CHICAGO
MAYOR LORI E. LIGHTFOOT

AIRCRAFT NOISE PROFILES

ONCC Ad Hoc Daytime Noise Subcommittee

September 15, 2022

CDA
Chicago Department of Aviation

O'HARE
INTERNATIONAL AIRPORT

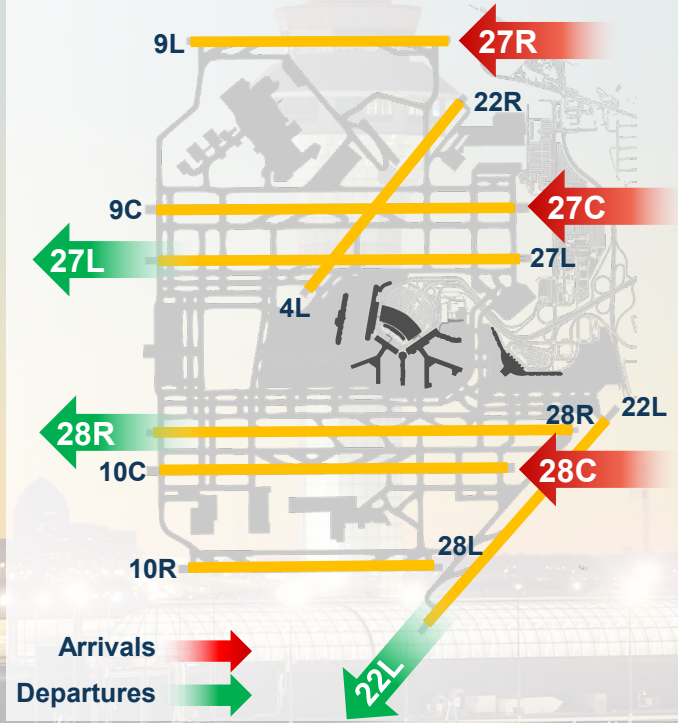
OVERVIEW

- Review of Daytime Operations
- Lmax noise metric
- FAA Part 36 Noise Standards
- O’Hare Aircraft Noise Comparison
- Engines
- Airframes

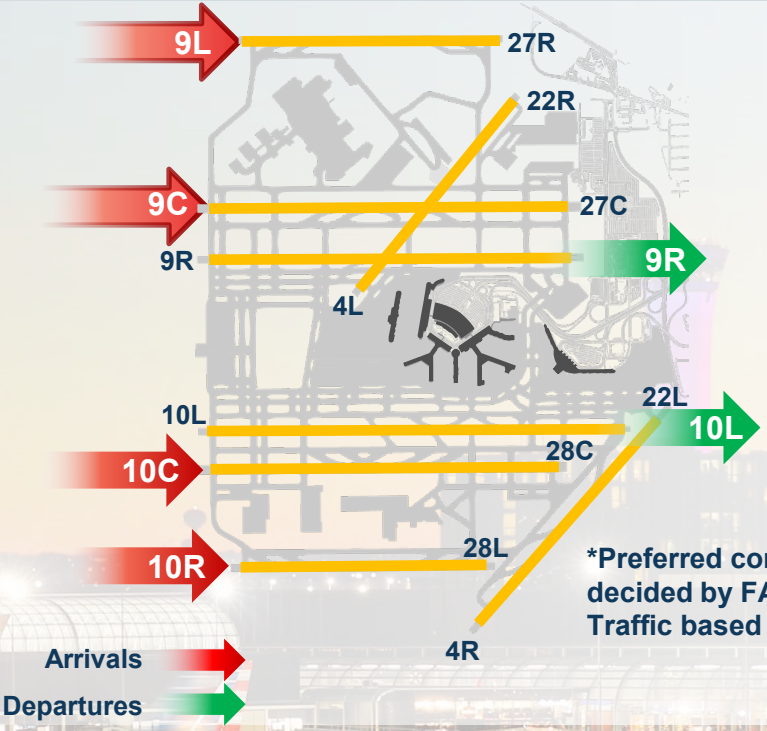
REVIEW
O'HARE DAYTIME RUNWAY CONFIGURATIONS

