Fuel Consumption and Emissions from Airport Taxi Operations

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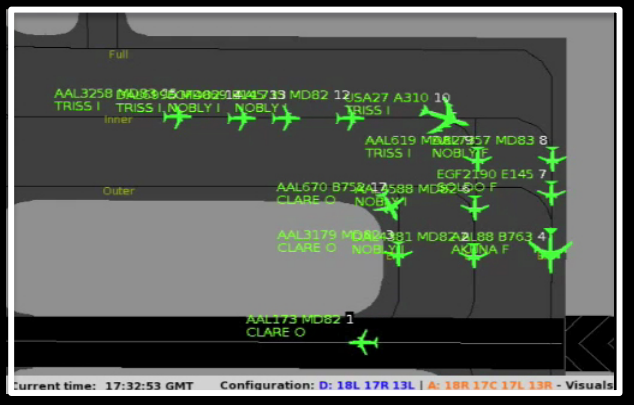
Airport Emissions

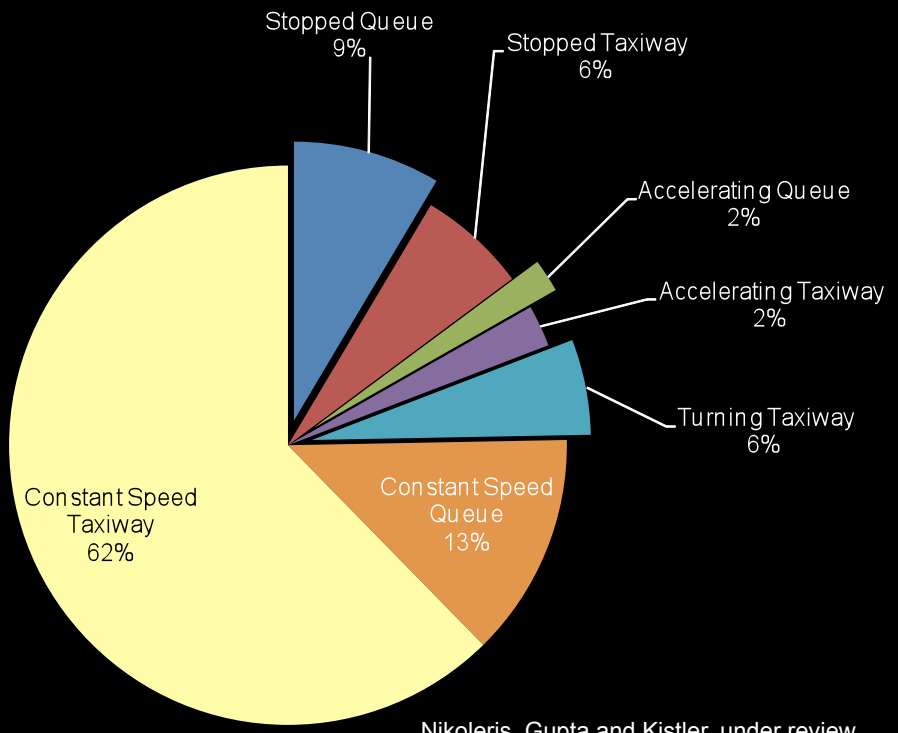
- 25% of the emissions are produced during the Landing Take-Off (LTO) cycle (for flights over a 800km range)[1]
- Taxi operations are the largest source of emissions in a standard LTO cycle[2]
- Fuel consumption from taxi operations is forecast to cost ~$7B by 2012; 18M metric tons of CO_2 per year[3]



[1] Kesgin, U. (2006). "Aircraft emissions at Turkish airports." Energy 31(2-3): 372-384.
[2] Perl, A., J. Patterson, et al. (1997). "Pricing aircraft emissions at Lyon-Satolas airport." Transportation Research Part D: Transport and Environment 2(2): 89-105.
[3] Environmental Leader (6/29/09), quoted from a report by EADS Airbus

