## Stage 2 Aircraft -Hush kitted to satisfy minimum Stage 3 certification criteria



DC-9-15 Take-off: 95.8 to 96.8 EPNdB Sideline: 99.5 to 100.5 EPNdB Approach: 99.4 EPNdB

The **McDonnell Douglas DC-9** is used by Airborne Express.

**B727-200** (Cargo) Take-off: 89.2 to 99.6 EPNdB Sideline: 96.5 to 99.5 EPNdB Approach: 97.2 to 99.9 EPNdB

The **Boeing 727** is used by Capital Cargo, Champion Air, and Kalitta Flying Service.

As of January, 2000 Stage 2 aircraft were phased out or could no longer be used in revenue service at U.S. airports. According to U.S. transition regulations codified in 14 CFR 91.801 through 91.877, hush-kit modification became an appropriate method to comply with Stage 3 aircraft noise limitation standards. Stage 2 phase-out applied to (subsonic) civil aircraft over 75,000 pounds.

## Stage 3 Aircraft



**A300-600** (Cargo) Take-off: 88,0 to 93.1 EPNdB Sideline: 97.9 to 98.3 EPNdB Approach: 101.3 to 101.9 EPNdB

The **Airbus A306 all** cargo version is used by FedEx and UPS.



A310 (Cargo) Take-off: 85,7 to 92.9 EPNdB Sideline: 94,8 to 96.5 EPNdB Approach: 98.5 to 100.6 EPNdB

The Airbus A310 all cargo version is used by FedEx.





A319 Take-off: 78,5 to 87.5 EPNdB Sideline: 91,4 to 94.9 EPNdB Approach: 93.7 to 94.8 EPNdB

The **Airbus A318** and **319** are used by American, Air Canada, Delta, Frontier, Spirit and United.





A320 Take-off: 84 to 88 EPNdB Sideline: 92.8 to 95.2 EPNdB Approach: 95.5 to 96.6 EPNdB

The **Airbus A320** is used by American, JetBlue, Frontier and United.



### A 321

Take-off: 81.8 to 89.8 EPNdB Sideline: 95.2 to 97.9 EPNdB Approach: 95.1 to 96.6 EPNdB

The **Airbus A321** is used by American, Delta, JetBlue, Frontier, Skywest and United.



### A 332

Take-off: 88.2 to 95.6 EPNd Sideline: 97.5 to 98.6 EPNdB Approach: 97.3 to 98.0 EPNdB

#### A 333

Take-off: 87.6 to 94.3 EPNd Sideline: 98.6 to 98.3 EPNdB Approach: 97.3 to 98.0 EPNdB

The **Airbus A332** and **333** are used by American and Delta.

### B 737-200

Take-off: 84.6 to 91.9 EPNdB Sideline: 94.8 to 97.7 EPNdB Approach: 95.9 to 98.3 EPNdB

The **Boeing 737-**200 is used by Delta.



**B 717-200** Take-off: 79.6 to 84.0 EPNdB Sideline: 89.2 to 91.7 EPNdB Approach: 91.3 to 92.1 EPNdB

The **Boeing 717-200** is used by Delta.





### B 737-300

Take-off: 81.6 to 87.5 EPNdB Sideline: 89.2. to 91.2 EPNdB Approach: 97.4 to 100.1 EPNdB

The **Boeing 737-300** is used by Southwest.



## B 737-400

Take-off: 82.4 to 88.9 EPNdB Sideline: 89,6 to 93.2 EPNdB Approach: 97.7 to 100.2 EPNdB

The **Boeing 737-400** is used by Alaska and Miami Air



**B737-500** Take-off: 80.4 to 87.7 EPNdB Sideline: 88.2 to 90.8 EPNdB Approach: 97.2 to 100.0 EPNdB The **Boeing 737-500** is used by Sierra Pacific .



**B737-600** Take-off: 80.2 to 85.4 EPNdB Sideline: 88.7 to 92.9 EPNdB Approach: 95.5 to 95.8 EPNdB

The **Boeing 737-500** is used by Westjet.



**B737-700** Take-off: 80.3 to 88.6 EPNdB Sideline: 89.2 to 95.5 EPNdB Approach: 95.8 to 96.2 EPNdB

The **Boeing 737-700** is used by Alaska, Sun Country, Southwest, United and Westjet.

**B737-900** Take-off: 85.1 to 88.4 EPNdB Sideline: 91.8 to 94.7 EPNdB Approach: 96.4 EPNdB

The **Boeing 737-900** is used by Delta and United.



**B737-800** 91.4 EPNdB

Sideline: 91.8 to 95.5 EPNdB Approach: 96.4 to 96.8 EPNdB

**Boeing 737-800** is used by American, Alaska, Casino Express, Delta, Miami Air, Sun Country, Southwest, United and Westjet.

