

#### TECHNOLOGY

# Biomimetic Wing or Blade Drive Mechanism for Pitching, Flapping, Translational and Rotational Motion

### **OVERVIEW**

Researchers at the University of Maryland, studying the fundamental physics required to develop miniature flying machines, have designed and developed a mechanism for small-scale flight that attempts to harness the unsteady aerodynamic mechanisms used by insects and small birds to generate thrust and lift. This device generates thrust and lift by combining the movement of three independent axes, including pitching (feathering), flapping (translational) and rotational (lagging) motions. One goal of this device is to find those combinations of wing/blade motion that lead to enhanced lift above and beyond those found for steady conventional flow conditions at low Reynolds number.

The mechanism was designed to be compact and lightweight so as to minimize the action strokes required to achieve large amplitude while allowing for uncoupled motion in all three degrees of freedom. In addition, the system can potentially interface with smart material actuators as well as conventional motors and cams to deliver the necessary amplitude stroke, frequency and proper phasing. The invention has applicability to the field of unmanned (uncrewed) "micro" aerial vehicles as well as uncrewed underwater vehicles. Possible uses of such a device are in the development of small-scale flying machines that can conduct military and civilian surveillance, and search and rescue operations in remote areas, such as caves, cliffs, and collapsed structures that are not easily accessible by humans. Another application of this device is in the development of toys for children as well as the next generation of model airplanes.

Further research is required to deliver an efficient device that operates at either the micro- or nano-length scales and for miniature flying machines weighing less than 100 grams.

For more information, contact the Office of Technology Commercialization, 301-405-3947 or <u>otc@umd.edu</u>. **CONTACT INFO** 

UM Ventures 0134 Lee Building 7809 Regents Drive College Park, MD 20742 Email: <u>umdtechtransfer@umd.edu</u> Phone: (301) 405-3947 | Fax: (301) 314-9502

## **Additional Information**

**INSTITUTION** University of Maryland, College Park

PATENT STATUS Patent(s) pending

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### CATEGORIES

- Aerospace
- Robotics

## **EXTERNAL RESOURCES**

• US Patent 6,938,853

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