Evaluation of Speed on Aircraft Noise

FAA Report to Congress – December 2020

Includes MIT Report ICAT-2020-03, April 2020

FAA Report to Congress

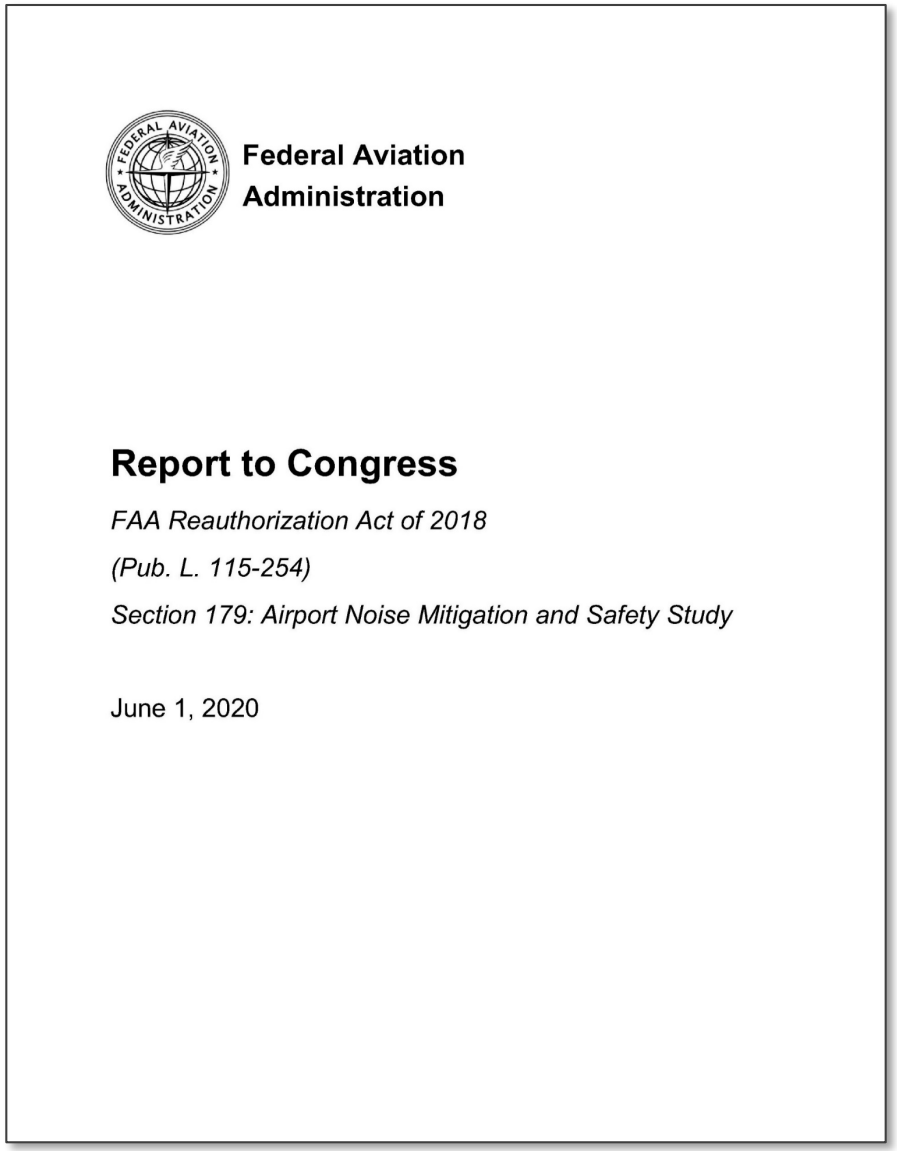
Provided to four members of Congress via letters on December 23, 2020

- Committee on Commerce, Science, and Transportation
  - Roger Wicker (R-MS), Chairman
  - Maria Cantwell (D-WA), Ranking Member
- Committee on Transportation and Infrastructure
  - Peter A. DeFazio (D-OR), Chairman
  - Sam Graves (R-MO), Ranking Member

Presentation Outline

- FAA Reauthorization Act of 2018, Section 179
- Aircraft Noise Sources
- Takeoff Noise
- Approach Noise
- Report Conclusions

https://www.faa.gov/about/plans_reports/congress/media/Airport_Noise_Mitigation_Safety_Study_report_PL115-254_Sec179.pdf



Federal Aviation Administration

Report to Congress

FAA Reauthorization Act of 2018

(Pub. L. 115-254)

