

Robo-Dragonfly: A Biomimetic Artificial Flying Insect

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Goals

- ◆ A Dragonfly has a 7.5 cm wingspan
- ◆ Weighs less than 1/5 of a penny
- ◆ The robot material costs about \$1
- ◆ Robots can be mass-produced by the thousands at low cost

Possible Applications

- ◆ Survivor search after earthquakes
- ◆ “Bugging” the enemy (military)
- ◆ Power line inspection
- ◆ Entertainment/Toys

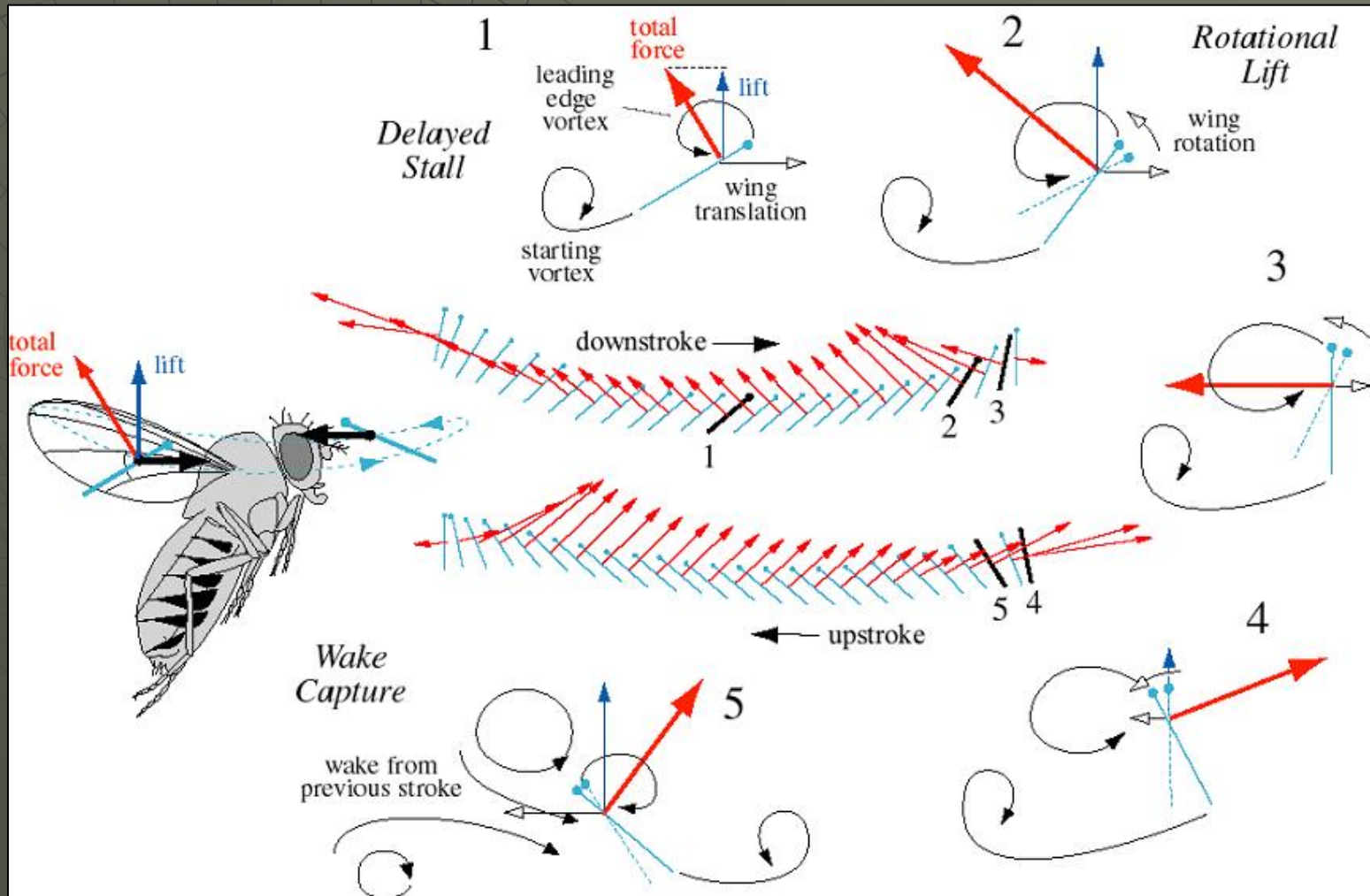


Dragonfly Specifications

- ◆ Simple, fixed wing geometry (flat plate)
- ◆ Flight speed=3-5 m/s
Flapping frequency= 40Hz
- ◆ Total Wing area =16cm²
- ◆ Weight=300-400 mg
- ◆ Wing loading=2.1 N/m²
- ◆ Power density=300W/kg

