Fuel Consumption and Emissions from Airport Taxi Operations

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Airport Emissions

• 25% of the emissions are produced during the Landing Take-Off (LTO) cycle (for flights over a 800km range)\(^1\)
• Taxi operations are the largest source of emissions in a standard LTO cycle\(^2\)
• Fuel consumption from taxi operations is forecast to cost ~\$7B by 2012; 18M metric tons of CO\(_2\) per year\(^3\)

\(^3\) Environmental Leader (6/29/09), quoted from a report by EADS Airbus
Fuel Consumption from Surface Operations at DFW

- Based on ASDE-X aircraft position data
- 3 months data (from April to July 2008)
- ICAO fuel and emission values were augmented and used
- Stopped operations result in 18% of fuel consumption

Nikoleris, Gupta and Kistler, under review for the journal *Transport Research Part D*
Average Daily Fuel Consumption and Emissions at DFW

Nikoienis, Gupta and Kistier, under review for the journal *Transport Research Part D*
Surface Environmental Research

- Develop concepts of energy efficient operations and decision support tools

- Conduct human-in-the-loop experiments to evaluate performance of the tools

- Perform estimation of fuel consumption and emissions
Spot and Runway Departure Advisory (SARDA) Tool

- A near-term decision support tool for tower controllers to enhance the efficiency of surface traffic
- Provides the Ground Controller with spot release advisories
- Provides the Local Controller with runway departure and runway crossing advisories (sequence)
SARDA Experiment – April 2010

With advisories
Stop-and-go Situations in SARDA

Average Departure Total Stops

Average Departure Queue Stops

Average Departure Ramp Stops
Environmentally Friendly Surface Operations

- Single engine taxi
- Departure metering
- Perimeter taxiway
- Tow-out taxiing
- Other concepts
  - Optimal runway allocation
  - Environmental planner
  - Take-off roll regulator
Summary

- Developed a method to calculate fuel consumption and emissions of phases of taxi operations.

- Results at DFW showed that up to 18% of fuel can be saved by eliminating stop-and-go situations.

- Developed an energy efficient and environmentally friendly surface concept: Spot and Runway Departure Advisory (SARDA) tool.

- The SARDA tool has been identified as a potential candidate for a technology transfer to the FAA.