FAA decides how runways are used

WEST FLOW



EAST FLOW



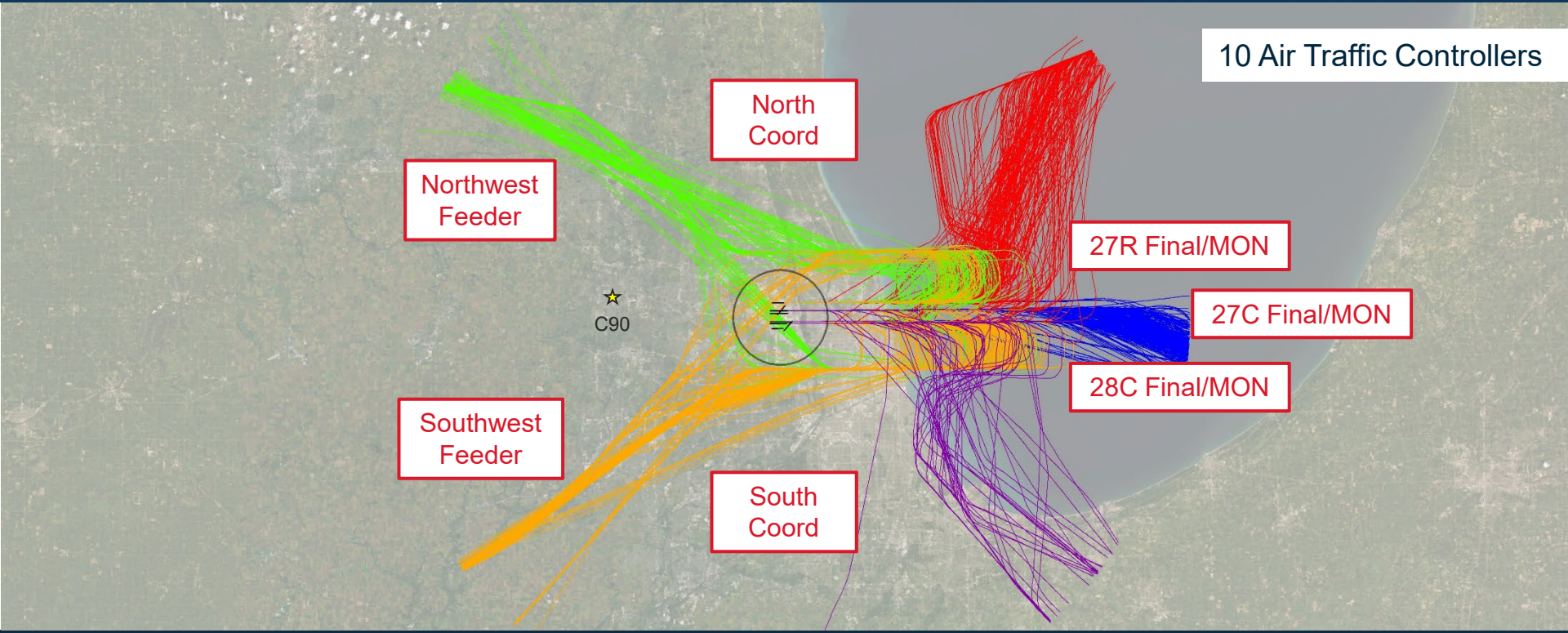
Only arriving 3 Runways at a time

Multiple arrival runway combinations:

