



ICAO | UNITING AVIATION



Evaluation of Operational Changes to Mitigate the Environmental Impacts of Aviation

Chris Dorian

U.S. Federal Aviation Administration
Office of Environment & Energy (AEE)

ICAO HQ, Montréal, Canada

9 – 10 SEPTEMBER 2014



FAA Office of Environment & Energy Operations Research Program

FAA E&E Operations Research Program Goals

1. *Identify and accelerate the implementation of air traffic management concepts that will reduce aviation environmental impacts and/or improve energy efficiency*
2. *Investigate the E&E effects of operational changes implemented by the FAA.*

Core Program Elements

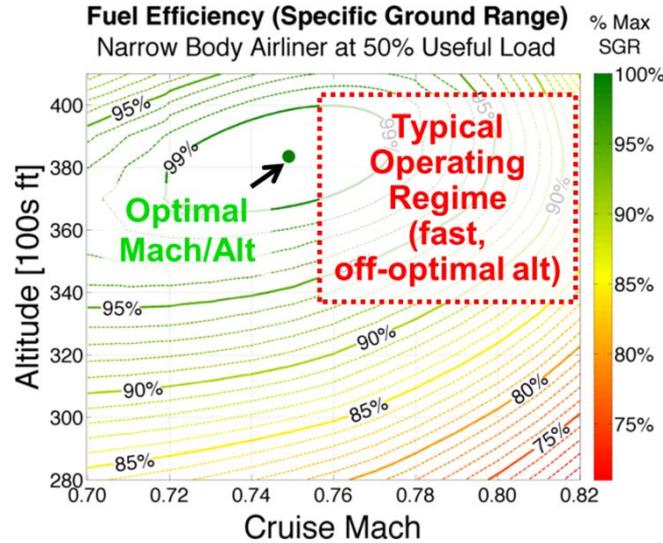
- *Research Process: Identifies, conducts, evaluates and transitions Air Traffic Management Modernization (ATMM) research for implementation*
- *Roadmap: Describes areas for ATMM Research near, medium, and long term.*
- *Portfolio Metrics: Assesses the portfolio's balance with regard to addressing E&E issues and the maturity progression of research project.*

- ❑ FAA Office of Environment & Energy sponsors operations research for all phases of flight: en route, terminal, and surface
- ❑ These E&E projects (a subset of which are presented in this briefing) are complementary to the wider NextGen initiative to modernize the US National Airspace System (NAS)



Cruise Altitude and Speed Optimization

- Identifying fuel savings potential from small changes in cruise altitude & speed
- Working with airlines to understand operational & business constraints
- Determining opportunities to realize savings in current & NextGen operations
- Concept is in research phase; has potential for implementation in near- to mid-term (within 10 years)



Benefits Potential: Speed Optimization

- 1.96% mean fuel burn reduction
- 25% of all flights have greater than 2.83% fuel burn reduction

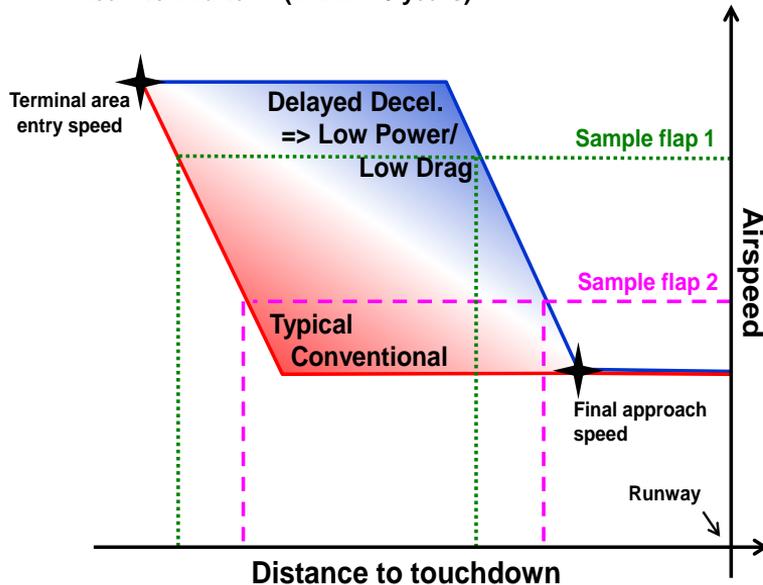
Benefits Potential: Altitude Optimization

- 1.75% mean fuel burn reduction
- 25% of all flights have greater than 4.61% fuel burn reduction

