Washington Dulles International Airport (IAD) Noise Contour Map Update

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Purpose

• Update the Dulles Airport noise contour map to incorporate changes in the aviation environment so that the future vision reflects these changes.

  - Flight tracks and overall utility of the airfield have evolved
  - Evolution will continue with implementation of NextGen
  - Flight procedures will soon allow for triple simultaneous runway operations during low visibility conditions (IFR)
Introduction

Note: Loudoun County does not use the DNL 70 and 75 contours to define their Aircraft Noise Impact Overlay District. Loudoun County also applies a 1 mile buffer around the DNL 60 contour line, which is not depicted on the map.

Source: Google Earth (aerial photography); Loudoun County Open Geospatial Data (noise overlay contours; county boundary); Fairfax County Open Geospatial Data (noise overlay contours; county boundary), March 2018.
What is a DNL Noise Contour?

- **DNL – Day-Night Average Sound Level**
  - Represents average noise for a 24-hour period
  - Provides 10 dB weighting factor for nighttime (10:00 pm to 6:59 am) operations

- **DNL Contour** – a line representing equal DNL, similar to a terrain contour representing equal elevation levels
Noise Contours

• Represent average annual noise rather than at a specific moment or over a given day
• Highlight existing or potential areas of significant aircraft noise exposure as defined by the FAA
• Assess the relative aircraft noise exposure of different runway and/or flight corridor alternatives to compare potential noise impacts of various alternatives
• Provide guidance for land use planners in the development of land use control measures, such as zoning ordinances, subdivision regulations, building codes, and airport overlay zones
<table>
<thead>
<tr>
<th>Land Use</th>
<th>Yearly day-night sound level (Ldn) in decibels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;65</td>
</tr>
<tr>
<td>Residential (SFD, SFA, MFA)</td>
<td>✓</td>
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<tr>
<td>Public Use (schools)</td>
<td>✓</td>
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<tr>
<td>Public Use (hospitals, nursing homes, churches, auditoriums and</td>
<td>✓</td>
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<tr>
<td>concert halls)</td>
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<tr>
<td>Public Use (transportation)</td>
<td>✓</td>
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<tr>
<td>Public Use (parking)</td>
<td>✓</td>
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<tr>
<td>Commercial Use (offices, business, professional, retail trade,</td>
<td>✓</td>
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<tr>
<td>communication)</td>
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<tr>
<td>Commercial Use (wholesale, retail- building materials, hardware</td>
<td>✓</td>
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<tr>
<td>and farm equipment, utilities)</td>
<td></td>
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<tr>
<td>Manufacturing (general)</td>
<td>✓</td>
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<tr>
<td>Manufacturing (livestock farming and breeding)</td>
<td>✓</td>
</tr>
<tr>
<td>Recreational (outdoor sports arenas and spectator sports)</td>
<td>✓</td>
</tr>
<tr>
<td>Recreational (outdoor music shells, amphitheaters)</td>
<td>✓</td>
</tr>
<tr>
<td>Recreational (amusements, parks, resorts and camps)</td>
<td>✓</td>
</tr>
<tr>
<td>Recreational (golf courses, riding stables and water recreation)</td>
<td>✓</td>
</tr>
</tbody>
</table>
### Table 1—Land Use Compatibility* With Yearly Day-Night Average Sound Levels