- 9L, 9C, 10C
- 9L, 9C, 10R
- 9L, 10C, 10R*
- 9C, 10C, 10R*

*Preferred combinations, decided by FAA Air Traffic based on demand

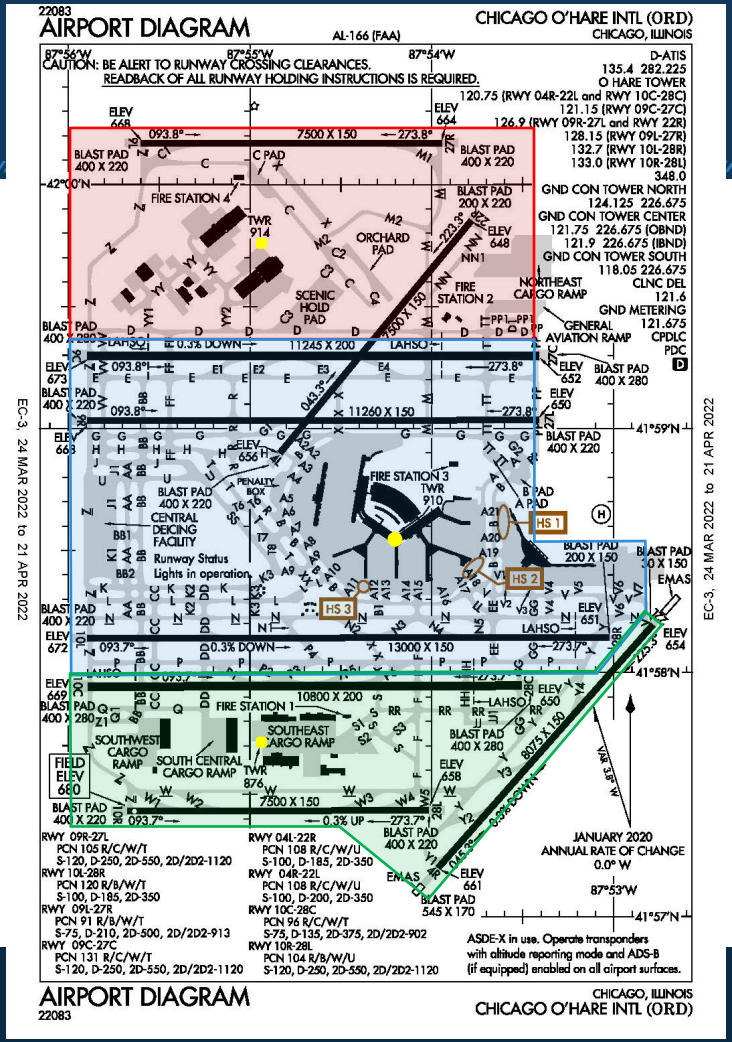
REVIEW
WEST FLOW ARRIVALS



REVIEW
AIR TRAFFIC CONTROL TOWERS

- North Tower – two controllers
- South Tower – two controllers
- Main Tower– five controllers

- **9** Total Local Air Traffic Controllers



REVIEW
AIR TRAFFIC CONFIGURATION CHANGES

Wind Patterns

- **Historically winds favor an east/west traffic flow approx. 94% of the time.**
  - East 37% and West 57%
- **The remaining 6% are conditions where some form of north/south flow could exist.**
  - North 2% and South 4%
- **In 2021 the conditions triggered the approx. configuration breakdown of:**
  - East: 42% West: 58% North: <1% South: 1%