### B747-400

Take-off: 88.7 to 99.2 EPNdB Sideline: 98.0 to 99.8 EPNdB Approach: 102.4 to 107.0 EPNdB

The **Boeing 747-400** is use by British Airways and Kalitta Air. When Lufthansa ended operating the **Airbus A340** in February 2004, British Airways re-introduced the **Boeing 747**-400 powered by RB211-524G engines.







**B757-200** Take-off: 79.4 to 91.4 EPNdB Sideline: 93.7 to 95.1 EPNdB Approach: 95.0 to 100.3 EPNdB

The **Boeing 757-200** is used by American, Delta and United. The cargo version by FedEx and UPS.



### B757-300

Take-off: 84.0 to 88.4 EPNdB Sideline: 93.9to 95.2 EPNdB Approach: 95.2 to 95.4 EPNdB

The **Boeing 757-300** is used by Delta and United.



**B767-200** Take-off: 81.6 to 91.4 EPNdB Sideline: 93.3 to 97.2 EPNdB Approach: 95.7 to 101.9 EPNdB

The **Boeing 767-200** cargo versions are used by Airborne Express and Air Transport International.



#### B767-300

Take-off: 79.4 to 84.6 EPNdB Sideline: 94.3 to 99.0 EPNdB Approach: 98.4 to 101.7 EPNdB

The **Boeing 767-200** is used by American, Delta Hawaiian. The cargo version is used by Airborne Express, Air Transport International, FedEx and UPS.



B767-400

Take-off: 85.5 to 91.2 EPNdB Sideline: 96.8 to 91.2 EPNdB Approach: 97.6 to 98.7 EPNdB

The **Boeing 767-400** is used by Delta.



**B777-200** Take-off: 84.9 to 94.3 EPNdB Sideline: 94.2 to 98.4 EPNdB Approach: 97.6 to 99.5 EPNdB

The **Boeing 777-200** is used by Delta.



**B787-800** Take-off: 81.6 to 89.0 EPNdB Sideline: 90.1 to 91.9 EPNdB Approach: 96.8 to 99.6 EPNdB The General Electric GEnx-1B engines satisfy Stage 5 noise limits.

The **Boeing 787-800** is used by American.







DC-10 (Cargo) Take-off: 100.0 to 100.1 EPNdB Sideline: 96.4 to 96.5 EPNdB Approach: 105.9 EPNdB

#### McDonnell Douglas

DC-10 is used by FedEx.



MD-80 Series Take-off: 84.1 to 89.7 EPNdB\* Sideline: 95.9 to 97.1 EPNdB\* Approach: 92.9 to 93.3 EPNdB\*

MD-82 is used by American, Aeromexico, Alaska, and Midwest Express.
MD-83 is used by American, Aeromexico, and Alaska.
MD-87 is used by Aeromexico.
MD-88 is used by Delta.



MD-90 Take-off: 77.2 to 84.2 EPNdB Sideline: 88.8 to 91.4 EPNdB Approach: 91.7 to 91.9 EPNdB

McDonnell Douglas MD-90 is used by Delta







# **Military Aircraft**

#### ERJ 135

Take-off: 77.9 EPNdB Sideline: 84.4 EPNdB Approach: 92.3 EPNdB

The **Embraer Regional Jet 135** is used by Continental Express

ERJ 145 Take-off: 77.9 to 79.4 EPNdB Sideline: 84.4 to 84.6 EPNdB Approach: 92.3 to 92.5 EPNdB

The **Embraer Regional Jet 145** is used by Continental Express

**CRJ 700** Take-off: 78.7 EPNdB Sideline: 82.4 EPNdB Approach: 92.1 EPNdB

The **Canadair Regional Jet 700** is used by Sky West



**CRJ 200** Take-off: 78.7 EPNdB Sideline: 82.4 EPNdB Approach: 92.1 EPNdB

The **Canadair Regional Jet 200** is used by Mesa Airlines and Sky West



**CRJ 900** Take-off: 82.7 to 84.5 EPNdB Sideline: 82.1 to 89.4 EPNdB Approach: 92.6 EPNdB

The **Canadair Regional Jet 900** is used by Mesa Airlines and Sky West



**Boeing KC-135R** version that has CFM56 Stage3 compliant engines.

The KC-135B, equivalent to a civil Stage2 compliant aircraft, was flown by the Arizona Air National Guard prior to April of 2005, when the 161st Operation Group (Arizona Air National Guard) completed the conversion of the tanker fleet to the KC-135R version.

EPNdb = Effective Perceived Noise Level. This is a measure used for certification of large transport planes according to Federal Aviation Regulations (FAR) Part 36. The regulation requires that measurements are taken under standardized conditions, taking into account topography, meteorology, aircraft position, engine models, power, flap settings, aircraft weights and the angles to microphones on the ground. The measurements are taken separately for the take-off phase, for over flight and for the approach phase. DNL = Day Night Level. This is a weighted averaged measure of predicted noise exposure levels around an airport based on computer modeling, where predominant flight paths and the mix of all aircraft types expected to be using the airport in the future are factored in to make the forecast.

EPNdb source: FAA AC 36-1H Appendix 1.