DySMAC CRASLAB

VT ROBOTIC BIRD

Virginia Tech

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Design a fully articulated bio-fidelic robotic bird that produces positive lift for flapping flight.

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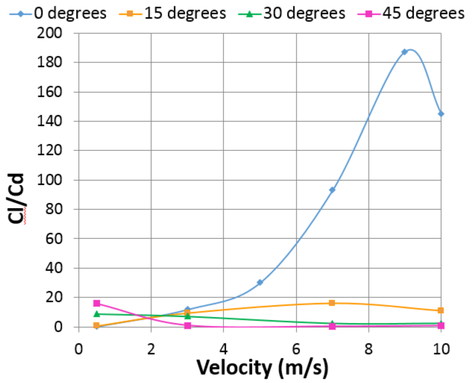
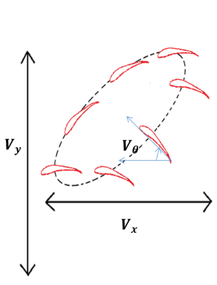
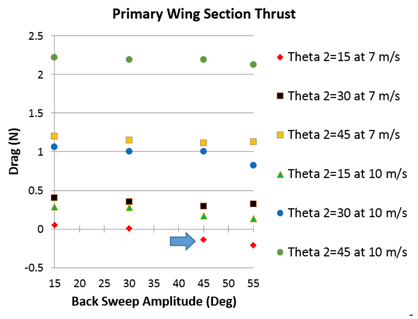
CFD Results

Plunging motion for the secondary portion of wing maximizes life, with an angle of incidence of 0°.



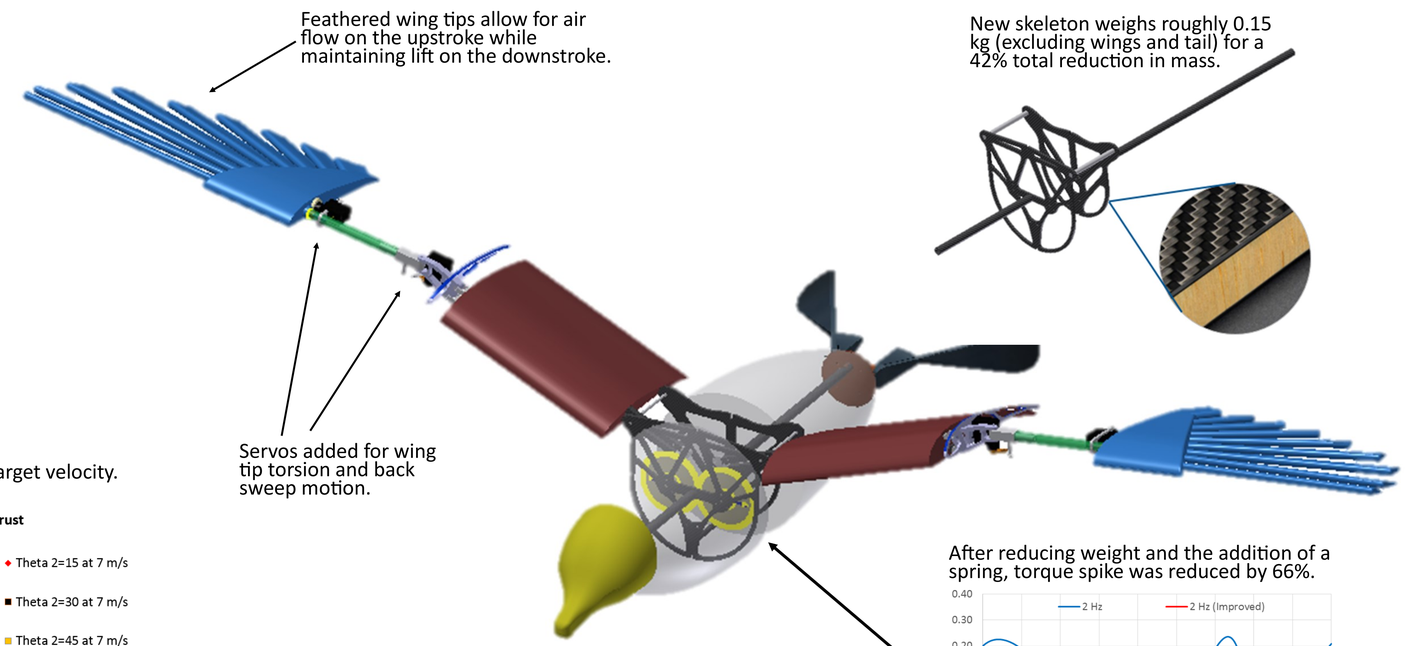
Primary wing section produces minimal drag and thrust at target velocity.





