Reprint 547

# Enhancement of the Anemometer-based System for Windshear Detection at the Hong Kong International Airport

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Eighth Meeting of the Communications/Navigation/Surveillance and Meteorology Sub-Group (CNS/MET/SG/8) of APANPIRG,

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**Agenda Item 12:** **MET support for operations at aerodromes and terminal areas**

# ENHANCEMENT OF THE ANEMOMETER-BASED SYSTEM FOR WINDSHEAR DETECTION AT THE HONG KONG INTERNATIONAL AIRPORT

(Presented by Hong Kong, China)

**SUMMARY**

This paper presents information regarding the latest enhancement of the anemometer-based system for automatic windshear detection at the Hong Kong International Airport.

## 1. INTRODUCTION

1.1 Since the opening of HKIA in 1998, the automatic windshear detection and alerting system of the Hong Kong Observatory (HKO) made use of wind data from the six airport anemometers along the two parallel runways to compute the magnitude of low-level windshear (see Figure 1). This anemometer-based subsystem, known as the Low-Level Wind Shear Alert System (LLWAS), supplements the Terminal Doppler Weather Radar in alerting windshear.

1.2 In May 2004, a new anemometer-based automatic windshear detection and alerting algorithm, known as the Anemometer-based Windshear Alerting Rules – Enhanced (AWARE), was put into operational use, replacing LLWAS. In addition to the six airport anemometers, the new algorithm makes use of wind data from three weather buoys and an anemometer on an island within the airport approach and departure corridors (see Figure 1) to compute the magnitude of low-level windshear for issuing automatic alerts.

## 2. THE ENHANCED SYSTEM

2.1 Between 2001 and 2003, the HKO deployed three weather buoys over the waters surrounding the airport to extend the coverage of the surface anemometer network (Figure 1) with a view to enhancing the windshear alerting service for HKIA. Studies of windshear events have confirmed that the three weather buoys together with the anemometer at the island named Tai Mo To (i.e. sites indicated in orange in Figure 1) are able to provide clear signatures of windshear events caused by low-level shear lines, primarily sea breezes.

2.2 AWARE makes use of data from all available anemometers along the approach / departure corridors, including the three weather buoys and the Tai Mo To anemometer to calculate the magnitude of low-level windshear. The shear magnitude was computed from the runway-oriented wind speed changes between adjacent stations. To minimize false alerts, data quality control measures were also devised to filter out small-scale fluctuations of the winds.

2.3 Performance of AWARE was evaluated through playback of past windshear cases and after tuning, AWARE proved to have superior performance over LLWAS. For instance, in a windshear episode which occurred in the afternoon of 14 January 2004, AWARE successfully captured the shear associated with convergence between the westerly sea breeze and background easterlies and generated headwind gain alerts of 15 knots for the western approach corridor of the northern runway (Figure 2). The shear computed by AWARE also agreed well with aircraft reports.

2.4 In view of the demonstrated better performance of AWARE, it has been integrated into HKO's operational automatic windshear alerting system to replace LLWAS in May 2004. Work is being undertaken to evaluate the benefits of the two additional weather buoys deployed in early 2004 (indicated in grey in Figure 1) with a view to incorporating them into AWARE.

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information provided in this paper.

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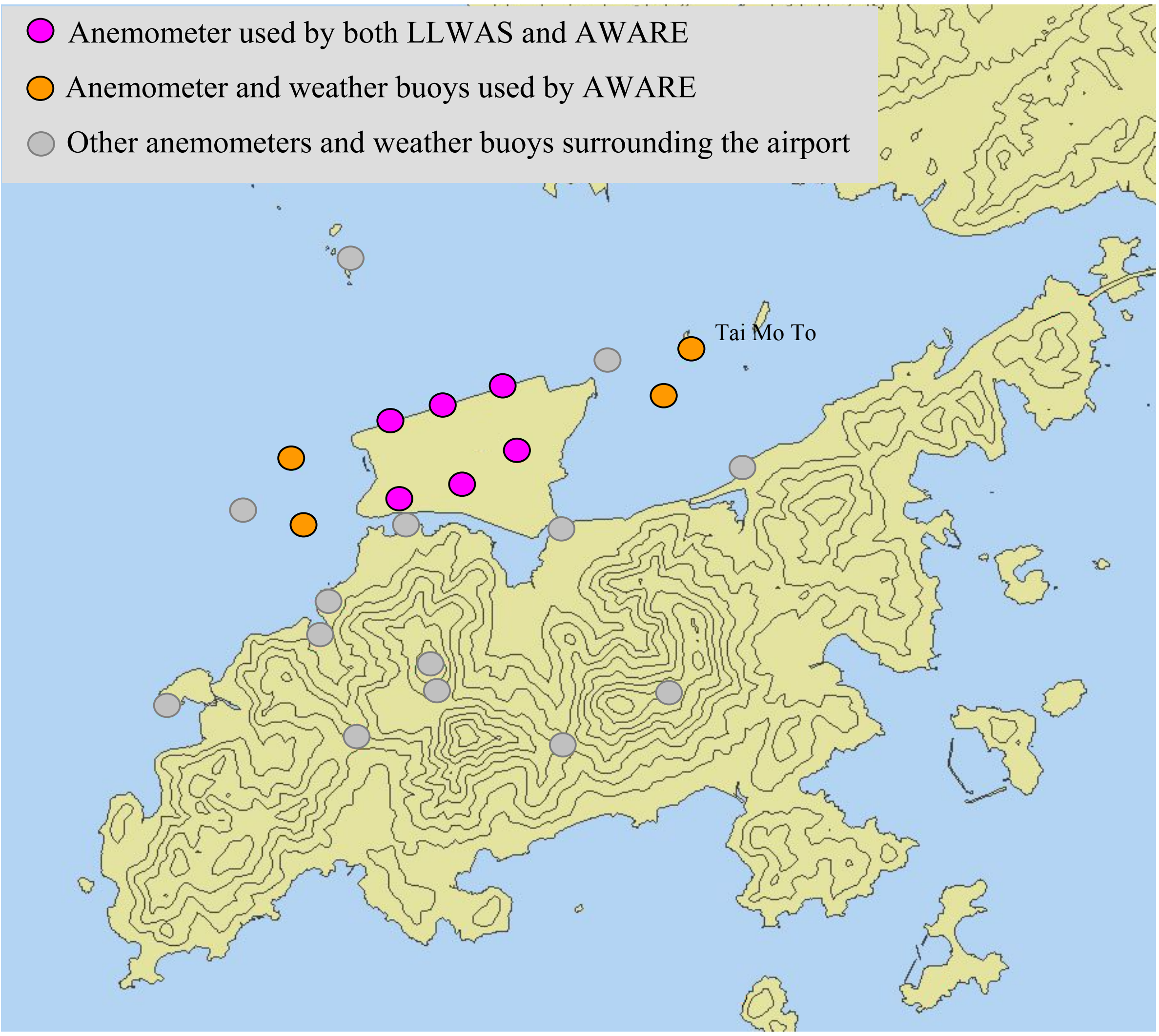


