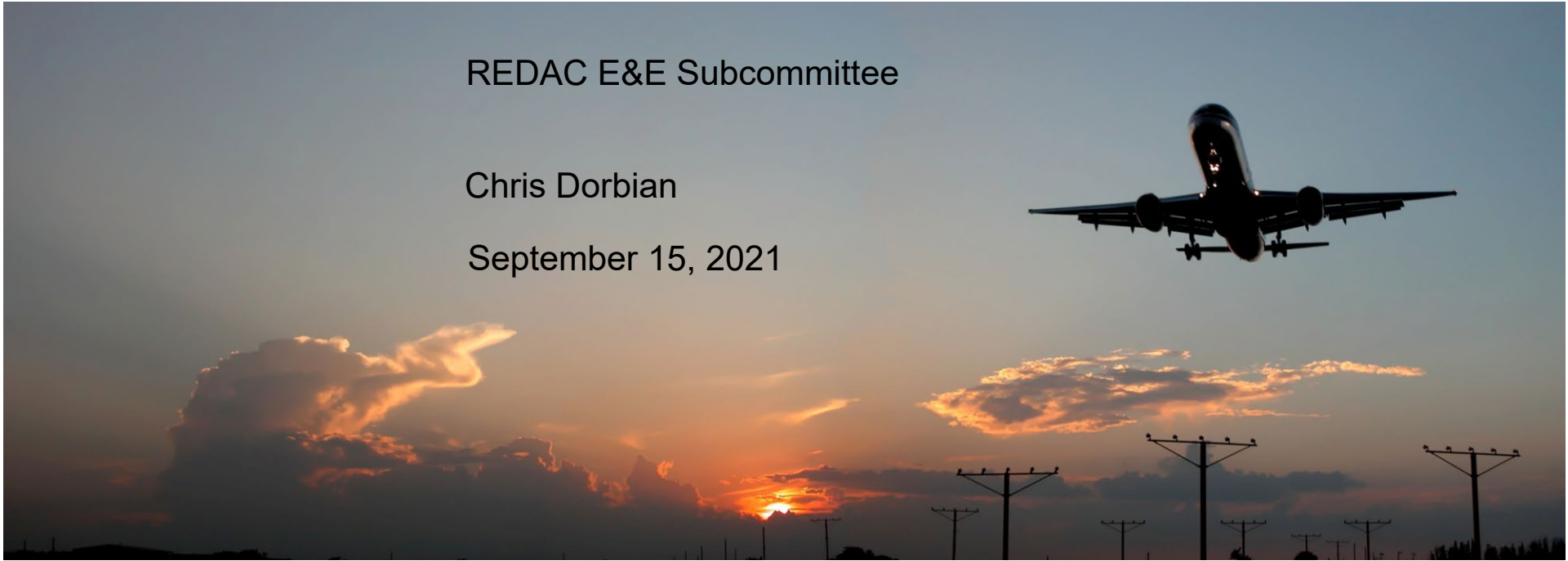
2021 REDAC Fall Meeting

Research on Operational Procedures



REDAC E&E Subcommittee

Chris Dorbian

September 15, 2021

FAA Efforts Relating to Aircraft Operations

1. Investigation of operational opportunities for noise reduction:

- Airlines largely determine ***what*** aircraft fly and ***when***
- There might be opportunities to change ***where*** aircraft fly (through precision navigation) and ***how*** aircraft are flown
- Must consider the entirety of the airspace and ensure the continued safety of operations
- Concepts being evaluated:
  - Route changes
  - Thrust / speed / configuration management
  - Vertical profile modifications
  - Systematic dispersion

