NASA Wake Turbulence Program Plans

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March 2005

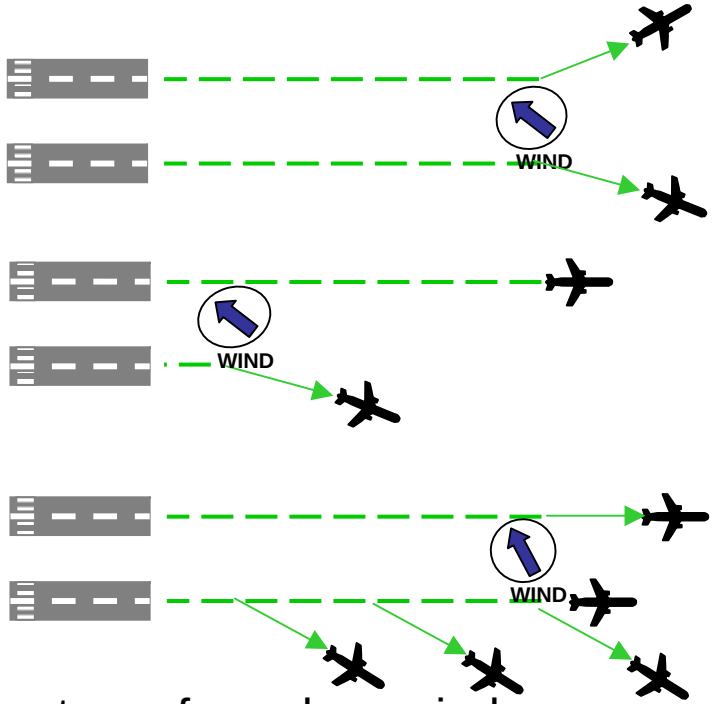
NASA FY05 Appropriation

Wake Turbulence Research's allocation was:

- 16 NASA FTE's
- $4.8M Contract Dollars (during planning cycle March 04, Planning #'s were $11M; at NAR in November 2004, #'s were $8.1 M.)

