

Pilotless Planes: Stealthy and Agile

Sergey Shkarayev designs MAVs that can shift rapidly from hovering to level flight.

Sergey Shkarayev, professor in the department of aerospace and mechanical engineering, is director of the Micro Air Vehicles Laboratory, where he researches unsteady aerodynamics and the design of small, unmanned aircraft. In addition to basic reconnaissance and surveillance, micro aerial vehicles (MAVs) can be equipped with sensors and, being only a few inches long, can go virtually unnoticed. The Air Force Office of Scientific Research is funding Shkarayev's research into the aerodynamic design of an MAV capable of Aggressive vertical takeoff and landing (VTOL).



Professor Sergey Shkarayev

The aerodynamics of fixed-wing VTOL MAVs, which use contra-rotating motors and propellers, are complex, and much of Shkarayev's research focuses on rapid pitching, the swift transition between hovering and level flight modes. He has conducted extensive wind-tunnel aerodynamic research aimed at improving autonomous execution of rapid-pitching maneuvers, and has built and flown fully autonomous VTOL MAVs. With a wingspan of only 10 inches, the speed of Shkarayev's MAVs ranges from 0 (hover) to 30mph. The aircraft can transition from hover to high-speed level flight in one second.

"Historically, pilot discomfort has been a barrier to development of these aircraft," Shkarayev said. "This makes MAVs an attractive technical solution."