2. Validation of noise abatement procedures

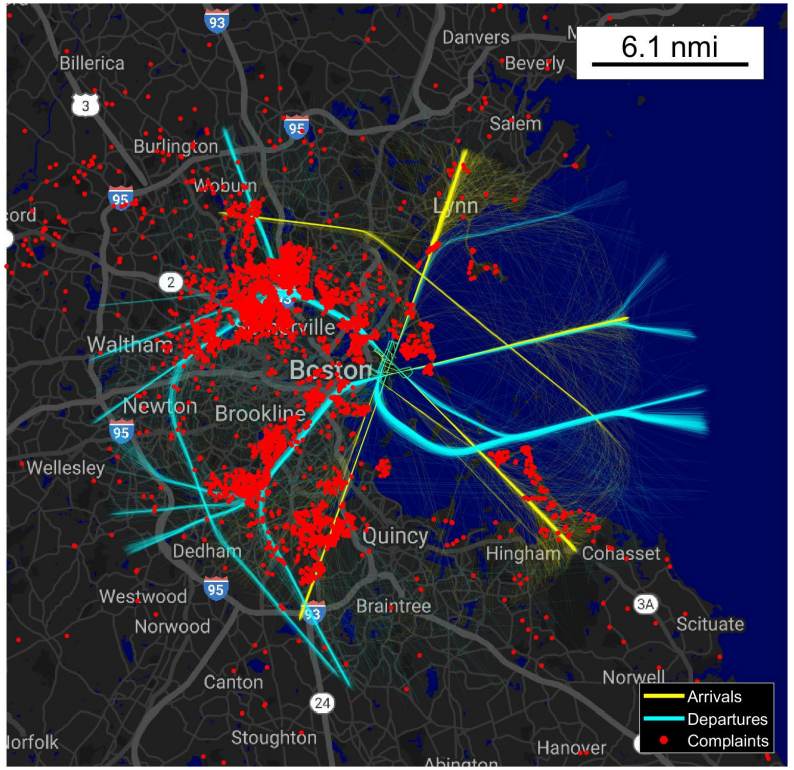
- Operationally validate (through flight sim/testing, noise measurement, etc.) noise management concepts

3. Advancement of tools, processes, and policies

- Execution of knowledge, guidance, & tools/options to manage noise
- Examination of metrics to facilitate assessment/communication of noise impacts

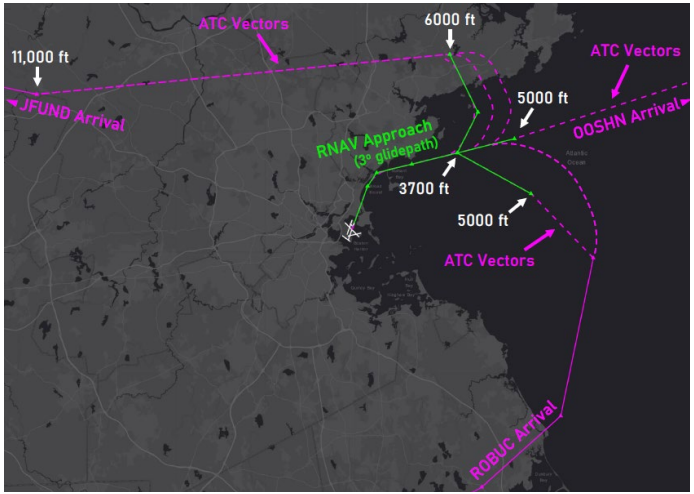
Massport MOU Update

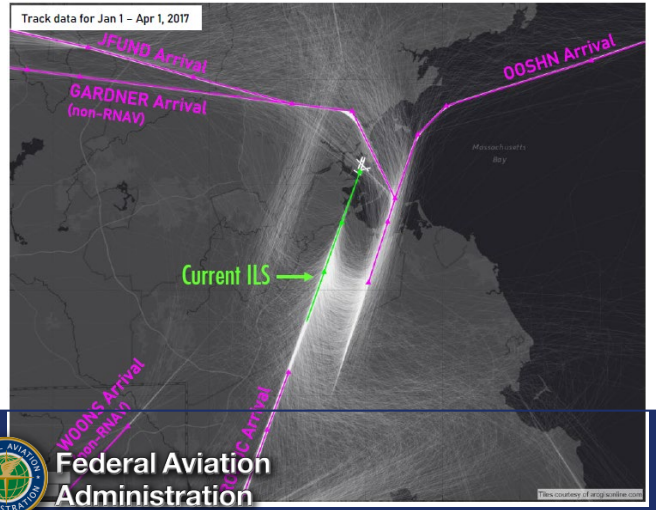
- Signed in September 2016 – established framework for cooperation between Massport & FAA to explore operational changes to mitigate noise impacts
- Two Block 1 proposals advancing (33L arrival, 15R departure)
- FAA/Industry provided preliminary feedback on Block 2 proposals in August 2020
- MIT worked collaboratively with FAA to refine proposals
- Revised proposals briefed to Massport Community Advisory Committee June 24
  - Block 2 report also completed; available upon request