<table>
<thead>
<tr>
<th>Land use</th>
<th>Yearly day-night average sound level (L_{da}) in decibels</th>
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<tbody>
<tr>
<td></td>
<td>Below 65</td>
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<tr>
<td><strong>Residential</strong></td>
<td></td>
</tr>
<tr>
<td>Residential, other than mobile homes and transient lodgings.</td>
<td>Y</td>
</tr>
<tr>
<td>Mobile home parks</td>
<td>Y</td>
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<tr>
<td>Transient lodgings</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Public Use</strong></td>
<td></td>
</tr>
<tr>
<td>Schools</td>
<td>Y</td>
</tr>
<tr>
<td>Hospitals and nursing homes</td>
<td>Y</td>
</tr>
<tr>
<td>Churches, auditoriums, and concert halls</td>
<td>Y</td>
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<tr>
<td>Governmental services</td>
<td>Y</td>
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<tr>
<td>Transportation</td>
<td>Y</td>
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<tr>
<td>Parking</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Commercial Use</strong></td>
<td></td>
</tr>
<tr>
<td>Offices, business and professional</td>
<td>Y</td>
</tr>
<tr>
<td>Wholesale and retail—building materials, hardware and farm equipment.</td>
<td>Y</td>
</tr>
<tr>
<td>Retail trade—general</td>
<td>Y</td>
</tr>
<tr>
<td>Utilities</td>
<td>Y</td>
</tr>
<tr>
<td>Communication</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Manufacturing and Production</strong></td>
<td></td>
</tr>
<tr>
<td>Manufacturing, general</td>
<td>Y</td>
</tr>
<tr>
<td>Photographic and optical</td>
<td>Y</td>
</tr>
<tr>
<td>Agriculture (except livestock) and forestry</td>
<td>Y</td>
</tr>
<tr>
<td>Livestock farming and breeding</td>
<td>Y</td>
</tr>
<tr>
<td>Mining and fishing, resource production and extraction</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Recreational</strong></td>
<td></td>
</tr>
<tr>
<td>Outdoor sports arenas and spectator sports</td>
<td>Y</td>
</tr>
<tr>
<td>Outdoor music shells, amphitheaters</td>
<td>Y</td>
</tr>
<tr>
<td>Nature exhibits and zoos</td>
<td>Y</td>
</tr>
<tr>
<td>Amusements, parks, resorts and camps</td>
<td>Y</td>
</tr>
<tr>
<td>Golf courses, riding stables and water recreation.</td>
<td>Y</td>
</tr>
</tbody>
</table>

Numbers in parentheses refer to notes.
IAD Noise Contours and Land Use Planning

• Aircraft noise, and its impact on regional communities, was a primary consideration during the planning of the airfield

• Long-range noise contours have been a resource and an aid toward the development of compatible land use

• Land use planning based upon Potential Noise Contours
  – Represent long-range development at IAD
  – Account for maximum number of operations the runways can accept
Noise Contour Map Timeline

• 1985: FAA (airport operator at the time) conducted and completed a Title 14 Code of Federal Regulations (CFR) Part 150 – not “accepted” or “approved”
  – Loudoun and Fairfax Counties adopted the zoning overlay districts based on the contours developed by MWAA.

• 1988: FAA Expanded East Coast Plan – changed procedures and runway use at IAD

• 1990: Airport Noise and Capacity Act – require phase out of older/louder Stage 2 aircraft weighing more than 75,000 pounds
Noise Contour Map Timeline (continued)

• 1993: MWAA conducted a Noise Exposure Map (NEM) update
  – Calculated long range planning noise exposure contours – “Potential Noise Exposure” reflecting an ultimate build scenario
  – Loudoun and Fairfax Counties agreed to accept the Potential Noise Exposure contours for Land Use Planning

• 2005: FAA prepared the new runways EIS
Noise Contour Map Defined

• The noise contour map will be developed based on a potential scenario(s) which are encountered during or at full-build of the Airport.
Noise Contour Map Timeline (continued)

1985 Potential Noise Contours

1993 Potential Noise Contours
Fairfax and Loudoun County Zoning

• Since 1985, Loudoun and Fairfax Counties have applied Potential Noise Contours recommended by MWAA as a tool for effective land use planning and zoning for long-term compatibility with IAD.

• IAD in partnership with Fairfax and Loudoun Counties is often used as a model for effective planning and zoning related to compatible development for the aerotropolis concept.

• Other major airports, such as DFW, were built in less-populated areas but over time became surrounded by more dense population.

