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How Hummingbirds Fight The Wind

Robotic Device Built in New Mexico Helps Analyze Hovering Birds
Presentation at Fluid Dynamics Meeting Today in Long Beach, CA

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EMBARGOED for release until 11:30 a.m. Eastern time (U.S.) on Sunday, Nov. 21, 2010

Contact: Jason Socrates Bardi,
American Institute of Physics
301-209-3091, office
858-775-4080, cell
jbardi@aip.org

WASHINGTON, D.C., November 21, 2010 -- Hummingbirds rank among the world's largest and most accomplished hovering animals, but how do they manage it in gusty winds?

A team of researchers at New Mexico State University, Los Alamos National Laboratory, Technische Universiteit Eindhoven, and Continuum Dynamics Inc. has built a robotic hummingbird wing to discover the answer, which they describe today at the American Physical Society Division of Fluid Dynamics (DFD) meeting in Long Beach, CA

Hummingbirds do not fly like other birds, whose wings flap up and down, explained B.J. Balakumar of the Extreme Fluids Lab at Los Alamos National Laboratory. Instead, their wings oscillate in a figure eight pattern to produce lift on both the downstroke and upstroke. They achieve the extra lift they need to hover by creating a vortex on the leading edges of their wings.

Such vortices are inherently unstable. "The birds, though, are very clever," Balakumar said. "Their wings create the vortex with a high angle of attack on the downstroke. Then they flip their wings around on the upstroke, so as they shed one vortex, they create another on the other side of the wing, thereby managing to maintain high lift forces."

A gust of wind could pull those vortices off the wing. Instead, hummingbirds continually readjust their wing angles to maintain high lift forces.

The researchers' robotic wing will attempt to replicate that feat in gusty conditions. They hope to identify robust algorithms that will allow the creation of stable ornithopters that can operate reliably under real-life conditions for surveillance and other applications.

The presentation, "Effect of gust on flow patterns around a robotic hummingbird wing" is at 8:39 a.m. on Sunday, November 21, 2010 in the Hyatt Regency Long Beach Room: Regency D. ABSTRACT: http://meetings.aps.org/Meeting/DFD10/Event/132368

IMAGE: There is an image available with this story. Contact: jbardi@aip.org

CAPTION: In the presence of a strong gust (30 percent from left to right), both leading and trailing edge vortices were observed during downstroke at a Reynolds number of 1400 (Strouhal number = 0.28).

CREDIT: This image may be used by reporters so long as they acknowledge the source. Courtesy: New Mexico State University.

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MORE MEETING INFORMATION

The 63rd Annual DFD Meeting is hosted this year by the University of Southern California, California State University Long Beach, California Institute of Technology, and the University of California, Los Angeles.

It will be held at the Long Beach Convention Center, located in downtown Long Beach, California. All meeting information, including directions to the Convention Center is at: http://www.dfd2010.caltech.edu/

USEFUL LINKS

Main meeting Web site: http://www.dfd2010.caltech.edu/
Search Abstracts: http://meetings.aps.org/Meeting/DFD10/SearchAbstract
Directions to Convention Center: http://www.longbeachcc.com/

PRESS REGISTRATION

Credentialed full-time journalist and professional freelance journalists working on assignment for major publications or media outlets are invited to attend the conference free of charge. If you are a reporter and would like to attend, please contact Jason Bardi (jbardi@aip.org, 301-209-3091).

ONSITE WORKSPACE FOR REPORTERS

A reserved workspace with wireless internet connections will be available for use by reporters in the Promenade Ballroom of the Long Beach Convention Center on Sunday, Nov. 21 and Monday, Nov. 22 from 8:00 a.m. to 5:00 p.m. and on Tuesday, Nov. 23 from 8:00 a.m. to noon. Press announcements and other news will be available in the Virtual Press Room (see below).

VIRTUAL PRESS ROOM

The APS Division of Fluid Dynamics Virtual Press Room will be launched in mid-November and will contain dozens of story tips on some of the most interesting results at the meeting as well as stunning graphics and videos. The Virtual Press Room will serve as starting points for journalists who are interested in covering the meeting but cannot attend in person. See: http://www.aps.org/units/dfd/pressroom/index.cfm

GALLERY OF FLUID MOTION
Every year, the APS Division of Fluid Dynamics hosts posters and videos that show stunning images and graphics from either computational or experimental studies of flow phenomena. The outstanding entries, selected by a panel of referees for artistic content, originality and ability to convey information, will be honored during the meeting, placed on display at the Annual APS Meeting in March of 2011, and will appear in the annual Gallery of Fluid Motion article in the September 2011 issue of the American Institute of Physics' journal, Physics of Fluids.

This year, selected entries from the 28th Annual Gallery of Fluid Motion will be hosted as part of the Fluid Dynamics Virtual Press Room. In mid-November, when the Virtual Press Room is launched, another announcement will be sent out.

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ABOUT THE APS DIVISION OF FLUID DYNAMICS
The Division of Fluid Dynamics of the American Physical Society (APS) exists for the advancement and diffusion of knowledge of the physics of fluids with special emphasis on the dynamical theories of the liquid, plastic and gaseous states of matter under all conditions of temperature and pressure. See: http://www.aps.org/units/dfd/

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