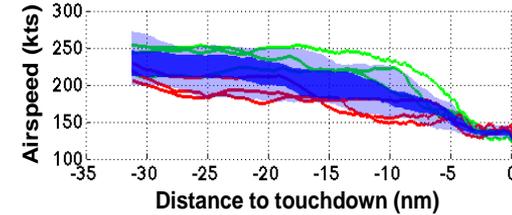
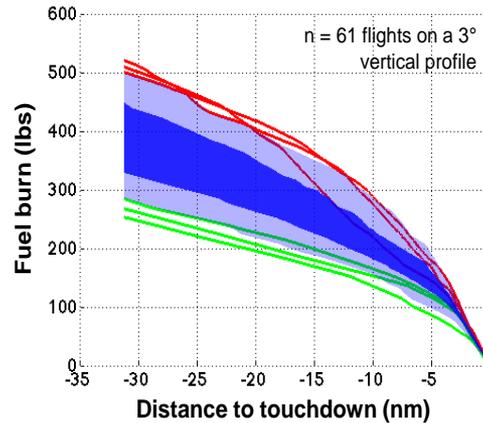


Delayed Deceleration Approach

- **Concept:** reduce fuel burn and emissions by maintaining higher airspeed with clean aerodynamic configuration for as long as possible during approach without impacting current speed gates
- **Concept is in research phase;** has potential for implementation in near- to mid-term (within 10 years)



Flight Data Recorder Analysis



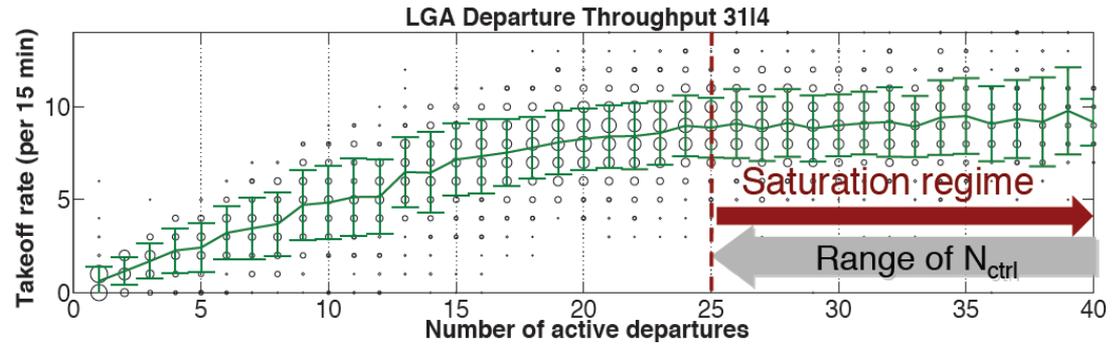
- From 5 to 95 % of the flights
- From 25 to 75 % of the flights
- 3 flights with lowest fuel burn
- 3 flights with highest fuel burn

- **Lowest fuel burn flights** correspond with higher airspeed profile (i.e., delayed deceleration)
- **30-50% fuel burn reduction** potential from DDAs, 10,000 ft to touchdown
- **Investigating potential for noise benefit** from flying in cleaner configuration during approach



Surface Congestion Management: N-Control

- **Concept:** control pushbacks to keep number of departures on the surface (N) close to target value (N_{ctrl}), thereby reducing taxi time, fuel burn, and emissions
- Complementary to other NextGen surface programs, e.g., Terminal Flight Data Manager
- Initial concept has been demonstrated; has potential for near-term implementation (within 5 years)



Boston Logan Airport (BOS) Field Tests

- Held in Summer 2010 & 2011
- 23-25 ton total reduction in fuel burn (52-58 kg decrease in fuel burn / gate-held flight)
- Fair distribution of benefits

New York LaGuardia Airport (LGA) Field Tests

- Highly congested airport
- Have adapted algorithm to unique airport environment
- Coordinating with ATC and airline stakeholders on test plan



Summary

- FAA Office of Environment and Energy conducts operations research to:
 1. Explore concepts with potential E&E benefits (three example projects shown in this briefing)
 2. Understand E&E effects of FAA-implemented operational changes
- Research complements larger NextGen initiative to modernize the US National Airspace System (NAS)



Phase of Flight	Example Concept
En Route	Cruise Altitude/Speed Optimization
Terminal	Delayed Deceleration Approach
Surface	Surface Management (N-Control)

- Once concepts are mature, coordinate with other organizations within FAA on further testing, validation, and ultimately implementation into the NAS