

Discussions on Joint EUROCONTROL/FAA Wake Turbulence Re-Categorization Phase II and III Effort



Outline

- Background for Phase I
- Goals for Phase II and III
- Wake Vortex Model Characteristics Desired to Support Phase II and III (day 1)
- Pilot Model Characteristics Desired to Support Phase II and III (day 2)

Recat Phase I Program Participants

Joint effort led by FAA and Eurocontrol

- Federal Aviation Administration FAA
 - ATO Air Traffic Operations
 - AVS Aviation Safety
- EUROCONTROL
 - Airspace Department
 - Performance and Methods/Safety Assessment
 - Performance and Methods/Validation
- Supporting Organizations
 - Department of Transportation Volpe Center
 - Det Norske Veritas
 - International Subject Matter Experts

Why Now

- Current ICAO wake separation standards are widely viewed as being outdated
- Many ANSP's globally have developed their individual variations from the ICAO standard
- Introduction into service of new large aircraft precipitated international cooperation in addressing ICAO wake standards
- ICAO tasked the FAA and EuroControl to update and harmonize wake separation standards for all aircraft

Methodology

- Focused on representative aircraft for process efficiency
- Wake strength used as the hazard metric
 - Data driven wake decay used to derive the hazard metric
 - Wake decay data from joint FAA and Eurocontrol measurements on both continents used
- Categories optimized for capacity increase
- Relative Safety argument: No worse than today

Results and Accomplishments from Phase I

- Modest changes in aircraft categories and associated separation minima (~5-10% capacity increases)
- First step towards performance based separation minima
 - Moves beyond weight based categories
 - Includes aircraft wingspan, speed, roll moment of inertia,...
 - Provides ATC and automation developers with an understanding of implications of Phase I and the ability to plan for Phases II and III

Phase II Goal

- Static pair-wise separation standards
 - Think of flexible categories where an aircraft can be in one category as a leader and another as a trailer
 - Allows each aircraft (or those that make up 90% of operations) to be optimally categorized
- Tentative schedule: Recommendation to ICAO by Sept 2013

Phase III Goal

- Dynamic pair-wise separation
 - Optimum performance based separation
 - Supports 4-D trajectory planning and execution
- ICAO role to issue system requirements and guidance for ANSP implementation
- Tentative schedule is 2018
 - Recommend system requirements and implementation guidance (e.g., ADS in and out)

Guiding Principles for Phase II and III

- Publically available data, models and tools
- Schedule must be maintained in order to ensure funding
 - Project moves slowly, but a defined pace
 - R&D breakthroughs cannot conform to pre-determined schedules
- We can make progress with current plans for data collection, existing models, etc but
 - Any improvement in wake data, aircraft data and wake & encounter models are obviously welcome
 - Those improvements will enhance results and increase capacity
 - This is why workshops like this one are particularly important to us

Requirements for Phase II and III Recat Wake and Encounter Models

- More wake data, better wake data
 - Primarily through service providers to date (FAA, EUROCONTROL, NATS,...)
 - Operational data on new aircraft after entry into service (A380, B748, A350, B787,...)
 - Filling in the gaps for existing fleet
- Better aircraft data
 - Through manufacturers contributions and operations, supplemented through observations
 - For Phase II
 - Range of aircraft speeds and speed profiles, weights, configurations
 - Approach, departure, en-route
 - For Phase III actual and planned elements should be provided real time
 - Planned approach and departure profile (4-D trajectory)
 - Planned 4-D en-route trajectory including climb and descent intent
 - Actual weight, configuration and observed weather data
 - Methodology to exchange information from cockpit to ground and back

Requirements for Phase II and III Recat Wake and Encounter Models (concluded)

- NextGen and SESAR envision Aircraft based weather sensors
 - Consider the quality and timing of available weather data
 - Work developing ADS-B reporting standards are underway
 - Wx elements
 - Individual timing for each
 - Wake modeling should consider the quality and timing of available weather data
- Discussion: What else should be included?

Discussion on Phase II and III Wake Models Needs

- Wake strength has been the primary safety metric
 - Similar to other wake separation efforts (7110.308, WIDAO, B757, A380, B748) focus was on single wake
 - Double wake system may be worth considering
 - Pilots cite this as a potential plausible worst case encounter
 - For many of the aircraft pairing types (heavy leading and smaller trailing), the differences in wingspan suggest that this type of encounter may be modeled as 2 independent encounters
 - Recat team has not conducted a literature survey in this area
- Discussion: Should we consider encounters with a wake system (pair)?

Discussion on Phase II and III Wake Models Needs (continued)

- Wake data collected and used to date naturally contains perturbed vortices especially at longer times
- Previous encounter modeling efforts have assumed a straight line vortex
- Topics today included encounters with perturbed vortices
- Discussion: Should we consider encounter modeling with a perturbed vortices?

Discussion on Phase II and III Wake Model Needs (concluded)

- While wake strength has been the primary safety metric for Phase I, bank angle and roll acceleration were also reviewed
 - General observations included higher bank angles for smaller aircraft trailing at the longer ICAO separation distances than heavier aircraft at shorter ICAO distances
 - Similarly, wake induced rolling moment as a percentage of roll control authority was higher for smaller aircraft trailing at the longer ICAO separation distances than heavier aircraft at shorter ICAO distances
- Static elements of encounter model might include
 - Wake induced rolling moment
 - Roll control authority of the aircraft
- Discussion: What other metrics should be considered as a measure of safety?