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Flying Snakes, Caught on Camera

Five related species of tree-dwelling snakes found in Southeast and South Asia may just be the worst nightmares of ophidiophobes (people who have abnormal fears of snakes). Not only are they snakes, but they can “fly” -- flinging themselves off their perches, flattening their bodies, and gliding from tree to tree or to the ground.

To Virginia Tech biologist Jake Socha, these curious reptiles are something of a biomechanical wonder. In order to understand how they do what they do, Socha and his colleagues recently studied *Chrysopelea paradisi* snakes as they launched themselves off a branch at the top of a 15-meter-tall tower.

Four cameras recorded the curious snakes as they glided. This allowed them to create and analyze 3-D reconstructions of the animals' body positions during flight -- work that Socha recently presented at the American Physical Society Division of Fluid Dynamics (DFD) meeting in Long Beach, CA.

The reconstructions were coupled with an analytical model of gliding dynamics and the forces acting on the snakes' bodies. The analyses revealed that the reptiles, despite traveling up to 24 meters from the launch platform, never achieved an “equilibrium gliding” state -- one in which the forces generated by their undulating bodies exactly counteract the force pulling the animals down, causing them

to move with constant velocity, at a constant angle from the horizon. Nor did the snakes simply drop to the ground.

Instead, Socha says, “the snake is pushed upward -- even though, it is moving downward -- because the upward component of the aerodynamic force is greater than the snake's weight.”

“Hypothetically, this means that if the snake continued on like this, it would eventually be moving upward in the air -- quite an impressive feat for a snake,” he says. But our modeling suggests that the effect is only temporary, and eventually “the snake hits the ground to end the glide.”

The presentation, “Gliding flight in snakes: non-equilibrium trajectory dynamics and kinematics” was given on November 22, 2010

This research is being published in the *Journal Bioinspiration and Biomimetics*.