

# 微飛行器撓性薄膜翼及拍擊紊流器氣動力分析與測試

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## 摘要

The main streams of micro aerial vehicles development: membrane wings and insect-like / bird-like flapping wings. Membrane wings can keep continuously increasing CL as higher angle of attacks and delay the dynamic stall angle to . But laminar as flow in low Re and low aspect ratio, separation and reattachment low pressure zone distribute, laminar, transition and turbulent model is unclear. Tip vortices flow field is complicate and lower lift / drag ratio, the low aspect ratio wing is quite susceptible to rolling instability and the fluctuations in wind speed, which can be comparable to MAV' s flight speed, make both the instantaneous flight Reynolds number and angle of attack vary substantially. Several problems exist. Therefore we propose to rebuild the membrane wing MAV. Adopt fluid / structure interaction numerical simulation. Create the insect-like flapping wing turbulator and run water tunnel laser flow visualization and water tunnel lift /drag ratio test in order to enhance aerodynamic performance increase lift / drag ratio and flight stability, and improve the flow field of tip vortices. The FSI module for low AOA has been built that can analysis stress and strain from flow pressure, and the results of water tunnel tests have proved installing turbulator for the FlyerII have better aerodynamic performance than before. If the membrane or plastic MAV couples with the rigid turbulator, optimized flapping mechanism and flow leakage problem have been take care as well, the breakthrough of MAV research will be expected. At least, the installation of turbulator provides a MAV one more mechanism for force balance.

關鍵字：Membrane wings、Flapping wings、Lift / drag ratio