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Recent Developments in AMDAR and  
Trends in Meteorological Data Downlink

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## **OPAG PROMET REPORTS**

### **RECENT DEVELOPMENTS IN AMDAR AND TRENDS IN METEOROLOGICAL DATA DOWNLINK**

#### **PROGRESS/ACTIVITY REPORT**

#### **SUMMARY**

Reference: CAeM-XIII/Doc. 4.2(5)

**CONTENT OF DOCUMENT:**

**Appendix:**

- Progress/Activity Report

## **PROGRESS/ACTIVITY REPORT**

### **1. INTRODUCTION**

1.1 At CAeM-XII (2002), the Commission was informed about the progress made by Hong Kong, China, in the implementation of an AMDAR programme aiming at increasing the number of upper-air observations in the vicinity of Hong Kong International Airport (HKIA). Hong Kong, China reported that studies carried out at HKIA indicated that AMDAR observations had the potential for detecting low-level wind shear. It was suggested that AMDAR data should be collected at a higher temporal resolution to enable the detection of wind shear. The Commission was requested to approach the AMDAR Panel with a view to studying the feasibility of observations with higher resolution, and considering a pilot project if found feasible.

1.2 This report summarizes the progress made by Hong Kong, China in the application of high-resolution AMDAR data in wind shear reporting and the latest trends in meteorological data downlink.

### **2. APPLICATION OF AMDAR DATA IN WIND SHEAR REPORTING**

2.1 At present, HKO receives about 1,000 AMDAR weather reports daily directly from its AMDAR fleet of six B747 aircraft of Cathay Pacific Airways. The precision of the wind data is 1 knot for wind speed and 1 degree for wind direction. The frequency of reports during descent is 20 seconds. On ascent, the reports are made at every 4 seconds for the first minute and every 20 seconds for the following 2 minutes.

2.2 In 2005, experiments were conducted in applying the AMDAR observations for low-level wind shear reporting at HKIA. Wind shear (i.e. headwind changes of 15 knots or more) experienced by aircraft during the take-off phase was computed from the high-resolution AMDAR reports received and compared with the Flight Data Recorder (FDR) wind data at 1-second resolution recorded on the aircraft (see example in the Annex). The AMDAR wind reports showed good agreement with the FDR data in respect of the altitude and the headwind (along the runway direction). In particular, AMDAR data at 4-second resolution was able to capture the significant headwind variations associated with wind shear events, even though 1-second data would be more useful to capture wind shear events with temporal scale of a few seconds.

2.3 Algorithms to identify changes of headwind of 15 knots or more in the AMDAR wind observations from ascending aircraft had been developed to automatically generate an automatic wind shear report. Since 17 August 2006, such AMDAR wind shear reports had been included in the wind shear warnings on the Automatic Terminal Information Service (ATIS) for HKIA with the same status as the pilot wind shear reports.

### **3. LATEST TRENDS IN METEOROLOGICAL DATA DOWNLINK**

3.1 Apart from the WMO AMDAR programme, there are provisions in the WMO Technical Regulations [C.3.1]/ICAO Annex 3 for suitably equipped aircraft to downlink meteorological data when the automatic dependent surveillance (ADS) is used. In the ICAO Communications/Navigation/Surveillance and Meteorology Sub-group meetings in the Asia and Pacific regions, proposals were made to extend the meteorological downlink to aircraft equipped with secondary surveillance radar (SSR) Mode S or automatic dependent surveillance – broadcast (ADS-B) datalinks. These proposals are to address the current situation that ADS is not used in areas under surveillance radar coverage. This is especially the case near the terminal areas within which the availability of high-resolution meteorological data will contribute to aviation efficiency (e.g. provision of descent winds to aircraft for fuel conservation application, aircraft sequencing) and

safety (e.g. warning of hazardous weather including wind shear). The use of SSR Mode S has been included in Amendment 74 to the WMO Technical Regulations [C.3.1]/ICAO Annex 3. Further development of avionics software onboard aircraft will be required to implement the downlinks following the establishment of the WMO/ICAO provisions.