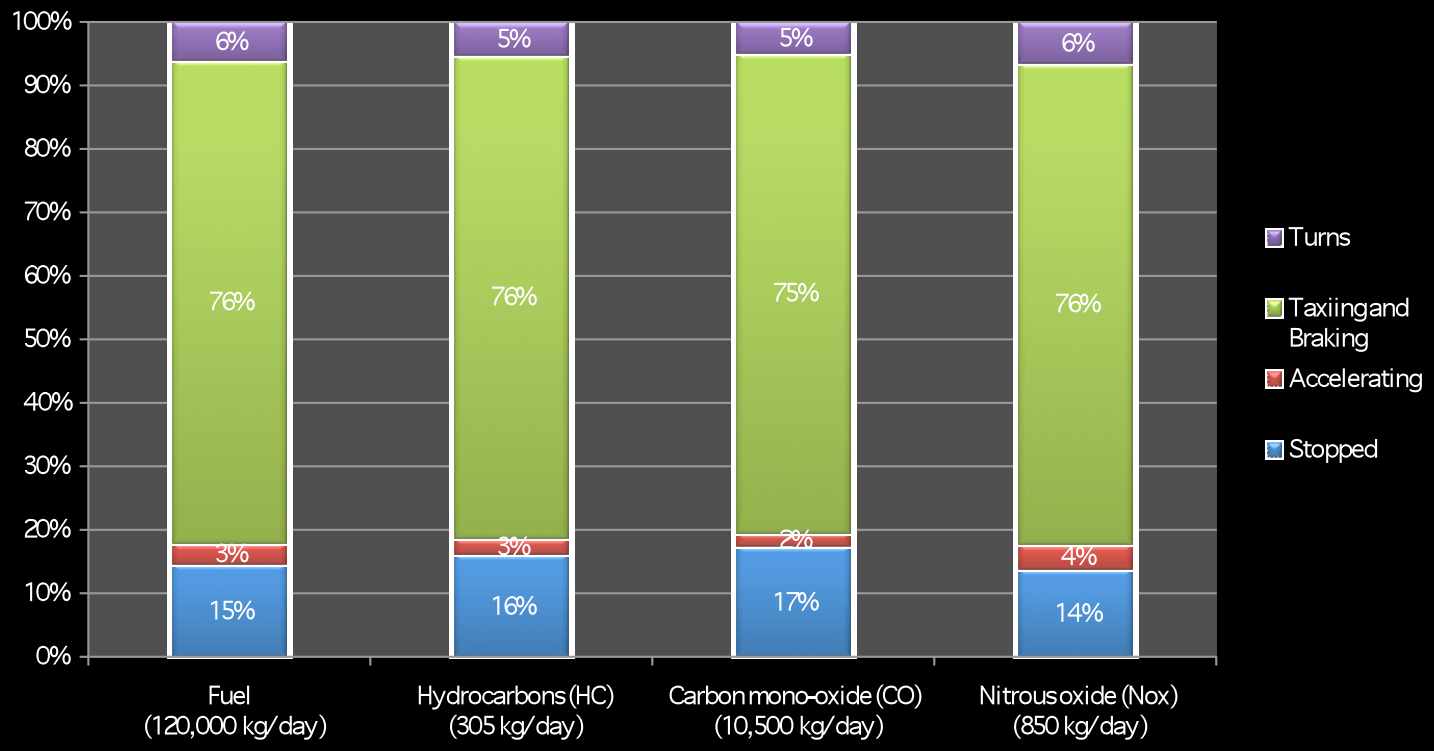
Fuel Consumption from Surface Operations at DFW

