Presentations of the meeting of WakeNet-USA at Boca-Raton, Florida, USA (March 16-17 2005)

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prepared: Elsenaar from information received at the meeting

Highlights of the presentations

(1) Near Term Operational Change (FAA/Lang)
Data are collected at StLouis (STL) to support a waiver request. The procedural change involves a separation reduction till 1 ½ mile diagonal behind small and large (medium) leaders for this CSPR airport. A substantial capacity increase is expected (about '1/2 a runway'). It has to be shown from the data collection that the risk will remain the same.

(2) Data Supporting STL proposed change (Volpe/Wang)
Very interesting data set (10000 cases) from both windline and LIDAR data. Only large jets (DC-9 and heavier) reported. Comparisons are made. Shows both vortex lifetime and distributions of wake location. Vortex strength is not evaluated. TKE data collected but not yet evaluated for vortex lifetime. Conclusions: 1) wakes are very rarely transported to the other runway and 2) the likelihood of wakes in the glide path for CSPR conditions is less than the one for single runway, in line separation. A quantification of 'rarely' was not readily available.

(3) ALPA Initiatives (ALPA/ Jim Duke)
Brief remarks on ongoing activities. Discussions with George Green, briefings on SOIA. There is a clear demand for systematic incident reporting (much talk about it but nothing has materialized). ASRS data base (funded by NASA) helps but far from ideal. We have to better quantify the wake encounter. Suggestion: use T-CAS display for additional information.

It was decided that a small working group has to be set-up to advise on Wake Turbulence incident reporting (whom, when, where???). WakeNet-USA has taken initial steps towards setting up this working group meeting to take place in late June/early July 2005.

In the pilots community there is concern for the A380 wake in RVSM conditions. On this subject a public letter has been written. A plea was made for lateral separation. John Foottit mentioned a study with a falcon underneath a heavy.

(4) Mid-term Perspective (FAA/Lang & NASA/Bryant)
The aim is to prepare for an installation in FY06/07 of a wind dependent prototype system for CSPR operation relying on wake lateral transport only to identify safe wake vortex regions.

(5) Initial Assessment of Wind Profile Predictability at STL (MIT/LL/Cole)
Tries to answer the question: How well can we predict when the crosswind profile will stay favorable? Four different types of measurements have been used (LLWAS surface winds: network of 10 anemometers spread at ~1 nmi spacing, 90 ft poles, 10 second update averaged to 2 minute mean winds; RUC wind profiles: 19 levels from the surface to over 6000 ft, ~70 ft to ~700 ft vertical resolution, hourly; ASOS wind and visibility: wind at 33 ft, 2 minute mean; CTI VAD wind profiles: 200 ft – max of 5500 ft, vertical resolution 63 ft). For a 30 minute 'look ahead' prediction about 70 to 80 % of the benefit is recovered. However, there are 1 to 2 % 'real missers'. The question if this is acceptable could not be answered (requires community acceptance of a probabilistic safety assessment?).

(6) Recommendations and Conclusions from the Concept Evaluation Team Report (Aviation Systems Engineering, Inc./ Fiduccia)
The work is almost finished. Various 'Candidate Operational Enhancements' (COE's) have been studied within the 4 identified development phases: 1) base line (current operation with no change to wake rules and procedures), 2) crosswind dependent departures (phase IIA), 3) crosswind dependent arrivals (phase IIB) and 4) ground based and airborne enhancement (phase III). Open issues (RQ's, 'research questions') are an essential part of the report. It appears that most of the RQ's are common to all scenarios. Contrary to the original expectations, single runway arrivals are the most easy to handle (single traffic flows are operationally simpler than parallel flows), however the requirement for longer term crosswind stability predictions somewhat negate this observation. Jim Duke remarked that the work is not done yet and that research has to move forward. It is also clear that a 'green/red light' scenario' (ad-hoc changes in separation distances) cannot work.

(7) Preliminary Findings from Human-In-The-Loop Evaluation (Mitre-CAASD/ Mundra)
Study to determine ATC feasibility of the proposed procedure using ATC man-in-the-loop simulations with pseudo pilots. A cross wind dependent departure procedure for CSPR's was studied by comparing this with current practice for the same stream. VFR and IFR conditions have been simulated for particular traffic mixes. The procedure appears to be acceptable and the benefit appears to be 1 to 2 additional operations out of each 20 operations. This result, that will depend on the traffic mix, is a bit less as expected, partly due to the fact that ATCO's 'squeeze already as much capacity as possible' in the current situation. To better assess the benefits, Monte Carlo simulations are needed. The work can be seen as a refinement to the input of the cost / benefit analysis already performed and reported by LMI in the past.

(8) Analysis of Wind Dependent Conops for Capacity, Opportunity, and Ranking (MITRE CAASD / Lumsford)
Monte Carlo simulations for 20 airports using various types of cross-wind based arrival and departure procedures (Phase II ConOPS). Benefits depend strongly on procedure scenario and particular airport / weather characteristics: gain on average for arrivals between 2 and 4 per hour, for departures between 1 and 3. The analysis includes Wind Threshold Calculations for CSPR using the APA wake transport model.

