Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Lift and Power Required for Flapping Wing Hovering Flight on Mars[1] JEREMY POHLY, MADHU SRIDHAR, JAMES BLUMAN, CHANG-KWON KANG, D. BRIAN LANDRUM, FARBOD FAHIMI, Univ of Alabama - Huntsville, HIKARU AONO, Tokyo University of Science, HAO LIU, Chiba University — Achieving flight on Mars is challenging due to the ultra-low density atmosphere. Bio-inspired flapping motion can generate sufficient lift if bumblebee-inspired wings are scaled up between 2 and 4 times their nominal size. However, due to this scaling, the inertial power required to sustain hover increases and dominates over the aerodynamic power. Our results show that a torsional spring placed at the wing root can reduce the flapping power required for hover by efficiently storing and releasing energy while operating at its resonance frequency. The spring assisted reduction in flapping power is demonstrated with a well-validated, coupled Navier-Stokes and flight dynamics solver. The total power is reduced by 79%, whereas the flapping power is reduced by 98%. Such a reduction in power paves the way for an efficient, realizable micro air vehicle capable of vertical takeoff and landing as well as sustained flight on Mars.

[1]Alabama Space Grant Consortium Fellowship

Jeremy Pohly
Univ of Alabama - Huntsville

Date submitted: 12 Jul 2017 Electronic form version 1.4