

## **Airbus A380 Wake Vortex study completed**

28 September 2006

Following three years of exhaustive studies, the Airbus A380 Wake Vortex Steering Group has rendered its conclusions and is now in a position to recommend more specific guidance, based on a unique and very extensive flight test programme. The Steering Group comprised representatives from the Joint Aviation Authorities (JAA), Eurocontrol, US Federal Aviation Administration (FAA), and Airbus.

The study has demonstrated that en route the A380 is very similar to the Boeing 747. In cruise and when flying in a "holding pattern", the A380 is considered to be identical to any other aircraft, both for vertical and horizontal spacing between it and any following aircraft.

The study has also established that there are no wake constraints for the A380 following any other aircraft, including another A380.

On approach, the spacing for the following aircraft is increased compared with the existing separation rules for aircraft currently in service, by two nm for another "heavy", by three nm for a "medium" sized aircraft, and by four nm for a "light" aircraft. However, because there are no constraints for the A380 following another aircraft, the A380 can land as close as practicable to the preceding aircraft. This can compensate for the additional spacing required for the following one.

On departures, a "heavy" aircraft following the A380 will have to wait two minutes, and the "medium" sized and "light" aircraft will have to wait three minutes. But here again, the A380 can take-off as close as possible to any preceding airliner. (See details in table below)

Though not specifically addressed, flight tests provided no indication of impact on parallel runway operations for runways separated by more than 760 m (2500 ft). This should be monitored in operational service for verification

These values are subject to review and possible reduction based on further study or changes in aircraft categories and operational experience. A significant aspect of this new guidance is that it has revealed the need for a future review of the existing aircraft categories, also taking into account operational experience.

The study was initiated in June 2003 with the objective of conducting investigations and gathering data to support recommendations, which would be made to the International Civil Aviation Organization (ICAO), regarding safe wake vortex separation criteria for aircraft following an A380 for various flight conditions.

The detailed scientific work was conducted by a subgroup consisting of the majority of the leading international experts in this complex field. It was supported by an unprecedented programme of flight tests with innovative aspects such as back to back comparative testing of different aircraft, cruise wake encounter tests, and ground and airborne LIDAR wake measurements, totalling over 180 hours flight time.

As an interim measure, pending completion of the scientific work, temporary guidance material was recommended to ICAO in 2005, to enable ICAO Member States to safely accommodate, from an air traffic management aspect, the A380 during its worldwide developmental flights. This interim guidance was necessarily conservative because data collection, processing, and analysis were still ongoing at that time.

### **Note to the editors:**

Details of the key elements of the guidance for ICAO Heavy, Medium, and Light aircraft categories:

#### **Vertical Spacing**

Vertical spacing in all cases to be the same as for other aircraft

Evidence and data from encounter flight tests at cruise altitude, supported by airborne LIDAR measurements, have demonstrated that the A380 wake characteristics are equivalent to those of the B744 (chosen as the benchmark aircraft) for this phase of flight. Therefore, the current ICAO vertical separations are confirmed to be appropriate for A380 operations.

#### **Horizontal spacing en-route**

En-route horizontal spacing to be the same as for other aircraft

#### **Holding**

Vertical spacing to be the same as for other aircraft

#### **Approach / Landing**

No wake constraint for the A380 as a following aircraft

A380 followed by Heavy = +2nm extra to existing ICAO separation (6 nm absolute distance)

distance)

A380 followed by Medium = +3nm extra to existing ICAO criteria (8 nm absolute distance)

A380 followed by Light = +4nm extra to existing ICAO separation criteria (10 nm absolute distance)

**Departure following A380**

No wake constraint for the A380 as a following aircraft.

Same radar spacing as for Approach / Landing

Or, for time based operations: Heavy = 2 minutes; Medium, Light = 3 minutes