- 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



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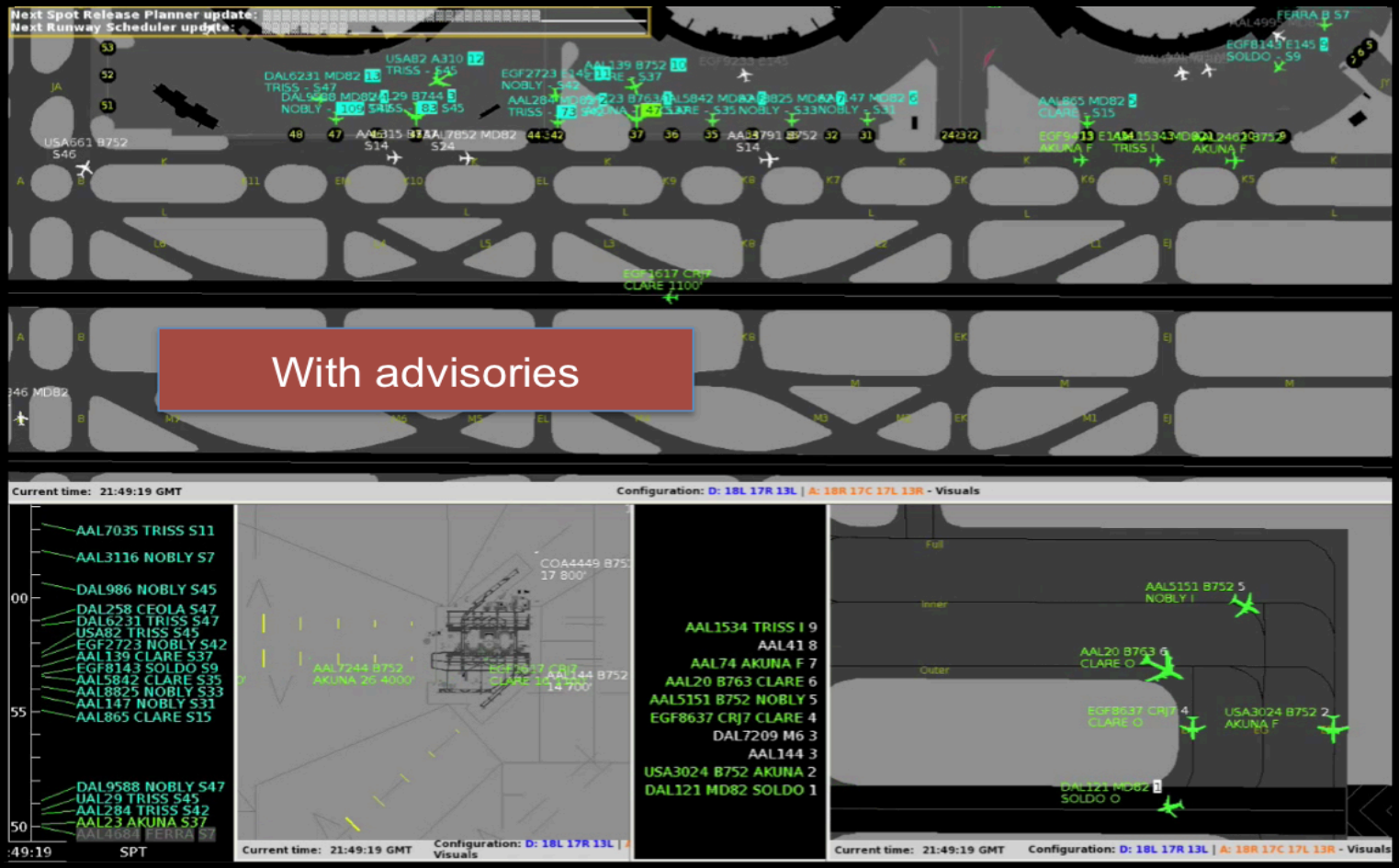
Surface Environmental Research

