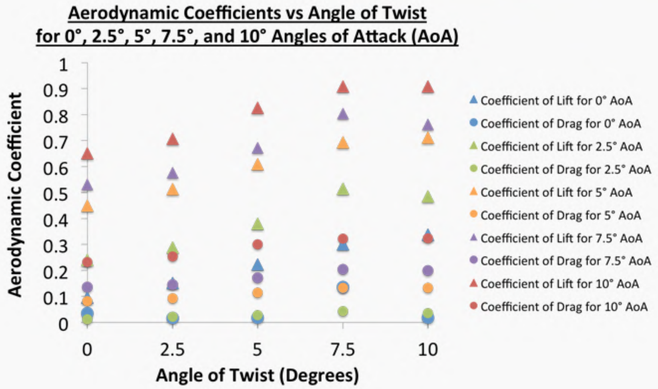
What's Next?

- Implement sensors that respond to different air travel conditions by actuating the torsional tower mechanism
- Scale up the size of the Demo Wing and implement a transparent wingskin so the internal mechanisms are still visible
- Construct a standard 0° angle of twist wing with slats and flaps and compare test results

Budget



Wind Tunnel



Each wing with a unique angle of twist (AoT) was tested at 5 angles of attack (AoA). The wing with the highest lift to drag ratio (LDR) was the best wing for its corresponding AoA. The tensegrity wing had larger LDRs than a conventional clean wing, but higher AoAs and AoTs showed signs of stall at the trailing edges. Cruising requires low AoAs, so the tensegrity wing is viable for increasing fuel efficiency for small aircrafts.

Team

Advisor: Edwin A. Peraza Hernandez

Team Leads: Elias Funez, Robert Rowe

Subteams			Auxiliary Teams
Aerodynamics	**Structures**	**Materials/ Electronics**	**Documentation**
Subteam Lead: Elias F.	**Subteam Lead:** Sean R.	**Subteam Lead:** Robert R.	Elias F.
			Fernando G.
Fernando G.	Angie G.	Erling E.	**Finance**
Oscar M.	Jeffrey H.	Richard H.	Fernando G.
Finita M.	John R.	Christian L.	**Safety**
Alexis S.	Efrain V.		Alexis S.

Contact Information: efunez@uci.edu, rarowe@uci.edu