Design Data

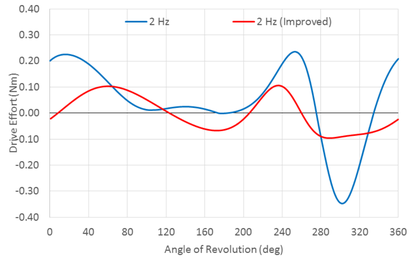
Feathered wing tips allow for air flow on the upstroke while maintaining lift on the downstroke.



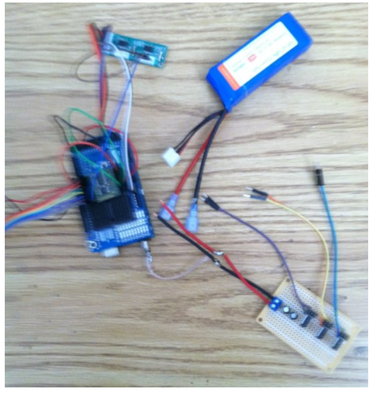
Servos added for wing tip torsion and back sweep motion.

New skeleton weighs roughly 0.15 kg (excluding wings and tail) for a 42% total reduction in mass.

After reducing weight and the addition of a spring, torque spike was reduced by 66%.

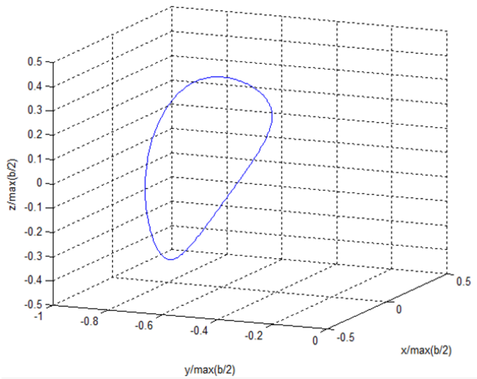


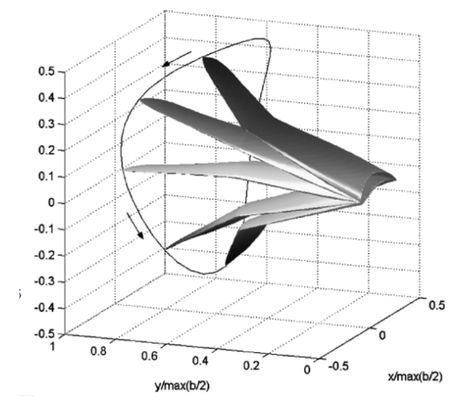
Wiring harness powers servos, gyrometer, motor control/encoder, and I2C communication.



Product Evaluation

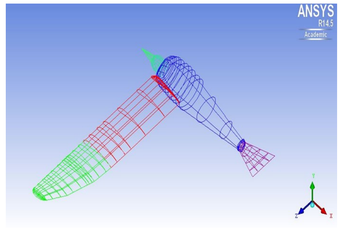
Dynamic simulation produced the following wing tip trajectory as compared to Liu's model.





Self Evaluation/Future Work

3D unsteady CFD simulations.



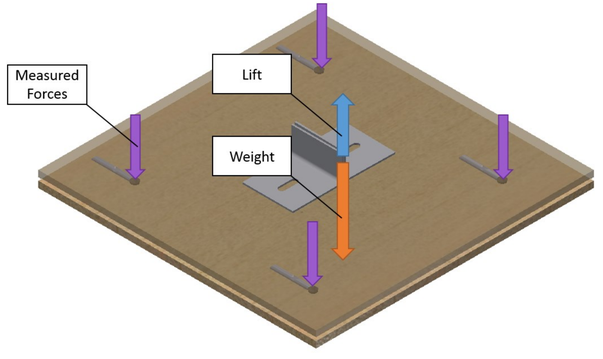
Redesign drive train for simplicity.

Back sweep articulation.

Stereo vision of wing kinematics.

Custom-designed PCB to reduce weight.

Force sensitive resistors between two boards will be used to measure the generated lift.



Test rig is comprised of lazy susan bearings with the robotic bird sitting at the end.