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Uplink of Windshear and
Turbulence Information to Aircraft

H.G. Wai

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METEOROLOGICAL INFORMATION DATA LINK STUDY GROUP (METLINKSG)

EIGHTH MEETING

Montreal, 1 to 4 February 2005

- Agenda Item 6: Uplink of meteorological information**
6.5: Re-assessment of requirements during terminal operations for data-link applications

UPLINK OF WINDSHEAR AND TURBULENCE INFORMATION TO AIRCRAFT

(Presented by H.G. Wai)

SUMMARY

This paper provides an update on the plan and progress in Hong Kong, China of uplinking windshear and turbulence information to aircraft.

1. BACKGROUND

1.1 METLINKSG/8-SN/3 invites updates on the windshear and turbulence alerting system in Hong Kong, China in connection with potential products for uplink (para. 2.2.14 refers).

2. WINDSHEAR AND TURBULENCE ALERTING SERVICE IN HONG KONG, CHINA

2.1 The Hong Kong Observatory (HKO) operates a number of meteorological equipment for monitoring windshear and turbulence at and around the Hong Kong International Airport (HKIA). These include a Terminal Doppler Weather Radar (TDWR), a Doppler LIDAR (Light Detection And Ranging) system and a network of wind sensors. Alerts for possible windshear and turbulence within 3 NM of the runway thresholds are automatically generated by computation algorithms of the Windshear and Turbulence Warning System (WTWS) using data from the suite of weather sensors. These alerts are presented to air traffic controllers for relay to aircraft. These alerts are updated at least once every minute. Warnings based on pilot reports automatic alerts issued and meteorological assessment with validity of an hour or so are also issued by the forecaster.

2.2 At present, windshear and turbulence information is disseminated to aircraft in the following two ways :

- a) automatic "microburst alert", "windshear alert" and "turbulence alert" generated by the WTWS relayed by air traffic controllers over radio; and
- b) "windshear warning" and "turbulence warning" consolidated from the various sources of information (pilot reports, automatic alerts and forecaster assessment) via ATIS broadcast and D-ATIS.

3. NEW DEVELOPMENTS IN THE PROVISION OF WINDSHEAR AND TURBULENCE INFORMATION TO AIRCRAFT

3.1 Following the introduction of the new template for windshear warnings in Amendment 73 to Annex 3 to the Convention on International Civil Aviation, windshear and turbulence are identified as "FCST" or "FCST AND REP" in warnings disseminated on ATIS/D-ATIS.

3.2 With the availability of Doppler LIDAR data, runway-specific windshear warnings are planned to be provided on ATIS/D-ATIS in early 2005 so as to provide more precise information for the runway corridors affected by windshear (e.g. due to nearby terrain or local phenomena such as sea breeze). Examples of the proposed terminology to be used are "SIG WS FCST AND REP 07L", "SIG WS FCST 07L AND 07R" and different warnings may be issued for Arrival and Departure ATIS respectively.

3.3 As requested by airlines, to help pilots appreciate the vertical windshear conditions when the airport is affected by high winds blowing across nearby terrain, estimated winds at 2,500ft above mean sea level will be provided on ATIS/D-ATIS. The winds are estimated based on hilltop anemometer data near the airport.

3.4 Algorithms and software to generate automatic windshear alerts based on LIDAR data have been developed. These alerts will be integrated into the WTWS after performance validation in the coming peak windshear season in the Spring.

4. USER REQUIREMENTS OF WEATHER INFORMATION UPLINK

4.1 In respect of weather information uplink, Hong Kong, China conducted a survey in early 2004 to solicit views from pilots regarding their requirements. A total of 66 replies from pilots of 10 airlines were received. The results are given in more details in Appendix A2 to the report of CNS/MET SG/8 of APANPIRG (available at http://www.icao.int/icao/en/ro/apac/2004/CNSMET_SG8/index.html). Specifically, windshear and turbulence alerts are identified by pilots as the most needed weather product for uplinking to the cockpit (Figure 1).

4.2 Windshear and turbulence are by nature transient and sporadic and so the windshear/turbulence alerts generated from automatic systems are highly perishable. It is desirable that the latest windshear and turbulence alerts be made available to the pilots, particularly during the approach phase of the flight. Understandably, it is not possible to relay the windshear and turbulence information to the pilot

on a minute-to-minute basis (or when a significant change occurs) via ATIS/D-ATIS. It would however be possible to do so via data uplink, preferably using a dedicated data link. In this connection, Hong Kong, China is making efforts to identify cost-effective means for uplinking windshear/turbulence products to cockpit from the near-term to the long-term. Various possibilities are being investigated in consultation with airlines, pilots and the civil aviation authority, as follows.

