



## TECHNOLOGY

# Flapping Wing Insect-Inspired Micro Aerial Robotic Vehicle

## OVERVIEW

### Background

Micro aerial vehicles (MAVs) at an insect scale would represent a phenomenal improvement in discrete reconnaissance vehicles. They would be especially advantageous for rapid exploration of small spaces and exploiting contextual camouflage. The ubiquitous occurrence of natural examples of insect-scale flapping flight suggests that the aerodynamics of small-scale flight may be best exploited through flapping wings. Not only do natural insects achieve incredible aerial mobility, whether maneuvering aggressively or station-keeping precisely, they often use less than 1mg of neurological material to achieve this remarkable performance. This incredible mix of high performance flight with relatively minimal computational resources is very attractive to the development of micro aerial vehicles, which can carry only limited computational payloads. Reducing the scale of flapping wing flight to the insect scale has numerous challenges, two of which are feedback processing and wing actuation. Stringent weight limits (

### Innovative Technology

Researchers at the University of Maryland have designed and operated a novel flapping wing robot, weighing 11-13 grams, which uses insect-inspired wing kinematics and actuation technologies for both lift generation and control, and is able to achieve stable hovering without a tail. The free-flying vehicle has numerous technological improvements, including a compliant series drive mechanism having dynamic resonance, parallel actuators for power and control, and magnetic "voice coil" actuators for high bandwidth actuation. The stabilizing avionics package weighs less than one gram, and the vehicle has a useful payload of 2 grams. The result of this development is an insect based vehicle that is more maneuverable than any form of manned flight and may unlock dramatic performance improvements in the capability of small-scale flying robots

## APPLICATIONS

- Military and police surveillance, fly-on-the-wall reconnaissance
- Discrete audio or video recording apparatus for film production industry (near term)
- Rapid exploration and mapping of small cavities and caves
- Invasive species pest contr

## ADVANTAGES

- Extremely high aerial maneuverability and mobility
- Lightweight small sized vehicle
- Insect-like appearance for contextual camouflage
- High bandwidth wing actuators

## CONTACT INFO

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## **Additional Information**

### **INSTITUTION**

University of Maryland, College Park

### **CATEGORIES**

- Robotics
- Robotics
- Aerospace

### **EXTERNAL RESOURCES**

- [US Patent 10,017,248](#)

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