

SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 3 (3C)

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EXPERIMENTAL ANALYSIS ON DYNAMIC CHARACTERISTICS OF AN ORNITHOPTER

Abstract

Ornithopter is an aircraft that moves its wings to fly like a bird. Landing of reentry capsules can be much effective by improving the atmospheric flight characteristic of the capsule. Trajectories of the capsules could be controlled to extend the landing ranges and precise pointing for reentry capsule adding active landing features and to widen the exploiting ability for planetary probes in addition to the atmospheric flight vehicles. Basic aerodynamic characteristics are studied for the ornithopter applied to improve the flight performance in this paper. A flight model of an Ornithopter is constructed and analyzed its flight characteristics experimentally in the present study. Size of the model for the experimental demonstration is wingspan 3.4m and, length 1.4m. Aerodynamic performance of the ornithopter is studied by many researchers and the importance of the three kinds of motion is understood in order to produce lift and thrust by the wing. These three kinds of motion includes, 1) flapping motion to move the wing into the vertical direction, 2) feathering motion to change the angle of attack in the flapping motion, and 3) lead-lag motion to move the wing into the horizontal direction. The flapping mechanism is implemented in the model employed with the Ornithopter concept and feathering and lead-lag motions are realized in order to let the model produce both lift and thrust. The three kinds of motion "flapping motion", "feathering motion" and "lead-lag motion" are realized and confirmed. As the result, it is shown that the model can produce the lift and thrust.