- a) for the near-term, explore the use of standard ARINC 623 message type 'Terminal Weather Information for Pilots (TWIP)' in existing available ACARS facilities for uplinking text based windshear/turbulence alerts;
- b) for the medium-term, explore the use of FIS-B service for uplinking text based windshear/turbulence alerts; and
- c) Uplinking graphical windshear/turbulence alerts and information for direct display on on-board navigational display will be considered on the long-term, pending availability of suitable cockpit display hardware/software.

4.3 As regards the near-term initiative, the feasibility of using commercial aircraft to conduct trials on uplinking text based windshear/turbulence alerts to aircraft via ACARS "TWIP" messages is currently being explored in Hong Kong, China.

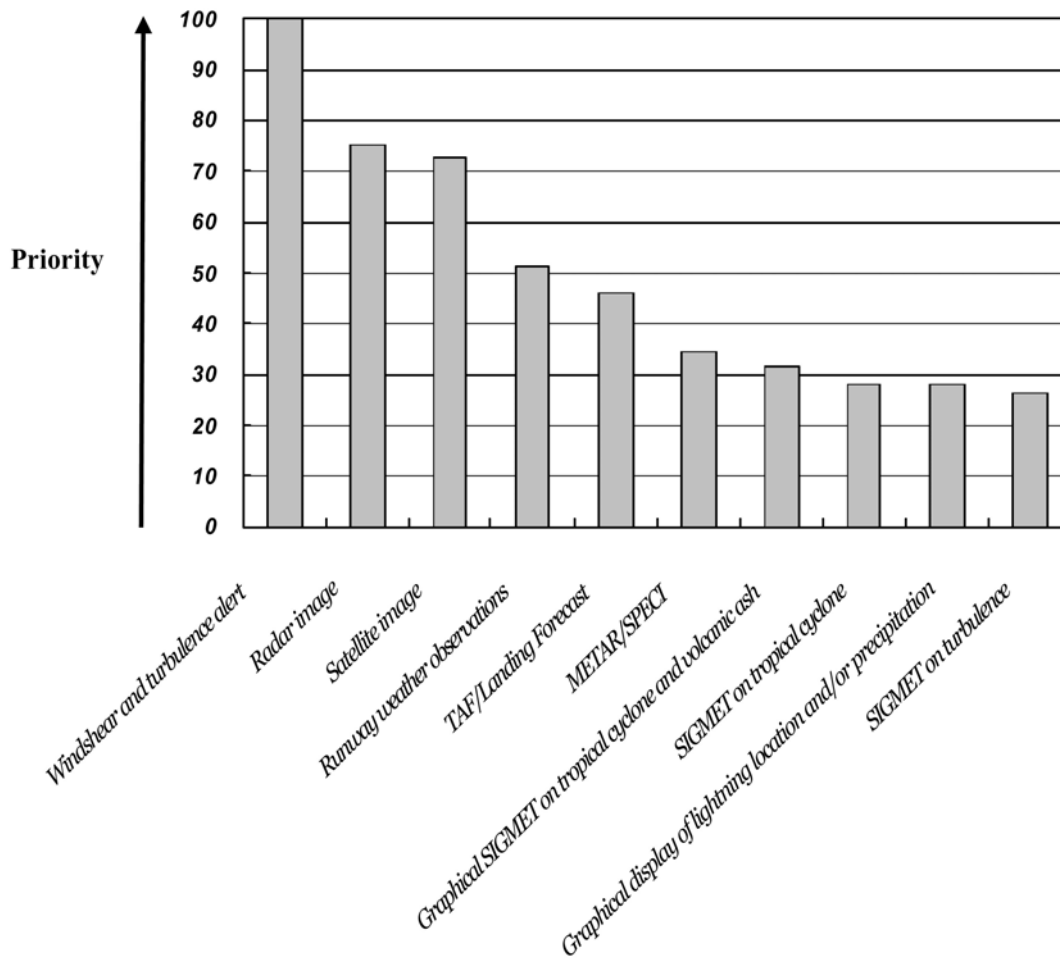


Figure 1 - Top ten most-needed meteorological information/products according to pilots
(survey by Hong Kong, China 2004)