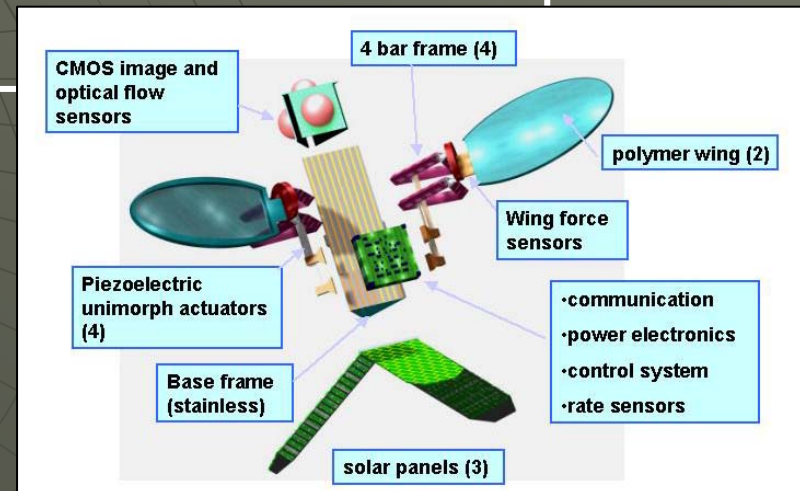


Larger lift forces can be achieved by wing flapping

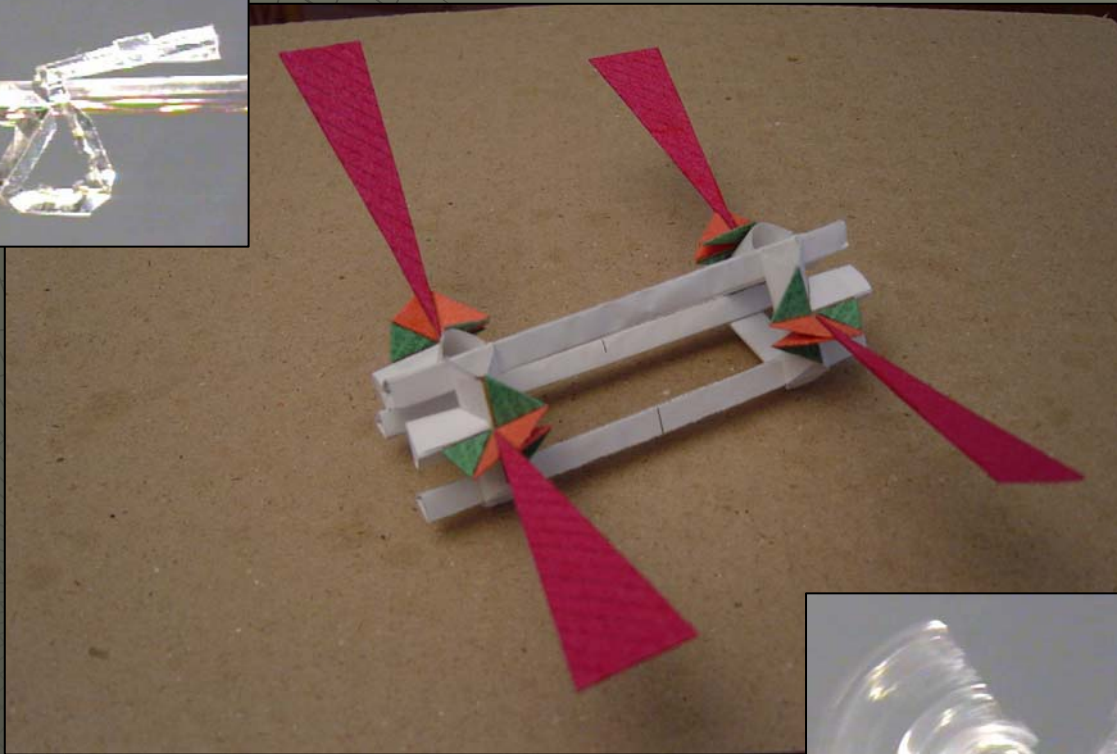


Robo-Dragonfly Design

Brain	Microcontrollers and transmitters
Body	Light-weight solid frame
Energy	Advanced batteries or fuel cells with voltage booster circuits
Wings	Plastic wings, flapping in 3 dimensions
Muscle	New Technologies with Electroactive Polymers

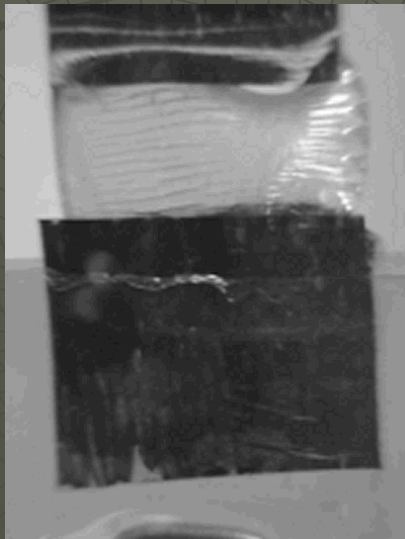


Frame Design

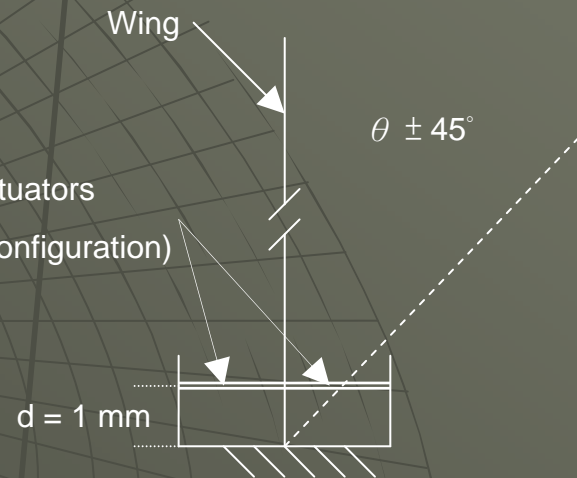


Design Using Electroactive Dielectric Elastomers

- ◆ 20 % Strain
 - Short Distance Between Pivot and Actuator



Dielectric Actuators
(Push-pull Configuration)



Future Work

- ◆ Force-displacement characterization of the dielectric elastomer actuators
- ◆ Improving the frame design
- ◆ Designing a light-weight high-voltage power supply and a voltage booster circuit
- ◆ Integrating the actuator and the wing with the frame
- ◆ Getting the Robo-Dragonfly to fly!

Robo-Dragonfly Chasers!



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