Block 2 Arrival Procedures

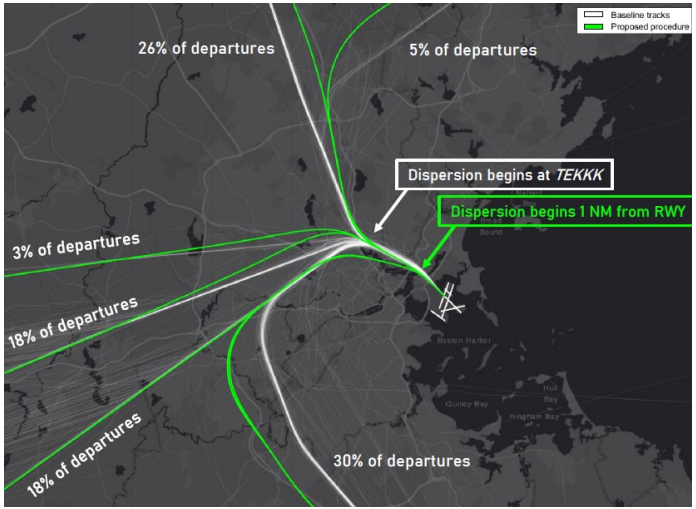
Proc. ID D = Dep. A = Arr.	Runway	Procedure	Primary Benefits
2-A1	22L	Implement a new overwater RNAV approach for Runway 22L that crosses the Nahant Causeway from the east to join a 4-mile final approach.	Arrival flight paths from the south and east moved overwater instead of overflying populated areas north/northeast of the airport.
2-A2	4R	Maintain use of current ILS approach to Runway 4R.	The current straight-in approach was found to have the lowest net population exposure among all RNAV approach candidates evaluated.

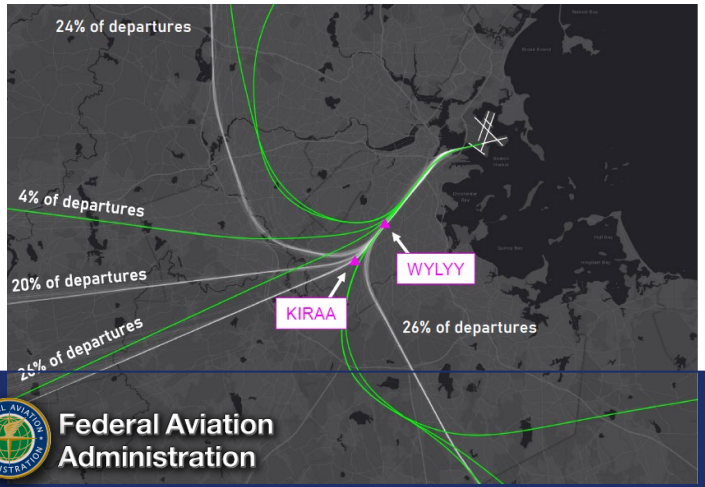




Block 2 Departure Procedures

Proc. ID D = Dep. A = Arr.	Runway	Procedure	Primary Benefits
2-D1	22L/R	Modify the current RNAV SID with a speed restriction to enable an earlier turn to the east, shifting aircraft tracks north away from Hull.	Departure flight paths moved north away from Hull.
2-D2	33L	Modify the current RNAV SIDs to enable the start of flight track dispersion at the earliest point possible (1 NM from the end of the runway).	Increased dispersion of flight tracks and noise distribution.
2-D3	27	Modify RNAV SIDs to begin flight track dispersion at the earliest point possible while satisfying the 1996 Environmental Record of Decision.	Increased dispersion of flight tracks and noise distribution; lower net population noise exposure.