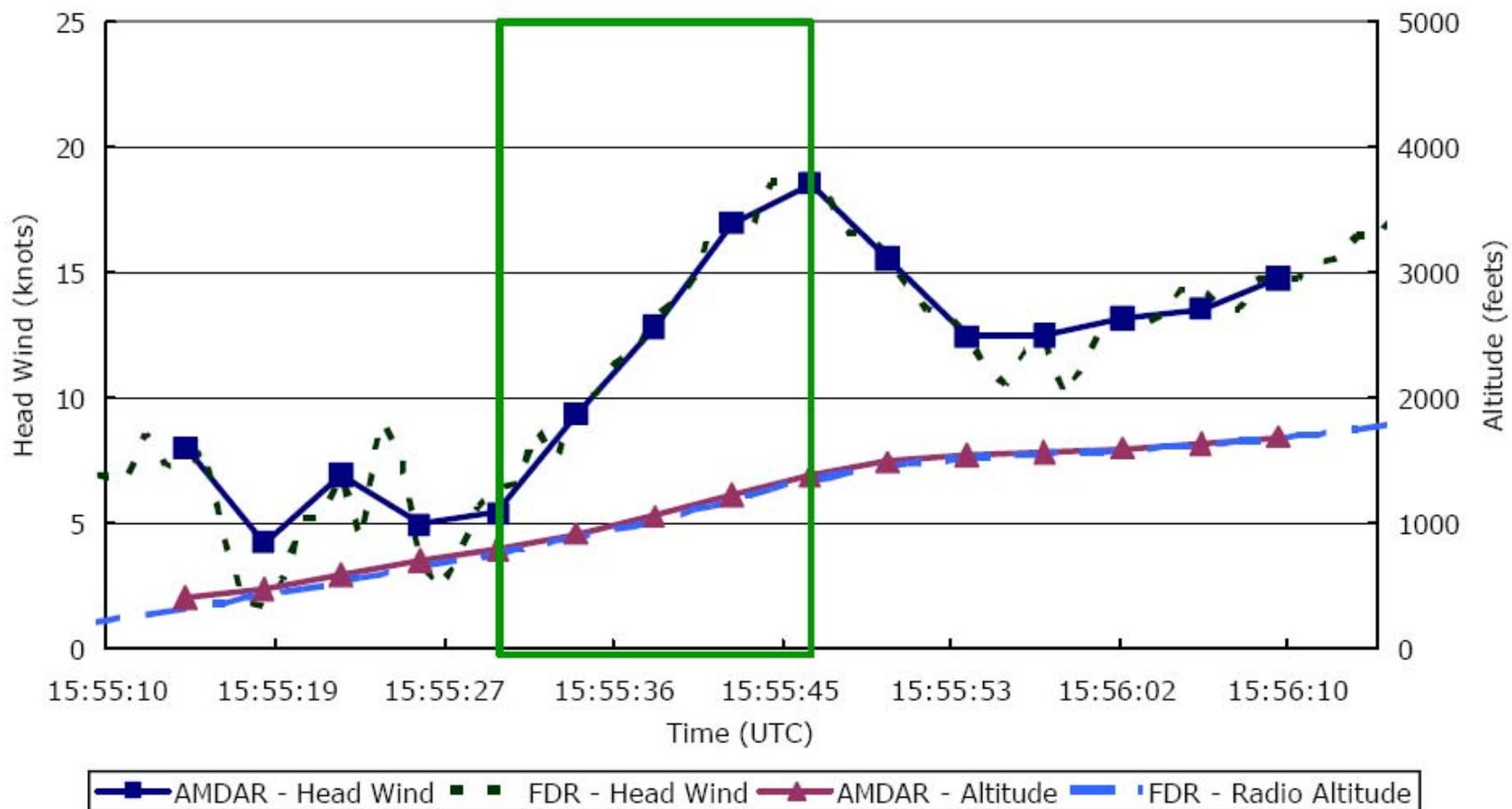
3.2 It is hoped that with the implementation of automatic air-reporting using SSR Mode S and ADS-B, the WMO and ICAO programmes will complement each other to further increase the availability of upper-air meteorological data for the betterment of aeronautical meteorological services worldwide.

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Annex: 1

**ANNEX**

2005-03-19 15:55Z Departure (118\_744\_32401\_CX880)  
Head Wind vs Time



An example of comparison between the headwind changes and aircraft altitude derived from the high-resolution AMDAR observations and Flight Data Recorder (FDR) wind data