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Latest development of weather sensing instrumentation
at the Hong Kong International Airport

C.M. Cheng

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

LATEST DEVELOPMENT OF WEATHER SENSING INSTRUMENTATION AT THE HONG KONG INTERNATIONAL AIRPORT

(Presented by Hong Kong, China)

Summary

This paper presents the development of weather sensing instrumentation at the Hong Kong International Airport over the past year.

1 Introduction

- 1.1 The Hong Kong Observatory (HKO) implemented a number of automatic weather sensing instruments at the Hong Kong International Airport (HKIA) in the past year. These include, among others, a Doppler Light Detection And Ranging (LIDAR) system and six forward scatter meters.

2 LIDAR

- 2.1 HKO installed a Doppler LIDAR at HKIA in mid-2002. The first of its kind in the world for operational aviation weather alerting, the LIDAR detects movement of aerosols in the air to determine the wind flow in clear air conditions. Located near the centre of HKIA, the LIDAR performs surveillance scans over the aircraft landing and departure flight paths.
- 2.2 The LIDAR has revealed wind patterns never seen before by other weather sensors in Hong Kong, China. These include sea-breeze structure, gust fronts ahead of severe thunderstorms as well as complex wind flow behind hilly terrain. A case in point occurred on 11 September 2002 when Severe Tropical Storm Hagupit over the northern part of the South China Sea brought high winds to Hong Kong, China. With winds crossing the hills south of HKIA, alternating streaks of high and low wind speeds appeared over the airport (see Figure 1). The LIDAR depicted these streaks well and enabled early issuance of the windshear alert to aircraft. Altogether 23 aircraft had to go around that day due to encounter of windshear.

- 2.3 In Hong Kong, China, a majority of windshear events occur in rain-free weather, particularly in spring when winds blow across the complex terrain on Lantau Island. The LIDAR has been found to be very helpful under these conditions, enabling the weather forecaster to issue timely windshear alerts.

3 Forward Scatter Meters

- 3.1 To strengthen visibility observations at HKIA, six sets of forward scatter meters (see Figure 2) were installed on the two runways of the airport, three on each runway. They are sited alongside the existing runway visual range transmissometers and provide automatic visibility readings representative of the take-off and landing areas of the runways in compliance with the recommendation 4.6.3 of ICAO Annex 3. This facilitates reporting of visibility in the local routine and special reports.
- 3.2 Since their installation in late 2002, the forward scatter meters have been providing readings that are found to correlate well with transmissometer observations. Also, they generally give more precise visibility readings than human observations, especially in the night hours.
- 3.3 In the reporting of visibility in METAR/SPECI reports and in local routine and special reports, the weather observer takes into consideration both the human observations and the instrument readings from forward scatter meters and transmissometers. The general rule of visibility reporting is as follows:
- (i) In the event that the human observed value is lower than readings from instruments, e.g. in the case of approaching fog that has not reached the instrument site, then the human observed visibility will be reported;
 - (ii) At night, more weight is put on readings given by the forward scatter meters; and
 - (iii) When the visibility is low, readings from instrument take precedence over human observations, particularly when visibility falls below 2000m. More weight is put on transmissometers as they generally give more accurate readings at low visibility conditions.

4 Action

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

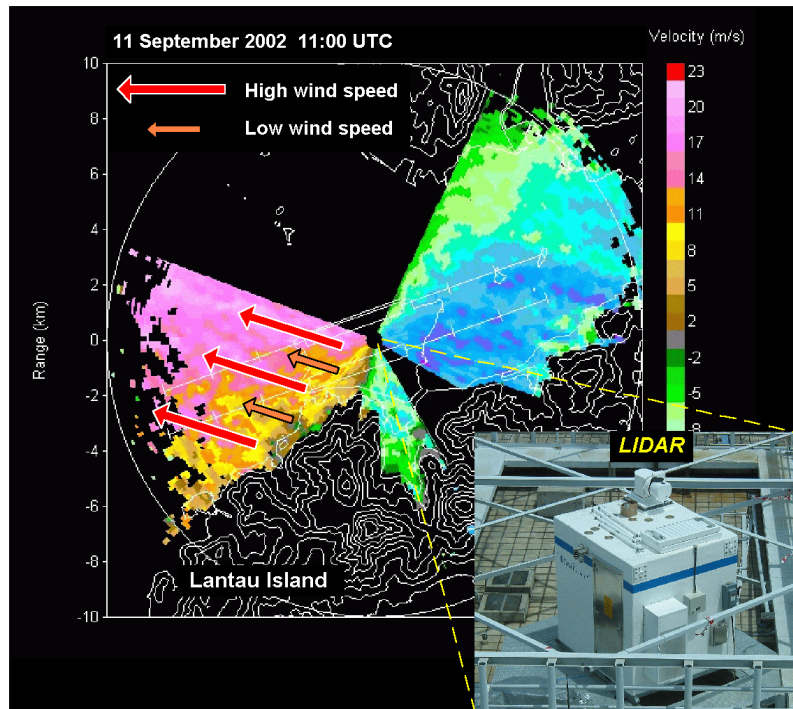


Figure 1 LIDAR image at 11 UTC on 11 September 2002 during the passage of Severe Tropical Storm Hagupit. Alternating streaks of high and low wind speeds were discernible downwind of the valleys and hills respectively on Lantau Island.



Figure 2 A forward scatter meter on HKIA