MOU Next Steps

- **Get community buy-in on procedures – public meeting to be held mid-September**
- **Massport will then make formal proposal to FAA → FAA conducts formal 7100.41A review**
- **In parallel, collecting lessons learned / takeaways from overall effort**
  - What worked? What didn't work?
  - Best practices or methods that may be translatable to other efforts in the NAS?
  - Implications for policy or process going forward, or need for further research & development?

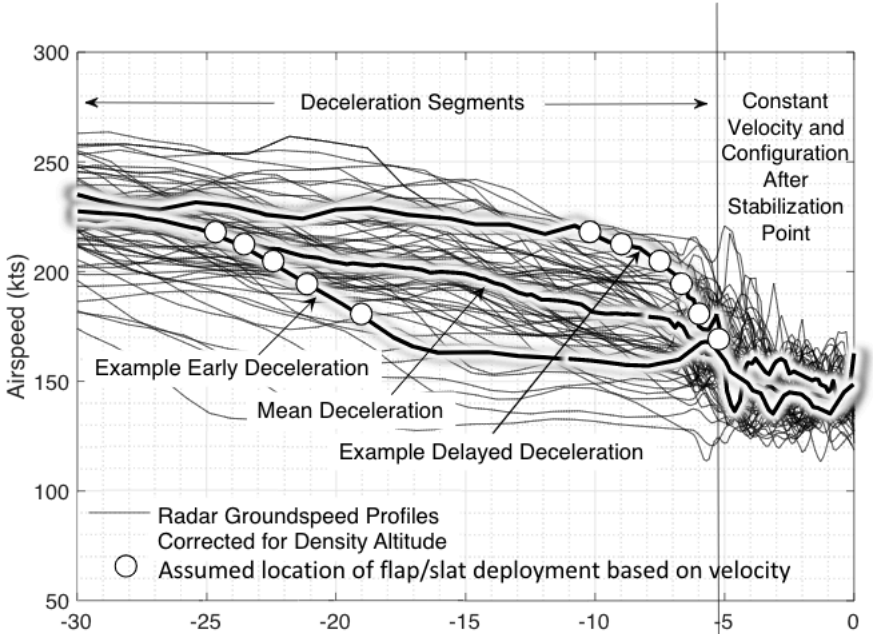
ASCENT Project 44 (Noise Abatement Procedure Modeling/Validation) Update

Primary Objectives:

- Collect aircraft state and noise measurement data to support validation of noise modeling methodology and identification of low-noise behaviors
- Gain stakeholder perspectives on flyability and implementation barriers to low-noise procedures