• Several airports are using an approach similar to IAD and the surrounding communities to prevent residential incompatibility:
  – Portland International Airport
  – Orlando International Airport
  – Phoenix-Mesa Gateway Airport
Loudoun County Zoning

• Established the Airport Impact Overlay District in 1993
• Recognized as a national leader in airport-compatible land use planning for adopting its Airport Impact Overlay District
• Uses IAD Potential Noise Contours calculated for the full-build 5 runway layout to define the Airport Impact Overlay District.

Source: Loudoun County, Virginia, Zoning Ordinance, AI-Airport Impact Overlay District § 4-1400.
Loudoun County Zoning (continued)

Residential Limitations:

– **Areas outside of, but within one (1) mile of the DNL 60:**
  Disclosure statement that the home is located within an area that will be impacted by aircraft overflights and aircraft noise.

– **Areas between the DNL 60-65 aircraft noise contours:**
  • Disclosure statement that the home is located within an area that will be impacted by aircraft overflights and aircraft noise.
  • Incorporate acoustical treatment into all dwelling units to ensure that interior noise levels within living spaces do not exceed DNL 45.
  • Prior to issuing a zoning permit for a residential lot, owner(s) of such parcel(s) shall dedicate an avigation easement to MWAA, indicating the right of flight to pass over the property, as a means to securing the long-term economic viability of IAD.

Source: Loudoun County, Virginia, Zoning Ordinance, AI-Airport Impact Overlay District § 4-1400.
Loudoun County Zoning (continued)

Residential Limitations (continued):

– **Areas of DNL 65 or higher aircraft noise contours:**
  
  • Residential units are not permitted, however;
  
  • New dwelling units and additions to existing may be permitted provided:
    
    – lot was recorded or had record plat approval prior to the effective date of adoption of this Ordinance
    
    – new dwelling unit or addition complies with the acoustical treatment requirements for residential districts set forth in the Virginia Uniform Statewide Building Code.

– No building or other structure shall be located in a manner or built to a height which constitutes a hazard to aerial navigation.

Source: Loudoun County, Virginia, Zoning Ordinance, AI-Airport Impact Overlay District § 4-1400.
Loudoun County Zoning (continued)

- Envision Loudoun: A New Comprehensive Plan that will serve as Loudoun County government’s guiding document for land use for the foreseeable future
Fairfax County Zoning

- Updated the Airport Impact Overlay District in 1993 based on largest extents of the amended FAR Part 150 Study and the potential post 2000 noise contours
- Uses airport impact overlay to define construction requirements for new residential units
- Provides compatibility table for different types of uses

Source: Fairfax County, Virginia, Zoning Ordinance, Airport Noise Impact Overlay District § 7-400.
Fairfax County Zoning (continued)

Residential Limitations:

– **Areas between the DNL 65-70 aircraft noise contours:**
  Permitted only with acoustical treatment to achieve interior noise levels within living spaces that do not exceed DNL 45.

– **Areas between the DNL 70-75 aircraft noise contours:**
  Permitted only with acoustical treatment to achieve interior noise levels within living spaces that do not exceed DNL 45.

– **Areas within the DNL 75 aircraft noise contours:**
  • New units: Not permitted.
  • Additions to existing units and new units on certain lots: permitted only with acoustical treatment to achieve interior noise levels within living spaces that do not exceed DNL 45.

Source: Fairfax County, Virginia, Zoning Ordinance, Airport Noise Impact Overlay District § 7-400.
Fairfax County Comprehensive Plan

• Fairfax County’s Comprehensive Plan includes land use compatibility guidelines, and is used to establish the basis for land use decisions within the designated Dulles Airport Noise Impact Area.

• Areas with projected aircraft noise exposures exceeding DNL 60 according to the Dulles Airport Noise Impact Area are not recommended.

• Where new residential development does occur near Washington Dulles International Airport, disclosure measures should be provided.

• No structure shall be located in a manner or built to a height which constitutes a hazard to aerial navigation.