Figure 1 – Anemometers and weather buoys used by AWARE

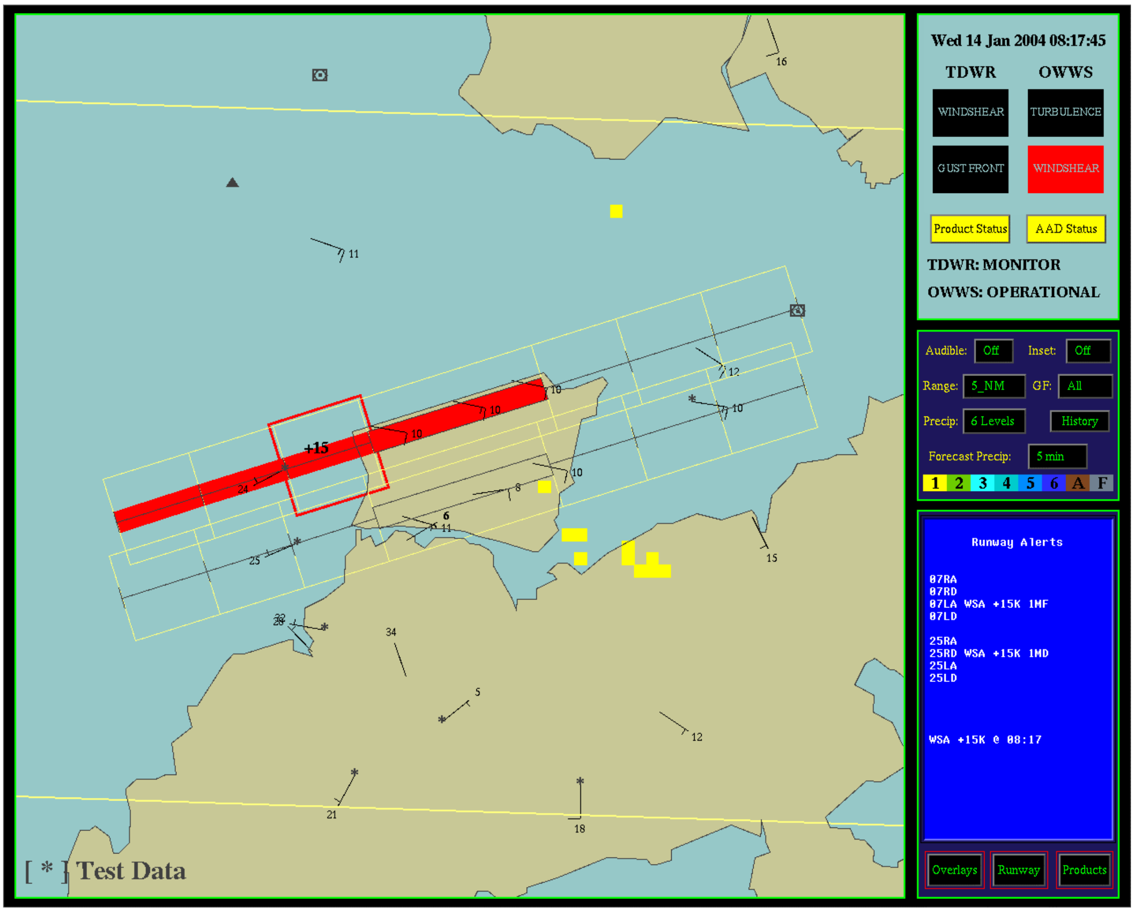


Figure 2 – Windshear alerts generated by AWARE at 08:17:45 UTC on 14 January 2004 for a sea breeze event