- 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

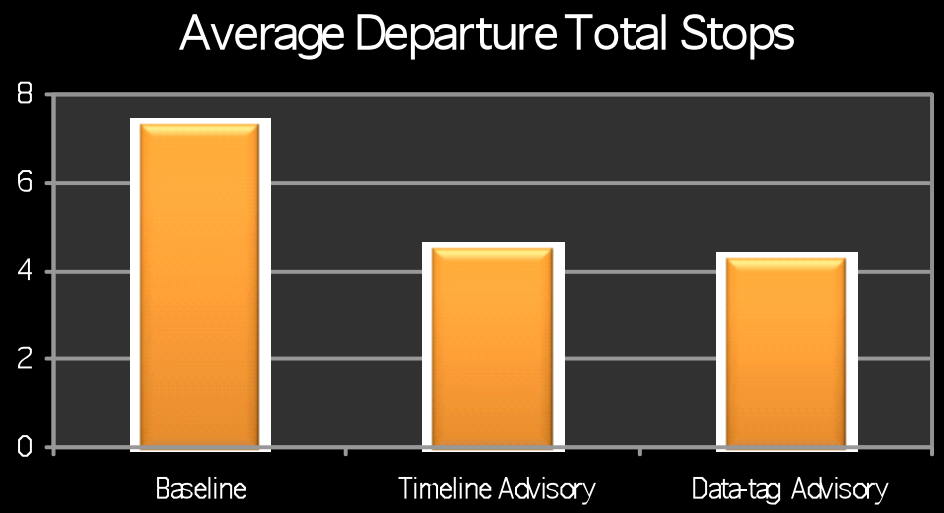
Spot and Runway Departure Advisory (SARDA) Tool

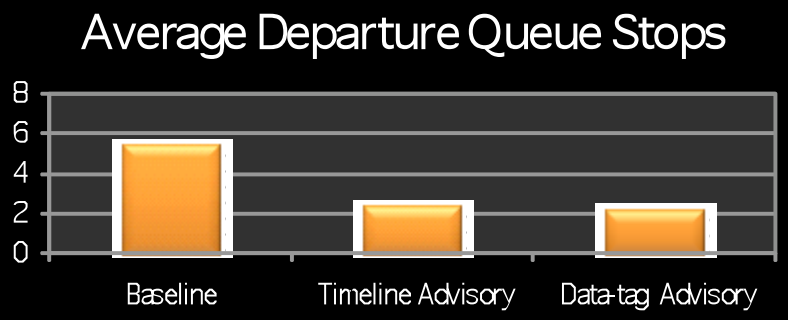
- A near-term decision support tool for tower controllers to enhance the efficiency of surface traffic
- Provides the Ground Controller with spot release advisories
- Provides the Local Controller with runway departure and runway crossing advisories (sequence)

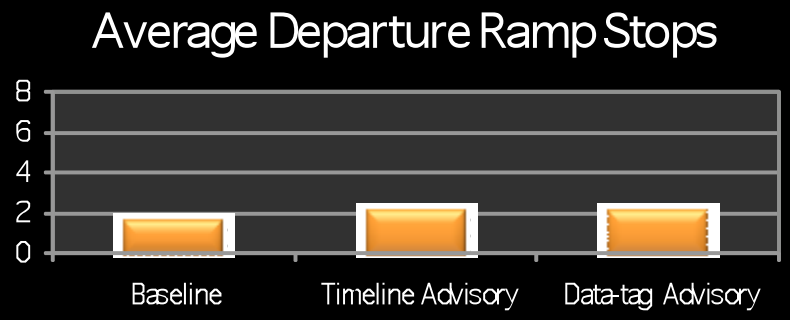
SARDA Experiment – April 2010



Stop-and-go Situations in SARDA

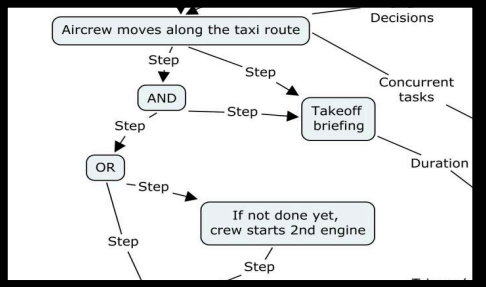






Environmentally Friendly Surface Operations

- 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.