Section 179: Airport Noise Mitigation and Safety Study

June 1, 2020

FAA Reauthorization Section 179 Requirements

1. Review and evaluate existing studies and analyses of the relationship between jet aircraft approach and takeoff speeds and corresponding noise impacts on communities surrounding airports
2. Determine whether a decrease in jet aircraft approach or takeoff speeds results in significant aircraft noise reductions
3. Determine whether the jet aircraft approach or takeoff speed reduction necessary to achieve significant noise reductions jeopardizes aviation safety; or decreases the efficiency of the National Airspace System, including lowering airport capacity, increasing travel time, or increasing fuel burn
4. Determine the advisability of using jet aircraft approach or takeoff speeds as a noise mitigation technique
5. Determine whether any metropolitan areas specifically identified in Section 189 (b)(2) of the Act would benefit without significant impact to aviation safety or the efficiency of the National Airspace System

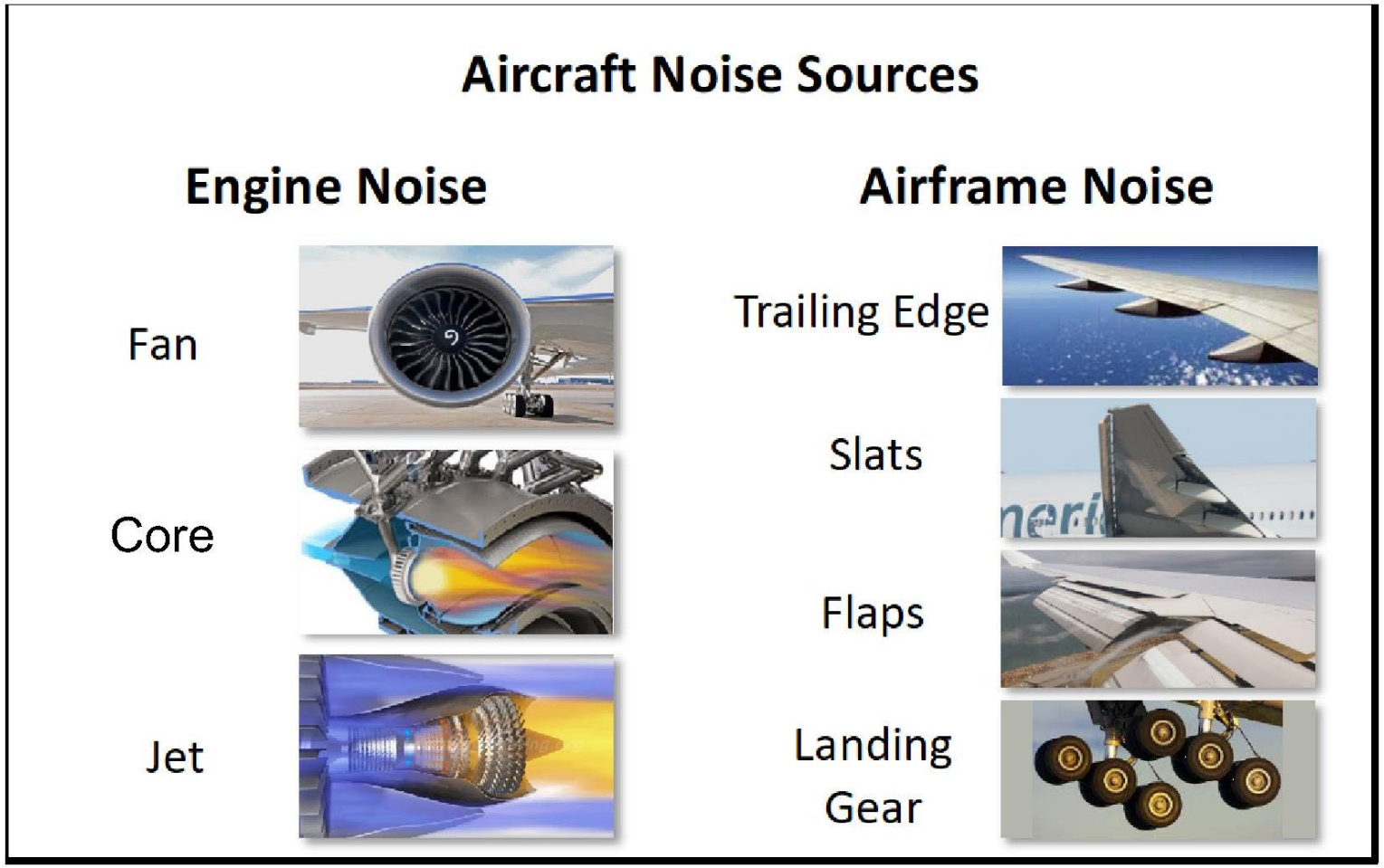


Fig. 1 Primary Conventional Turbofan Aircraft Noise Sources

Source: *Evaluation of the Impact of Transport Jet Aircraft Approach and Departure Speed on Community Noise*, MIT International Center for Air Transportation Report No. ICAT-2020-03, April 2020.

