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For Release: Nov. 19, 2012, 10 a.m.

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Owls' Ability to Fly in Acoustic Stealth Provides Clues to Mitigating Conventional Aircraft Noise

San Diego, Calif., Nov. 19 – Owls have the uncanny ability to fly silently, relying on specialized plumage to reduce noise so they can hunt in acoustic stealth. Researchers from the University of Cambridge, England, are studying the owl's wing structure to better understand how it mitigates noise so they can apply that information to the design of conventional aircraft. They present their findings at the American Physical Society's (APS) Division of Fluid Dynamics (DFD) meeting, held Nov. 18 – 20, in San Diego, Calif.

"Many owl species have developed specialized plumage to effectively eliminate the aerodynamic noise from their wings, which allows them to hunt and capture their prey using their ears alone," said Justin Jaworski with the department of applied mathematics and theoretical physics at the University of Cambridge. "No one knows exactly how owls achieve this acoustic stealth, and the reasons for this feat are largely speculative based on comparisons of owl feathers and physiology to other not-so-quiet birds such as pigeons."

All wings, either natural or engineered, create turbulent eddies as they cut through the air. When these eddies hit the trailing edge of the wing, they are amplified and scattered as sound. Conventional aircraft, which have hard trailing edges, are particularly noisy in this regard.

Owls, however, possess no fewer than three distinct physical attributes that are thought to contribute to their silent flight capability: a comb of stiff feathers along the leading edge of the wing; a soft downy material on top of the wing; and a flexible fringe at the trailing edge of the wing. At present it is not known whether it is a single attribute or the combination of attributes that are the root cause of the noise reduction.

The researchers attempted to unravel this mystery by developing a theoretical basis for the owl's ability to mitigate sound from the trailing edge of its wing, which is typically an airfoil's dominant noise source. Earlier owl noise experiments suggest that their wing noise is much less dependent on air speed and that there is a large reduction of high frequency noise across a range where human ears are most sensitive.

Using mathematical models, the researchers demonstrated that elastic and porous properties of a trailing edge could be tuned so that aerodynamic noise would depend on the flight speed as if there were no edge at all. "This implied that the dominant noise source for conventional wings could be eliminated," said Nigel Peake also of the University of Cambridge. "The noise signature from the wing could then be dictated by otherwise minor noise mechanisms such as the roughness of the wing surface."

Presentation: "Poroelastic Trailing Edge Noise and the Silent Flight of the Owl," is at 9:30 a.m. on Sunday, Nov. 18, in Room 30E.

Abstract: <http://meeting.aps.org/Meeting/DFD12/Event/177007>

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MORE MEETING INFORMATION

The 65th Annual Meeting of the American Physical Society (APS) Division of Fluid Dynamics will take place from November 18-20, 2012, in San Diego, Calif. It will bring together researchers from across the globe to address some of the most important questions in modern astronomy, engineering, alternative energy, biology, and medicine. All meeting information, including directions to the Convention Center, is at: <http://apsdfd2012.ucsd.edu/>

USEFUL LINKS

Main Meeting Web Site: <http://apsdfd2012.ucsd.edu/>

Searchable Abstracts: http://meeting.aps.org/Meeting/DFD12/APS_epitome

Directions and Maps: http://apsdfd2012.ucsd.edu/?page=Venue_and_Maps

PRESS REGISTRATION

Credentialed full-time journalists 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 Charles Blue (dfdmedia@aps.org, 301-209-3091).

SUPPORT DESK FOR REPORTERS

A media-support desk will be available. 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 feature news releases, graphics, videos, and other information to aid in covering the meeting on site and remotely. 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 evocative images and graphics from either computational or experimental studies of flow phenomena. The outstanding entries are selected for their artistic content, originality, and ability to convey information. They will be honored during the meeting, placed on display at the 2013 APS March Meeting, and appear in the annual Gallery of Fluid Motion article in the American Institute of Physics' journal, *Physics of Fluids*.

Selected entries from the 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.

This release was prepared by the American Institute of Physics (AIP) on behalf of the American Physical Society's (APS) Division of Fluid Dynamics (DFD).

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/>