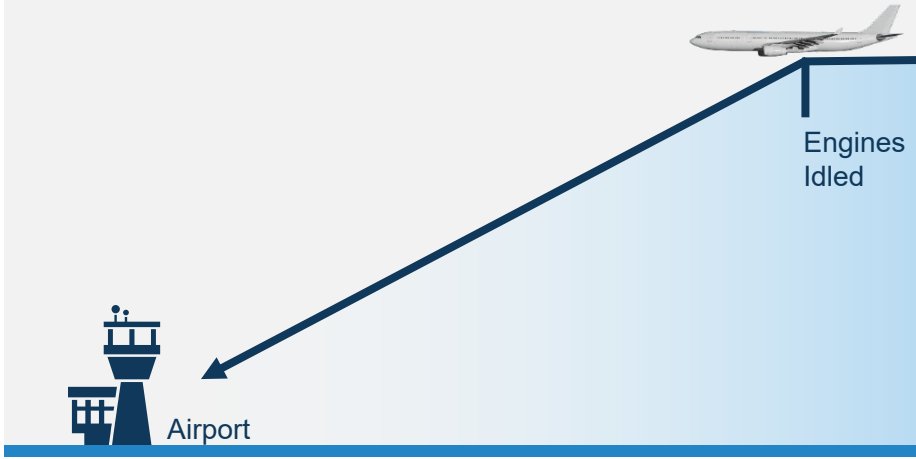
Execution

- **A configuration change involves coordination with numerous entities responsible for the safety and integrity of the National Airspace System.**
  - KORD ATCT, Chicago TRACON, Chicago ARTCC, FAA ATCSCC
- **Other expertise included as needed:**
  - National Weather Service forecast units (CWSU, ATCSCC Forecasters, etc.)

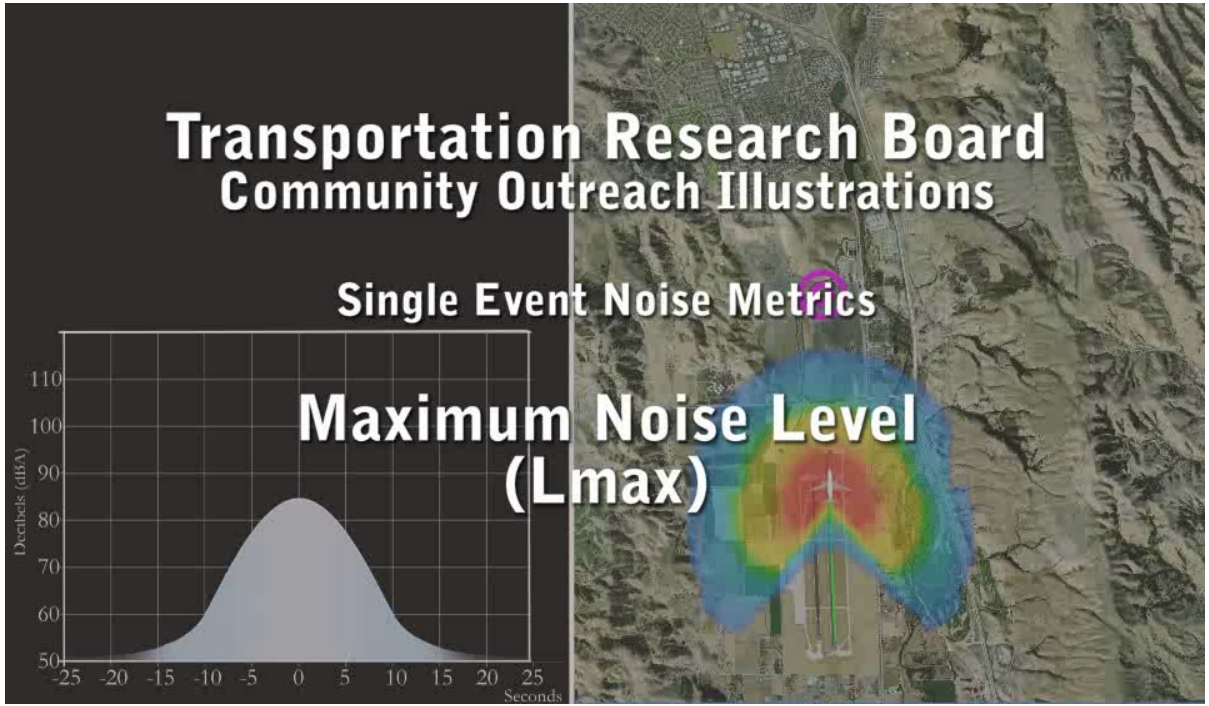
REVIEW
OPTIMIZED PROFILE DESCENT (OPD)