(9) A-380 Activities (FAA/Greene/Lang, EEC/Nicolaon; Greene to report)
George Greene announced that FAA was invited to participate at the flight LIDAR trials. The working group is still working and no information will be disclosed prior to the final report (expected August 2005). The driving factors are to produce results 'prior to

operation' and to have 'credibility'. An ESARR-4 type independent safety assessment will be made (following a 'Proposal Top-Level Argument') with the elements: acceptance – guidance – implementation – evaluation. Critical items are validation of the wake models, the safety case, the stakeholder involvement and the external communication. Question: how is hazard defined? Answer: no comment but the probability of a go-around is clearly not an acceptable criterion. Question: what is the standard for the AN225? Answer: if you have no information you put 10 miles behind it. Concern with RVSM.

(10) TASS Driven Algorithm for Wake Prediction (TDAWP) (NASA/Proctor)
A follow-on of the APA /Sarpkaya model to predict the weather dependent wake vortex strength and position based on a parameterization of LES calculations (TASS). It is a 2-phase model similar to D2P from DLR. It models turbulence and stratification. Extensions foreseen for cross-wind shear to be able to model IGE vortices and probability bounds (as P2P).

(11) Changing Role of STL Instrument Suite (Volpe/Hallock)
Jim Hallock presented a project to compare various wind/wake measuring systems (3 Lidar systems, windline, SODAR) 'in situ' (at STL) with the aim to cross check results, to examine axial coherence, to accurately measure vortex height and to discriminate wakes from turbulence for IGE cases. No results available yet.

(12) Denver Evaluation of Pulsed vs. CW LIDAR (NASA/Koch)
As a side activity for the SOCRATES evaluation at Denver, pulsed and CW wave Lidar measurements have been compared. In general good correspondence but not always. RMS difference in position tracks is approximately 20 m for both lateral and vertical dimensions. Circulation still to be evaluated.

(13) Wake Alleviation – Summary of Toulouse Workshop (NASA/Durston)
Don Durston participated in the February WN2E workshop in Toulouse on Wake Alleviation. Slides from various presentations were presented and he concluded that: 1) Europe has more focused activities in WV research than U.S.; 2) Some of the research addresses far-field vortex behaviors, but not enough (similar on both sides of the Atlantic); 3) Many near-field studies show significant changes in vortices from either passive or active alleviation schemes, but these changes may get washed out in mid- and far-field, leaving little or no alleviation achieved; 4) Seems that they (Europe) are at as much a loss for a practical alleviation scheme as we (US) are and 5) No wake vortex solution in place for A380…they will flight-test it and measure the wake.

(14) Initial Assessment of CTI LIDAR Wind Profiler Data (MIT / Cole)
LLWAS surface winds, RUC wind profiles and CTI VAD (Velocity Azimuth Display) wind profiles (see above) have been compared. The comparisons are good in general (typically 2 knots differences) but there appears to be a need to improve data quality. Vertical wind (w) is very noisy and it was even proposed to set w = 0 (to reduce scatter for the other components). VAD profiles look very good most of the time, especially at altitudes needed for departures.

(15) Preparatory study of wake vortex detection technology case (Leosphere / Laurence Sauvage)
Results were presented of a EUROCONTROL generated study to assess the available methods for weather measurements and 'all weather' vortex detection. A rather complete assessment matrix was presented to measure vortex, wind, turbulence and temperature during ILS, approach and climb phases for no-rain, fog and heavy rain conditions.

(16) Acoustical Data Signal Processing (Florida Atlantic University/ Prof. Nurgun Erdol)
Enhanced signal processing techniques to filter the wake signature out of noisy signals.

(17) Wake Acoustic Microphone Array Results - A Preliminary Sneak-Peak - (NASA / Booth)
Report on the Denver 2003 Wake Acoustics Test where results from the Socrates system have been compared with the NASA Microphone Array, the DLR Microphone Array and (as reference) Pulsed and CW LIDAR. It was concluded that Aircraft wakes can be tracked using acoustic array and that the results compare well with other sensors (good agreement for Wake Elevation Angle, reasonable agreement with wake lateral position, although a bit lower altitude than Pulsed Lidar).

(18) Utility of Microphone Arrays (Volpe/Wang)
Well-balanced view on acoustic wake detection. One of the great advantages is that a rather complete picture can be obtained, similar to smoke visualizations. Vortex position is well detected although there are quite a few cases where the vortex was 'missed'. Conceptually difficult are the derivation of vortex strength and the operation in a noisy environment.

(19) Socrates Status: Plans for 2nd Denver Wake Acoustic Test ('05) and Outlook for Demo in '06 (Flight Safety Technology/Lockheed-Martin - Cotton)
A summary was given of the 2003 acoustic tests at Denver showing a good comparison in vortex position with LIDAR data. Plans are for a new test campaign in 2005 to realize 'Focused Tracking' using 3x5 billboard arrays to increase 3D resolution in range, cross-range, and elevation. It is proposed to have in 2006 a CONOPS Phase 3 compatible implementation, complementary to LIDAR systems.

*(20) Status of WakeVAS Benefits Assessments (NASA/Johnson)*Based on CONOPS studies, comparison of benefits for various airports. Recommendations for future steps.

Perspective – NASA's Far-Term Objectives/Benefits (NASA/Bryant)
Due to the unclear funding situation it is too speculative to talk about. Will be clearer 6 month from now.

Wrap-up discussion
Positive comments on the meeting. WakeNet-USA is viewed by some participants as a model program for co-operation between FAA and NASA. The next meeting will be on October on CSPR departures.

(21) Presentation Bram Elsenaar: Staus report on WakeNet2-Europe

(22) Presentation of Bram Elsenaar for the 'National Institute for Aerospace', Langley, March 14, 2005