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Bird Flight as a Model for a Course in Unsteady Aerodynamics JAMEY JACOB, JONATHAN MITCHELL, MICHAEL PUOPOLO, Oklahoma State University — Traditional unsteady aerodynamics courses at the graduate level focus on theoretical formulations of oscillating airfoil behavior. Aerodynamics students with a vision for understanding bird-flight and small unmanned aircraft dynamics desire to move beyond traditional flow models towards new and creative ways of appreciating the motion of agile flight systems. High-speed videos are used to record kinematics of bird flight, particularly barred owls and red-shouldered hawks during perching maneuvers, and compared with model aircraft performing similar maneuvers. Development of a perching glider and associated control laws to model the dynamics are used as a class project. Observations are used to determine what different species and sizes of birds share in their methods to approach a perch under similar conditions. Using fundamental flight dynamics, simplified models capable of predicting position, attitude, and velocity of the flier are developed and compared with the observations. By comparing the measured data from the videos and predicted and measured motions from the glider models, it is hoped that the students gain a better understanding of the complexity of unsteady aerodynamics and aeronautics and an appreciation for the beauty of avian flight.

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