Traditional Level Off Approach

Optimized Profile Descent



L_{MAX} – MAXIMUM SOUND LEVEL

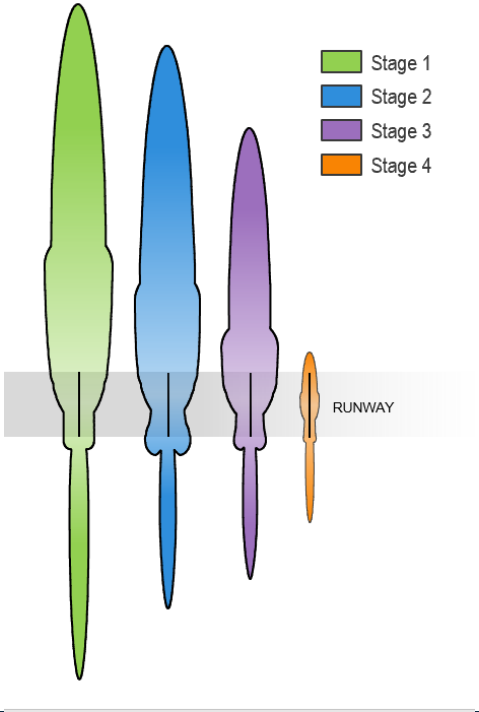


FAA PART 36
"NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION"

- Aircraft must meet Part 36 standards to receive new or revised "type" or "airworthiness" certificates to operate in the U.S.

- Noise standards for most aircraft are defined in terms of "stages."
  - Stage 1 – *Prohibited since 1985*
  - Stage 2 – *Phased out in 2000*
  - Stage 3
  - Stage 4
  - Stage 5 – *Approved in 2017*

- Most jets in operation today are Stage 3, Stage 4, and Stage 5 aircraft with much quieter engines. According to an August 2020 Government Accountability Office (GAO) report, the majority of U.S. commercial and general aviation aircraft in operation today are able to meet Stage 4 or 5 standards.