Fairfax County Dulles Suburban Center Study

- A land use planning study that will update recommendations for future land uses and development
Transformation Since 1993

- 2005: FAA IAD New Runways EIS (proposed Runway 1L-19R relocation from 3,400’ to 4,300’ from 1C-19C)
- 2005: Airport Begins Acquiring 800 ac. Of Additional Property
- 2008: Runway 1L-19R opened
- 2009: NextGen Area Navigation GPS Approaches/Departures Implemented
- 2014: FAA Washington, DC Metroplex Area Navigational Procedures
- 2017: FAA Begins Implementation Of Triple Simultaneous Arrival/Departure During IFR conditions
2005 FAA EIS – Potential Aircraft Noise Contour

2025 Alternative 3 Noise Contours compared to Loudoun/Fairfax County Noise Overlays
Transformation Since 1993 (continued)

Fleet Mix:

• Up-gauging of aircraft (e.g., from 50-seat regional jets to 70- and 90-seat aircraft, from 90-seat regional jets to 737 and A-320 aircraft)

• Introduction of very large aircraft (e.g., Airbus 380 and Boeing 747-800)

• Increasing percentage of quieter Stage 4 models in the fleet mix

• Cargo operations and facilities grow
Transformation Since 1993 (continued)

• Future Enhancements:
  – Simultaneous triple parallel runway approaches during low visibility conditions or Instrument Meteorological Conditions (IMC) at IAD
  – Wake turbulence separation reduction
  – Equivalent Lateral Spacing Operations (ELSO)
  – Required Navigation Performance (RNP) based procedures
Noise Contour Map Update Need

• Incorporate changes since the 1993 update critical to the region and the Airport
  – Significant Tool The Airport Uses To Assist Local Governments With Their Off-Airport Land Planning and Zoning Decisions

• Continue to ensure compatibility between the Airport and local jurisdictional land use
Changes to Incorporate

- New FAA procedures allow for simultaneous use of triple parallel runways during low visibility conditions
- Flight tracks due to NextGen enhancements
- Capacity improvements due to NextGen
- Airfield layout
- Changes in forecast Airport development related aircraft activity
Regional Population Growth - 2040
Regional Population Growth - 2045

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>5,486.5</td>
<td>5,793.6</td>
<td>6,043.6</td>
<td>6,274.3</td>
<td>6,488.7</td>
<td>6,686.6</td>
<td>6,888.4</td>
</tr>
<tr>
<td>Heads of Households</td>
<td>2,009.4</td>
<td>2,146.2</td>
<td>2,276.2</td>
<td>2,400.2</td>
<td>2,519.6</td>
<td>2,642.7</td>
<td>2,775.4</td>
</tr>
</tbody>
</table>

Source: Table 3 and Figure 5 excerpt from Metropolitan Washington Council of Governments. *Growth Trends to 2045-Cooperative Forecasting in Metropolitan Washington*. November 2016.

Figure 5: Historic and Forecast Population, 1990 to 2045
Regional Population Forecasted Growth by Jurisdiction

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**Counties/Cities served by IAD**

**Figure 14: Percent Change in Population Growth by Jurisdiction, 2015 to 2045**

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>District of Columbia</td>
<td>47%</td>
</tr>
<tr>
<td>Arlington County</td>
<td>31%</td>
</tr>
<tr>
<td>City of Alexandria</td>
<td>41%</td>
</tr>
<tr>
<td>Montgomery County</td>
<td>20%</td>
</tr>
<tr>
<td>City of Rockville</td>
<td>36%</td>
</tr>
<tr>
<td>City of Gaithersburg</td>
<td>33%</td>
</tr>
<tr>
<td>Prince George's County</td>
<td>10%</td>
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<tr>
<td>Fairfax County</td>
<td>25%</td>
</tr>
<tr>
<td>City of Fairfax</td>
<td>15%</td>
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<tr>
<td>City of Falls Church</td>
<td>34%</td>
</tr>
<tr>
<td>Loudoun County</td>
<td>37%</td>
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<tr>
<td>Prince William County</td>
<td>33%</td>
</tr>
<tr>
<td>City of Manassas</td>
<td>23%</td>
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<tr>
<td>City of Manassas Park</td>
<td>11%</td>
</tr>
<tr>
<td>Charles County</td>
<td></td>
</tr>
<tr>
<td>Frederick County</td>
<td>40%</td>
</tr>
<tr>
<td>City of Frederick</td>
<td>32%</td>
</tr>
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</table>