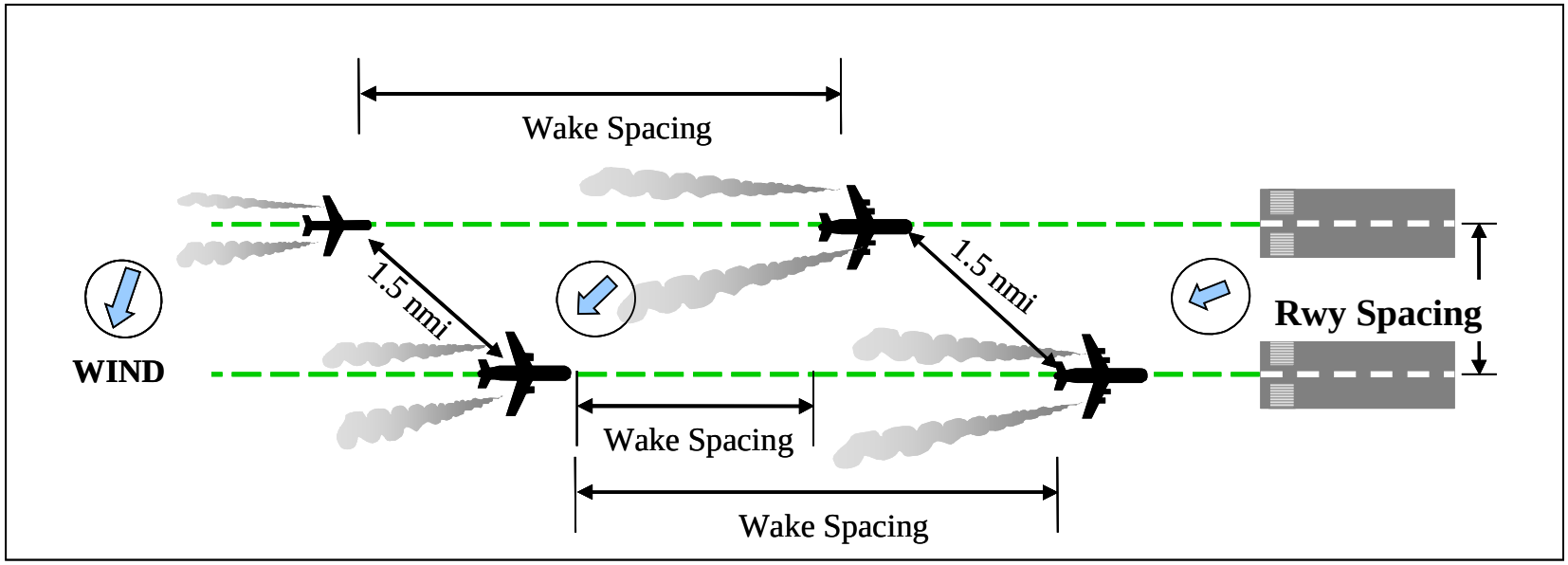
Conops Team Departure Options

- Both runways depart straight-out to 5 nmi
- Downwind runway departs straight-out, upwind runway departure diverges upwind at 1 nmi
- Downwind runway departs straight-out, upwind runway has multiple points where departures can diverge upwind



- Upwind runway wake-free relative to departures from downwind runway
- Same runway wake sep applied on both runways in options 1 and 2
- Option 3 also reduces same runway wake sep on upwind for diverging departures
- Similar geometries proposed by CET for single runway departures

Conops Team Arrival Options



- Straight-in, 10-20 nmi final
- Angled 3 degree approaches to MAP
- Angled 3 degree approaches to FAF
- Alternating LDAs (up to 30 degrees) to MAP
- One straight-in, one 3 degree angled approach
- Similar geometries for single runway arrival options

FY05 Plans

- Work toward wind dependent CSPR runway departures and arrivals enhancements
  - 65 to 75% Resource Allocation
  - Complete development of concept of operations
  - Complete cost-benefit and preliminary safety risk analyses
  - Begin prototype coding
  - If feasible, develop data collection and analysis plan for Prototype Evaluation Airport
  - Install data collection and analysis suite at Evaluation Airport (FAA's 3rd LIDAR)

FY05 Plans

- Work toward
  - wind dependent single runway solutions
  - establishing improved basis for wake predicting/tracking enabled reduced wake turbulence separations (Phase III solutions)
- 25 to 35% Resource Allocation
- Determine feasibility of WakeVAS single runway departure (possible arrival) procedures
  - Explore joint FAA/NASA/European Wake Project (3 years, starting in January 06) to
    - Acquire required data at STL & FRA
    - Develop concept of operations
    - Conduct wake data analysis
    - Complete hazard identification and analysis
    - Conduct safety analysis
- Improve Wake Predictor Model
- Complete preliminary cost-benefit and safety risk analyses for longer-term WakeVAS solutions.

FY05 Funding

FY05 Funding Priorities do not allow for:

- Exploration of all operationally feasible concepts
- Carrying of potential solutions beyond the prototype phase of development

FY06 Plans

Wake Turbulence Research in FY06 as part of the Efficient Aircraft Spacing Project:

- 20 NASA FTE's
- $8M Contract Dollars

FY06 Plans

- Wind dependent CSPR runway departures and arrivals
  - ~75 % of project resources
  - Continue wake turbulence data collection at Evaluation Facility
  - If feasibility is determined, add single runway capability to prototype system being developed for CSPR departures/arrivals
  - Establish Site Implementation Team for Evaluation Airport

FY06 Plans

Wake predicting/tracking enabled reduced wake turbulence separations for arrivals/departures:

- ~25% Resource allocation
- Continue development of WakeVAS prediction algorithms utilizing wake behavior information from SFO, STL and Evaluation Airport.
- Incorporate MIT/LL developed wind prediction algorithm into WakeVAS prototype
- Complete assessment of wake detection technology for use in the WakeVAS system
- Develop preliminary airport level system design for WakeVAS to include additional weather sensors and/or data links and wake detection systems (if required)
- Complete preliminary safety assessment

NASA Project Schedule

Task	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09
Concept of Operational Enhancement development and program initiation						
Wind Dependent prototype development and demonstration planning						
Wind Dependent prototype installation and shadow mode use						
Wake Dependent enhancement to prototype development and demonstration planning						
Wake dependent enhancement installation and shadow mode use						

Key Issues Being Worked

- Safety/Hazard Analysis Methods
  - WAVIR, ASAT, TOPAZ, HAZOP, VESA, ...
- Wake Encounters
  - We know more about Wake Turbulence transport than we did several decades ago – what separation standards are realistic, feasible in a safe NAS System?
  - Are high fidelity wind predictions along departure path feasible
  - What wake circulation level is “significant”?
- Adequate prediction of wake vortex behavior
  - How good is ‘good enough’ for the target system?
  - Are there significant differences among the available WV predictors?
  - What additional information inputs are required to make a WakeVAS an operationally viable ATC tool?
- What should be the safety net?