AIRCRAFT NOISE COMPARISON

B787-800

65 Lmax Area (in sq. mi.)

17.4

B737-800

65 Lmax Area (in sq. mi.)

31.6

Source: Aviation Environmental Design Tool (AEDT) Version 3e

65 Lmax **75 Lmax**

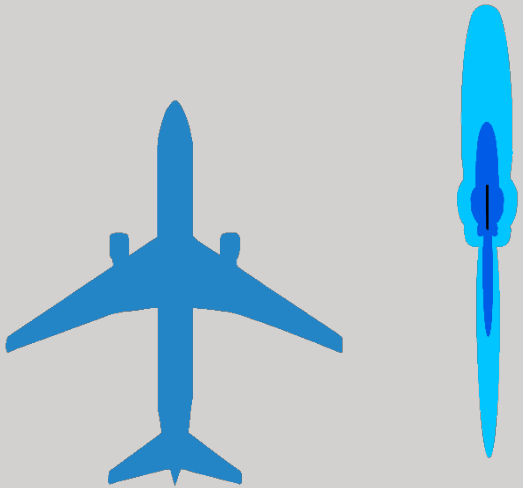
AIRCRAFT NOISE COMPARISON

B787-800

65 Lmax Area (in sq. mi.)

17.4

B767-300



65 Lmax Area (in sq. mi.)

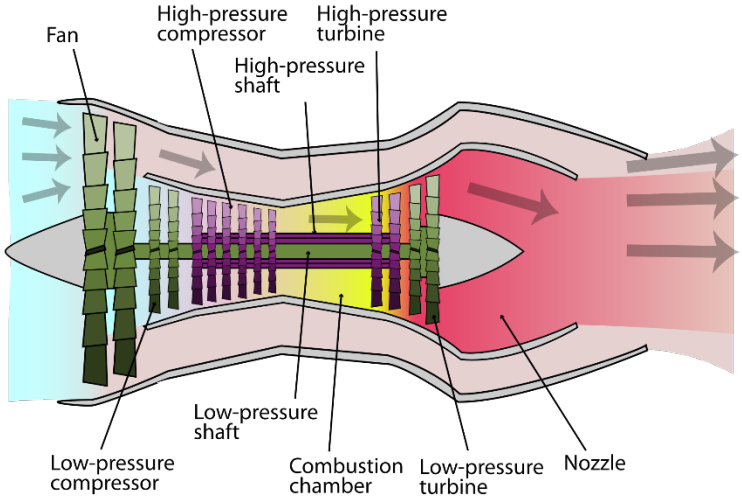
49.7

Source: Aviation Environmental Design Tool (AEDT) Version 3e

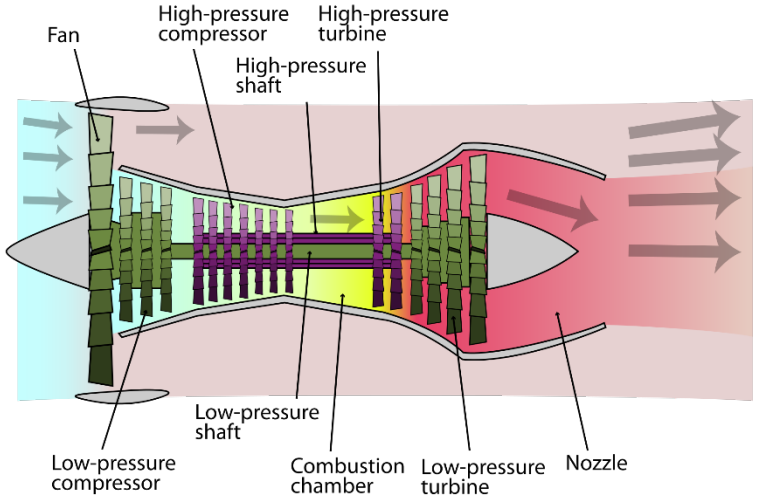
65 Lmax **75 Lmax**

AIRCRAFT NOISE COMPARISON
ENGINES

Low-bypass Engine



High-bypass Engine



AIRCRAFT NOISE COMPARISON
ENGINES

Boeing 737-200

Boeing 737-200 Hush Kit

Boeing 737-800 MAX

AIRCRAFT NOISE COMPARISON
ENGINES

- Chevrons

Boeing 787-800

Boeing 747-800

AIRCRAFT NOISE COMPARISON
AIRFRAMES

- Airframe noise
  - Slats
  - Flaps
  - Landing Gear

NASA's Supercomputer to Cut Aircraft Noise
Watch later
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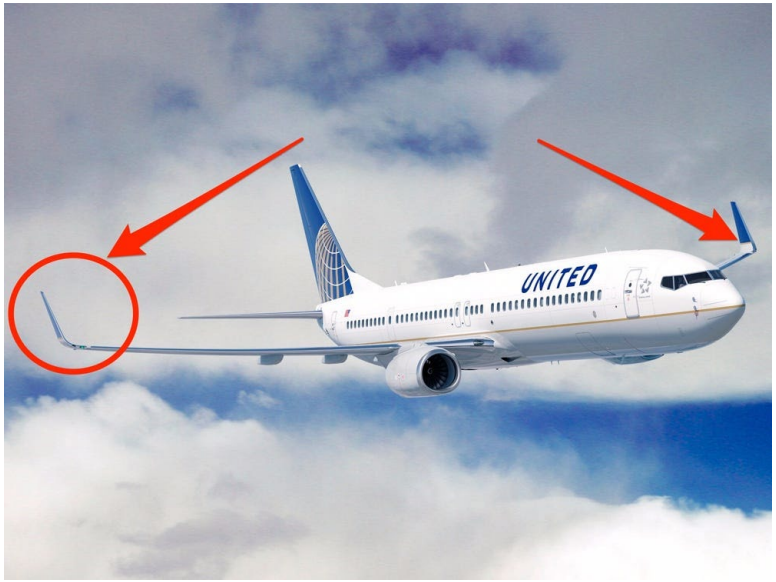
AIRCRAFT NOISE COMPARISON
AIRFRAMES

- NASA Technology May Reduce Airframe Noise During Landing
  - Landing Gear Noise Reduction technology (LGNR) that includes landing gear fairing that are porous with small holes that create less noise
  - Flexible trailing-edge wing flaps that improve aerodynamic efficiency and reduce noise