IAD Air Service Growth in Region

### Washington Airports Overview

<table>
<thead>
<tr>
<th>Existing Destinations By Airline</th>
<th>IAD (21 New)</th>
<th>DCA (15 New)</th>
<th>BWI (6 New)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akron/Canton</td>
<td>UA</td>
<td>AA</td>
<td></td>
</tr>
<tr>
<td>Atlanta</td>
<td>F9</td>
<td>DL</td>
<td></td>
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<tr>
<td>Charleston, SC</td>
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<td></td>
</tr>
<tr>
<td>Charlotte</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Chicago Midway</td>
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<tr>
<td>Chicago O'Hare</td>
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<td>Cincinnati</td>
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<td>Cleveland</td>
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<tr>
<td>Dallas Love Field</td>
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<tr>
<td>Detroit</td>
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<tr>
<td>Fort Lauderdale</td>
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<td>Fort Myers</td>
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<td>Hartford</td>
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<td>Indianapolis</td>
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<tr>
<td>Jacksonville</td>
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<td>Kansas City</td>
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<td>Las Vegas</td>
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<td>Madison</td>
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<td>Memphis</td>
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<td>Minneapolis/St Paul</td>
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<td>Nashville</td>
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<tr>
<td>New Orleans</td>
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<td>Oakland</td>
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<td>Omaha</td>
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<td>Orlando</td>
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<tr>
<td>Portland, OR</td>
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<td>San Diego</td>
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<td>Seattle</td>
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<td>St. Louis</td>
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<tr>
<td>St. Augustine</td>
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<tr>
<td>Tampa</td>
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<tr>
<td>West Palm</td>
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<tr>
<td>Cancun</td>
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<td></td>
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<tr>
<td>Nassau, Bahamas</td>
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</tbody>
</table>

IAD Air Service Growth in Region
New Domestic Service in 2018

April 3: Twice daily service to Shenandoah Valley, VA.
April 4: Three times weekly service to Greenbrier, WV.
April 9: Twice daily service to Wilmington, NC.
All on 50 seat regional jets.

April 8: Resume seasonal daily nonstop service to Colorado Springs on a 150 seat Airbus A319 & Denver on a 180 seat Airbus A320.
April 11: Starts twice weekly service to Tulsa, OK on a 150 seat Airbus A319
IAD Air Service Growth in Region
New International Service in 2018

May 23: New seasonal daily service to Edinburgh, Scotland on a 169 seat Boeing 757.

May 1: Starts additional daily flight to Montreal, Canada on a 50 seat regional jet.

May 17: Twice weekly service from Dulles International to San Salvador, El Salvador with continuing service to San Jose, Costa Rica on a 144 seat Airbus A319.

June 10: Will start to operate its third daily flight on a year-round basis using a 154 seat Boeing 737.

August 22: Five times weekly service from Dulles International to London, Stansted Airport on a 200 seat Airbus A321

September 16: Four weekly flights between Dulles International and Hong Kong on a 334 seat Airbus A350.
Major Surface Access Improvements In Vicinity of IAD

Dulles Airport
On-Airport Land Use
Dulles Airport
Capital Improvement Program
Dulles Airport
Primary Runway Operating Configurations

North Flow


South or Mixed Flow

Dulles Airport
Traffic Patterns

Arrivals
Departures

North Flow

Arrivals
Departures

South or Mixed Flow

Dulles Airport
Air Service Domestic Destinations

DOMESTIC MARKETS
APRIL 2018 SERVICE
78\* Destinations
7 Carriers
259 Daily Departures

AIRCRAFT: Continental, Delta, JetBlue, Northwest, Alaska, Virgin America, Southwest