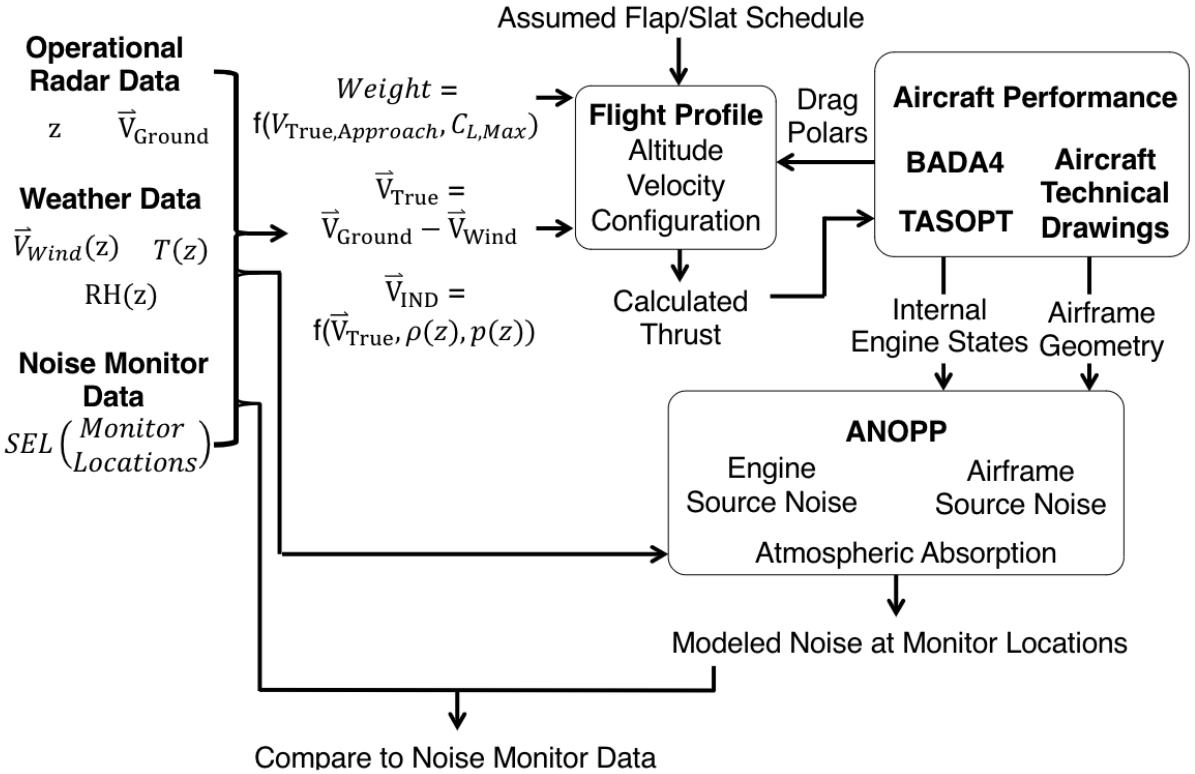
Current Status:

- Assessed noise monitor and radar data for BOS and SEA



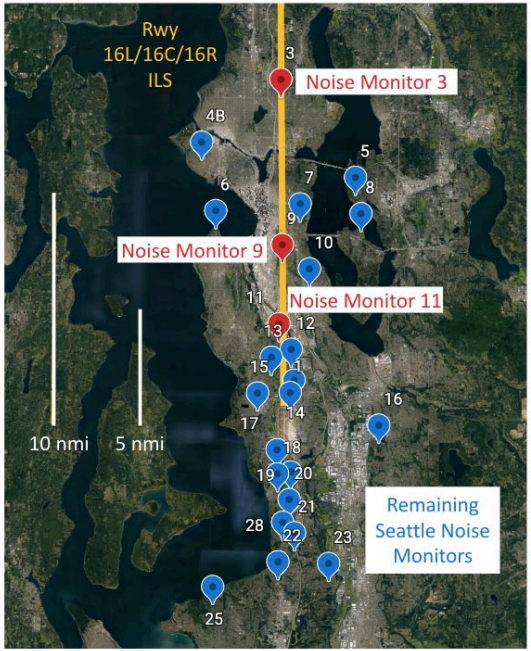
Early, Mean and Delayed Deceleration

Noise Modeling Validation Methodology



- Ambient wind, temperature, and relative humidity corrections must be made to determine airspeed, attenuation
- Weight must be determined to model thrust on approach
- Flap settings not known a priori
  - Noise results were modeled for different flap settings for each flight
  - Representative flap extension speeds used as reference for reasonable flap settings for a given overflight velocity

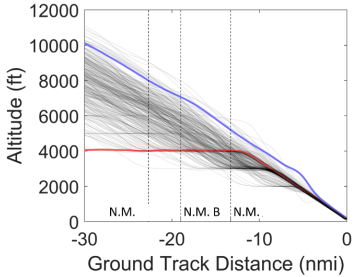
Noise Monitor Networks at BOS and SEA



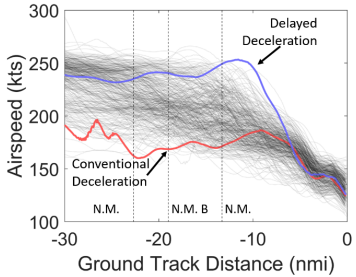
BOS, SEA Noise Monitor Networks

Operational Radar Profiles

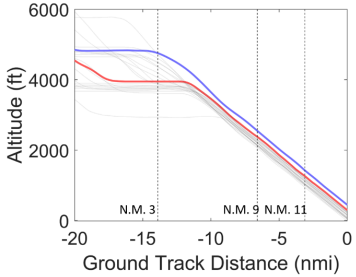
- Delayed Deceleration Approaches (DDA) can be isolated from aggregate radar (ADS-B) data and compared with conventional approaches



(a) Aggregate Altitude Profiles



(b) Aggregate Indicated Airspeed Profiles



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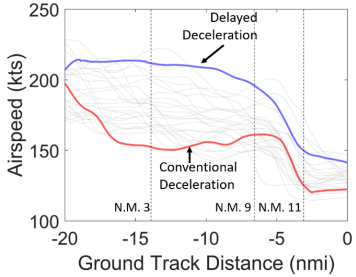

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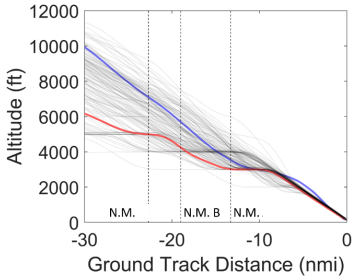

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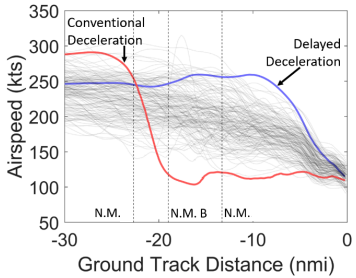
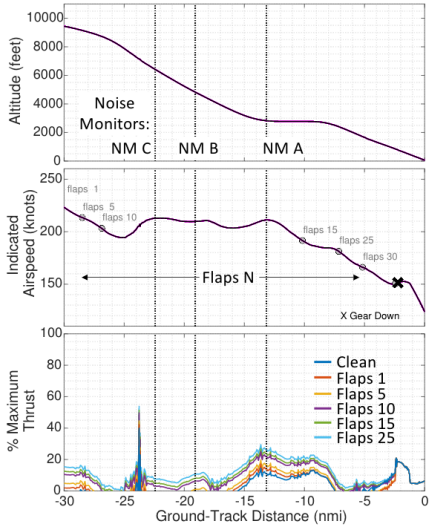


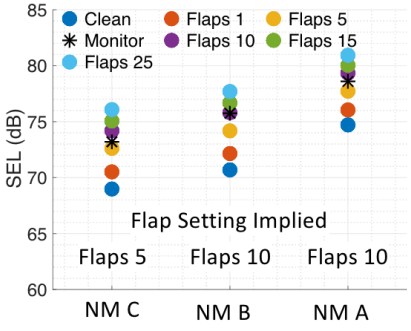
(b) Aggregate Indicated Airspeed Profiles