Aircraft Noise Sources

Takeoff Noise

- Engines continue to be the dominant noise source during jet aircraft takeoffs
- Engine noise increases with:
  - Increased power setting
  - Increased difference between:
    - Speed of the high velocity jet airflow
    - Speed of the aircraft
- MIT evaluated the following jet aircraft takeoff scenarios with NASA's Aircraft Noise Prediction Program (ANOPP)
  - "Close-In" Noise Abatement Departure Profile (NADP 1) vs "Distant" Noise Abatement Departure Profile (NADP 2)
  - Reduced climb speed to maintain the aircraft at the minimum safe airspeed with flaps up until 10,000 feet in altitude

Takeoff Noise

Two jet aircraft takeoff scenarios evaluated:

1. Changing the location of the start of acceleration and flap retraction through NADPs
2. Reduced climb speed to maintain the aircraft at the minimum safe airspeed with flaps up until 10,000 feet in altitude

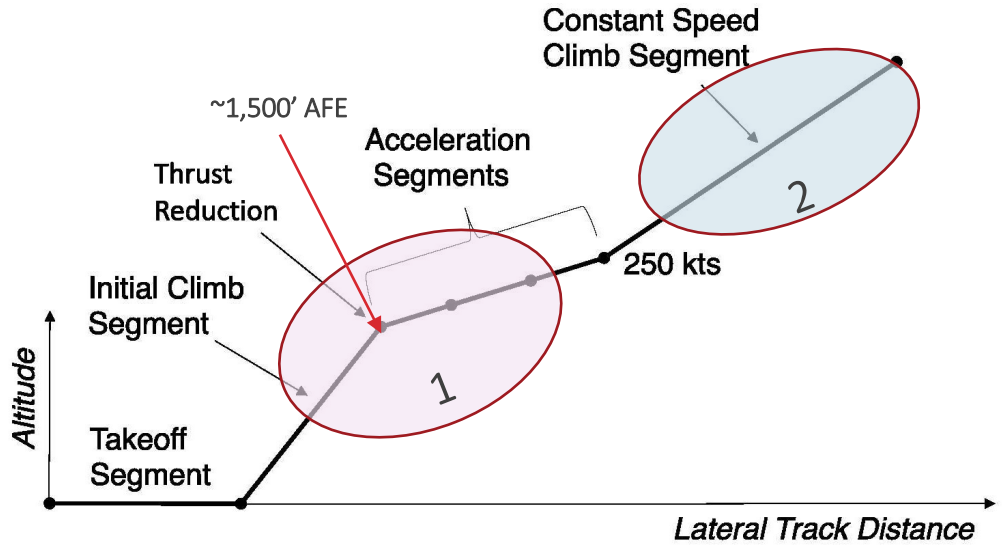


Fig. 4 Typical Departure Procedure Divided into Segments, Consistent with NADP 2.

Sources: (1) *Evaluation of the Impact of Transport Jet Aircraft Approach and Departure Speed on Community Noise*, MIT International Center for Air Transportation Report No. ICAT-2020-03, April 2020. (2) HMMH annotations (red arrow and red outlined ellipses).

Results of Takeoff Noise Evaluation

1. NADP Evaluation

Changes in the acceleration location on departure results in minimal (likely not noticeable) noise reduction

2. Reduced Climb Speed

Because the noise is dominated by the engines during the climb, the climb speed does not have a significant effect on noise

Approach Noise

- Airframes have become a more dominant noise source during jet aircraft approaches
- Airframe noise sources are highly sensitive to aircraft speed and speed is tightly coupled to the deployment of flaps, slats and landing gear
- MIT evaluated a delayed deceleration approach (DDA) concept with NASA's Aircraft Noise Prediction Program (ANOPP)

Pros and Cons of DDA Concept

Pros

- Reduced noise from engines and airframes 10 to 25 miles from touch down
- Reduced fuel burn due to:
  - Reduced flight times
  - Lower engine thrust settings

Cons

- Ideal deceleration profile varies by:
  - Aircraft type
  - Weight
  - Weather
- Varying deceleration rates poses a challenge to air traffic controllers in terms of:
  - Sequencing
  - Spacing

Report Conclusions

- Takeoff
  - Changes in aircraft climb speed after initial acceleration do not noticeably affect the overall aircraft takeoff noise due to the dominance of engine noise
- Approach
  - Delaying the deceleration of the aircraft on approach could reduce noise between 4 and 8 dB (noticeable) 10 to 25 miles from touch down
  - Additional work is required to validate this potential noise benefit and resolve implementation challenges

Questions/Discussion

Presented by Gene Reindel, HMMH Vice President