微風暴之多重環狀渦旋流模擬研究

Microbursts formed near airports during thunderstorm activities have been responsible for several major airliner crashes. This weather phenomenon features a sudden and very intense downflow that can cause even the most sophisticated aircraft to quickly lose altitude. Proper airline transport pilot training in flight simulators is an effective way of achieving greater safety to aircraft against microbursts. Both steady and unsteady multiple-vortex-ring models are developed to simulate microbursts. The models use an impulsive free jet as an input to provide the central axial velocity of the vortex rings and their mirror images. Wind velocity fields are plotted to display the calculation results. For unsteady flow, trajectory plots are also made to demonstrate how the locations of the two vortex rings vary in mid air as time advance. The flow pattern and the interaction between two vortex rings are discussed. The predicted penetration of the smaller vortex ring through the larger one, when they share a common central axis, is shown in one of the unsteady cases.