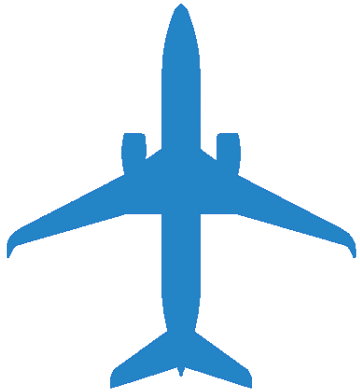
AIRCRAFT NOISE COMPARISON
AIRFRAMES

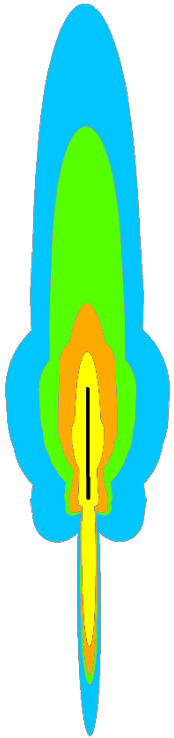
- Winglets provide better takeoff performance and allow a steeper climb.

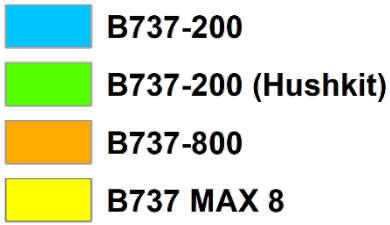


AIRCRAFT NOISE COMPARISON

Boeing 737 - 75 Lmax contours



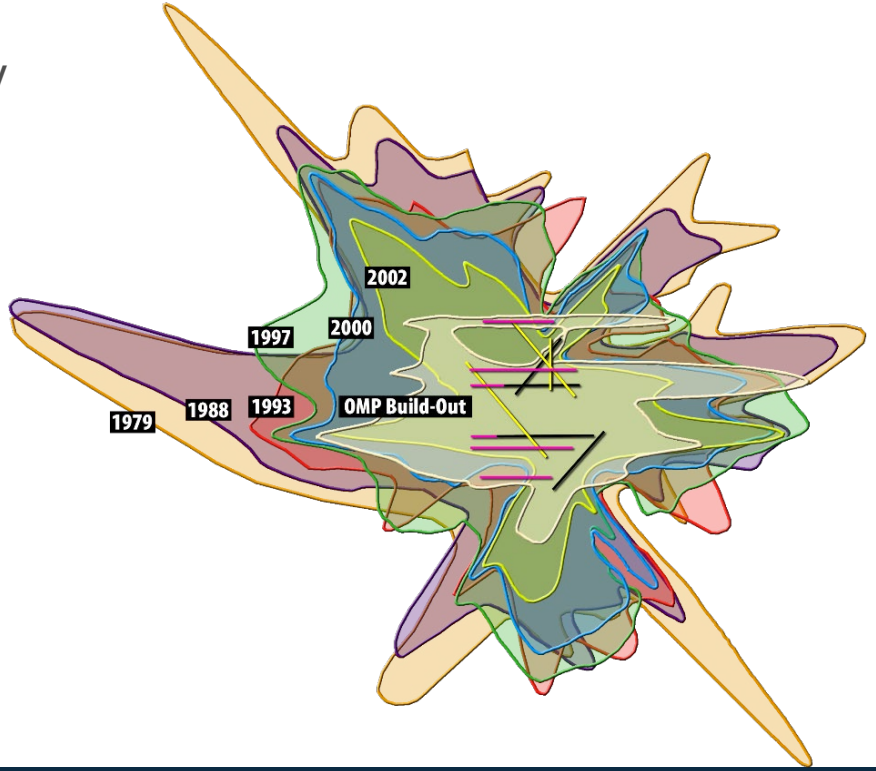




Source: Aviation Environmental Design Tool (AEDT) Version 3e

AIRCRAFT NOISE REDUCTION

- Aircraft noise has decreased considerably around airports nationwide
  - The introduction of modern turbojets and turbofan engines
  - The retirement of older and noisier aircraft
  - New noise standards and regulations
  - A range of new technologies



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O'HARE & MIDWAY

INTERNATIONAL AIRPORTS

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