AIRLINES
Alaska/Virgin America
American
Delta
Frontier
JetBlue
Southwest
United

Dulles Airport
Air Service Domestic Destinations

DOMESTIC MARKETS
APRIL 2018 SERVICE
78* Destinations
7 Carriers
259 Daily Departures

*Includes seasonal destinations not operating in April, and single-plane destinations

AIRCRAFT
Alaska/Virgin America
American
Delta
Frontier
JetBlue
Southwest
United

Dulles Airport
Air Service International Destinations

INTERNATIONAL MARKETS APRIL 2018 SERVICE
57* Destinations
33* Carriers
67 Daily Departures

*Includes seasonal destinations not operating in April, Edinburgh, Hong Kong, London Stansted and single-plane destinations

Dulles Airport
Air Service International Destinations

INTERNATIONAL MARKETS
APRIL 2018 SERVICE
57 Destinations
33 Carriers
67 Daily Departures

AIRLINES

- Emirates
- Ethiopian
- Air China
- Air Canada
- British Airways
- Iberia
- KLM
- Lufthansa
- Norwegian
- Oman Air
- Qatar Airways
- Royal Air Maroc
- Saudia
- South African
- Turkish Airlines
- Virgin Atlantic
- Virgin Atlantic

Aircraft Noise Overview – Noise Terminology

- A-Weighted Decibel, dBA
- Maximum A-Weighted Sound Level, Lmax
- Sound Exposure Level, SEL
- Equivalent Sound Level, Leq
- Day-Night Average Sound Level, DNL
Aircraft Noise Overview – A-Weighted Sound Level

- The human auditory system is not equally sensitive to all frequencies
- To be a useful environmental analysis tool we need a way to measure sound the same way the ear hears it
- The A-weighted sound level achieves this goal
- Correlates well to human perception of noisiness
- The EPA has adopted the A-weighted sound level for environmental analyses
Aircraft Noise Overview – Maximum Sound Level (Lmax)

• Because of the variation in level of a sound event, it is often convenient to describe the event with its maximum sound level, abbreviated as Lmax.

• Accounts only for sound amplitude (A-weighted sound level).

• Two events may have the same maximum level, but much different exposures.
Aircraft Noise Overview – Sound Exposure Level (SEL)

- A way to describe the “noisiness” of a complete noise event
- Accounts for sound amplitude (A-weighted sound level)
- Accounts for noise event duration
Aircraft Noise Overview – Equivalent Sound Level (Leq)

- A constant sound level “equivalent” on an energy basis of a time varying sound level over the same time period
- Leq is time-averaged
- Accounts for sound amplitude and time
Aircraft Noise Overview – Day/Night Average Noise Level (DNL)

- A way to describe the noise dose for a 24-hour period
- Accounts for noise event “noisiness” (SEL)
- Accounts for number of noise events
- Provides an additional weighting factor of 10 dB for nighttime (10:00 pm to 6:59 am) operations
  - 1 nighttime noise event is equivalent to 10 daytime noise events
**Aircraft Noise Overview - How is Aircraft Noise Quantified?**

- FAA specifies DNL metric to assess aircraft noise impacts
  - Title 14 CFR Part 150, Airport Noise Compatibility Planning
  - FAA Order 1050.1F, Environmental Impacts: Policies and Procedures

- Environmental Protection Agency (EPA) specified DNL for community noise and airport noise assessments

- DNL accounts for higher sensitivity to noise in the nighttime

- Found to correlate with percentage of highly annoyed by transportation noise
Aircraft Noise Overview - How is Aircraft Noise Quantified?

- DNL calculated based on average annual day operations (AAD)
- AAD represents the average aircraft operations and patterns that occurred over a consecutive 12-month period
  - Accounts for all operations and patterns and the frequency of occurrence within 12 months
  - Accounts for average weather conditions within 12 months
- DNL is calculated using the FAA’s aircraft noise mode AEDT
AEDT Overview
Background

• The Aviation Environmental Design Tool (AEDT)
  – Version 2d was released in September 2017
  – Replaced
    • Integrated Noise Model (INM – airport noise)
    • