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\(^3\)

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\(^3\) 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

Nikoleris, Gupta and Kistler, 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 crossing advisories (sequence)
SARDA Experiment – April 2010

With advisories
Stop-and-go Situations in SARDA

Average Departure Total Stops

Baseline | Timeline Advisory | Data-tag Advisory
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Average Departure Queue Stops
Baseline | Timeline Advisory | Data-tag Advisory
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Average Departure Ramp Stops
Baseline | Timeline Advisory | Data-tag Advisory
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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.