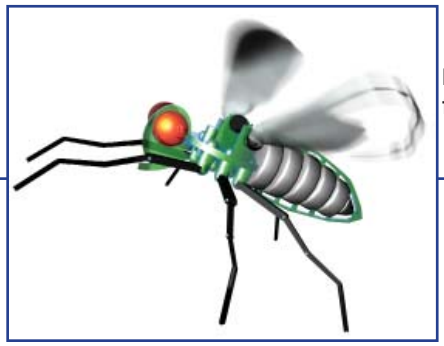
HPC Reveals the Phenomena of Flight on a Small Scale

Project Purpose: This research project investigates flexible and flapping wings and how membrane wings are used for flight, and how the membrane is affected by air flow over and around the wing.

Understanding the Project: AFRL requested an activity group, led by Dr. Leslie Perkins, be started to investigate MAVs. The activity group is focused on two major goals: a 2015 goal of bird-sized Micro Air Vehicles MAVs with a life span of hours, and a 2030 goal of autonomous insect-sized MAVs with a life span of weeks. These goals are broad enough to allow researchers flexibility in their development, but narrow enough to help direct research. The expansive nature of these goals allows the activity group to engage members of multiple disciplines, like biologists, chemists, and physicists. Each brings their own perspective to the group in the hopes of truly discovering how animals take flight.



Possible year 2030 autonomous flying device equipped with sensors

Visualization of a time interval of changes in surface flows over a wing shape during a numerical flapping sequence.

IMPACTS:

- ***Allows remote/covert surveillance operations***
- ***Removes the Airman from dull, dirty or dangerous missions***
- ***Increases mobility and maneuvering in flight dynamics***

Dr. Raymond Gordnier is the principle investigator of a challenge project currently utilizing the AFRL High Performance Computers (HPCs) Eagle, Falcon, and Hawk, and a combination of HPCMP provided Computational Fluid Dynamics (CFD) software, Computational Structures and Mechanics (CSM) software, and an in-house code.

AFRL DSRC HPC System Utilization: Falcon with 626,407 hours, Eagle with 228,893, Hawk with 1,617.801 hours

PA Clearance 88ABW-2009-1356

June 2009