

Study of Low-level Wind Field Around Airport

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Abstract

Windshear is the sudden change of wind speed and/or direction. Many of the aviation accidents in the past few decades were related to the occurrence of windshear near the airport. In particular, windshear associated with the passage of a strong gust front or the occurrence of severe microbursts near the runway are particularly hazardous to aircrafts landing and/or taking off. The present study includes two parts, one is the use of a mathematical model and based on idealized and actual wind observations near an airport to analyze and distinguish different types of windshear along the runway. Different headwind, tailwind and cross wind situations can be visualized using this model. Using only a number of automatic weather stations around the airport, a system can be established to describe and detect the occurrence of strong gust fronts and microburst downdrafts. The second part of the study is to investigate the concept of Low-level Windshear Alert System (LLWAS) which only uses point information of the runway corridor for divergence calculation and comparison of wind speed among sensors. Since this is unsuitable for airports with significant topographical influences nearby, a diagnostic model with topography feature is used to address the problem. This model contains objective analysis and parameterized treatment of slope flows, kinematic terrain effects, and terrain blocking effects. Both theoretical data and actual measurements from Guangzhou Bai-yun International Airport are used to identify the gust and downdraft.

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