Operational A320 Arrival Profiles, SEA RWY 16L/C/R

Measured and Modeled Results Comparison

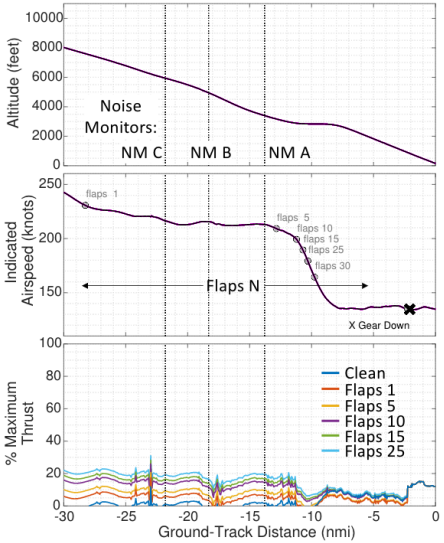


(a) Flight profiles

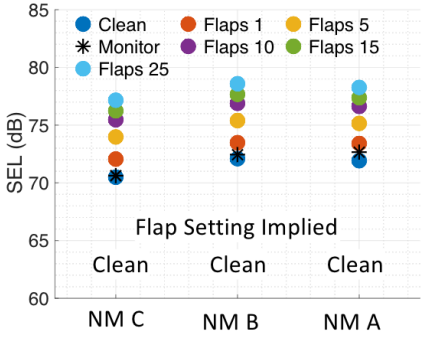


(b) Modeled and measured noise

Boeing 737-800 Early Deceleration



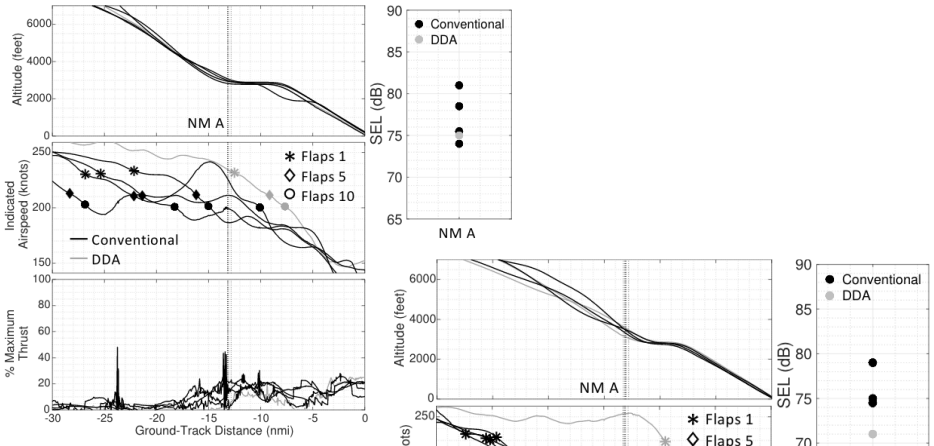
(a) Flight profiles



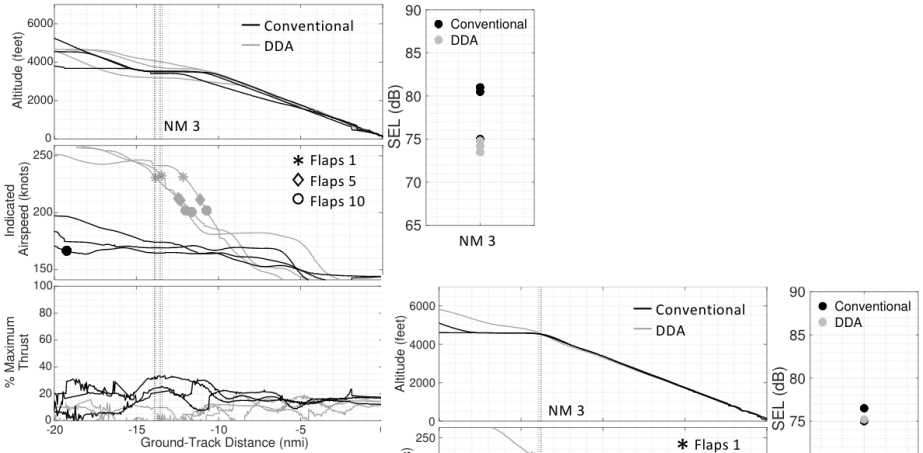
(b) Modeled and measured noise

Boeing 737-800 Delayed Deceleration

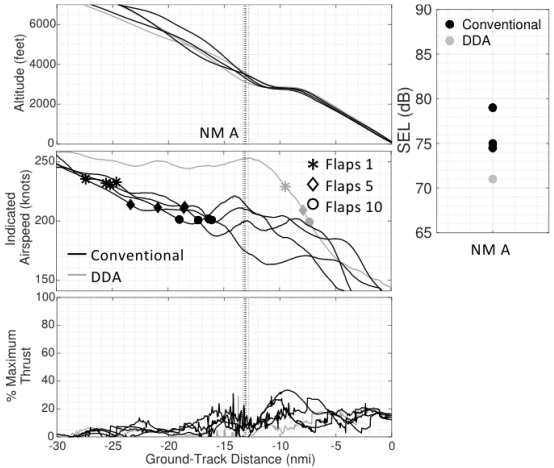
Conventional vs. DDA Measured Noise (B738)



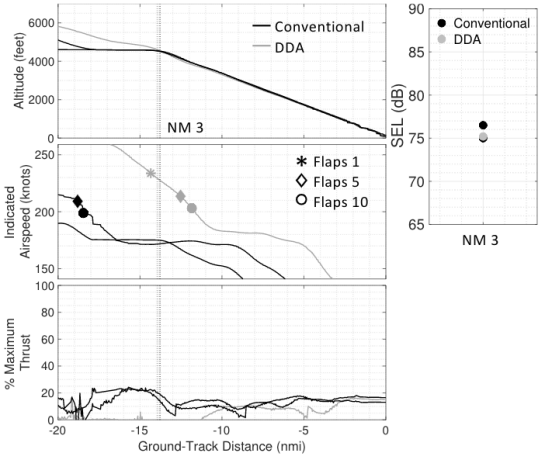
(a) BOS, 3000 ft



(b) SEA, 4000 ft



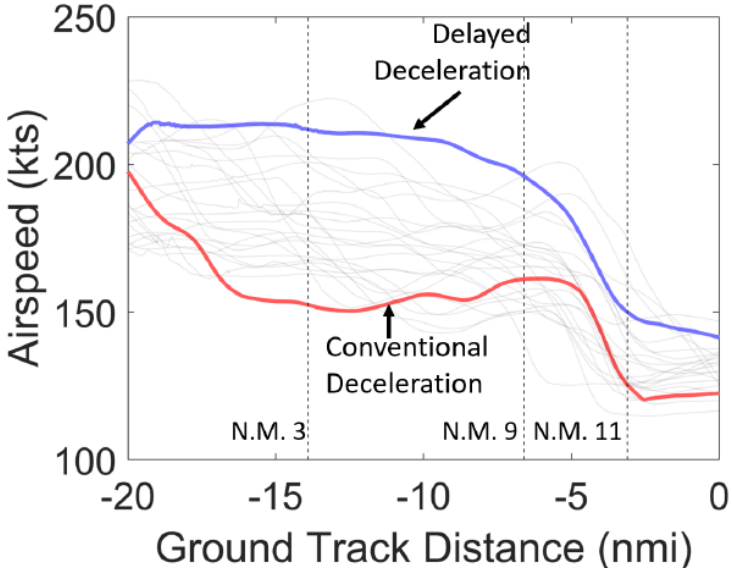
(c) BOS, 3500 ft



(d) SEA, 5000 ft

ASCENT Project 44 Next Steps

- **Noise measurements and radar data helping to validate noise modeling and procedure identification**
- **Similar approach can be used to revisit departure phase for potential opportunities**
- **Examine integration opportunities with ATM merging and spacing tools (speed management)**



Example A320 Arrival Profiles, SEA RWY 16L/C/R (Nov 2019)

Summary

- **Research aspect of MOU nearing conclusion – pivoting to national focus**
- **Noise modeling / procedure validation has advanced – need to better understand opportunities for implementation**
- **Continuing coordination on operations for reduced climate impacts as opportunities arise**

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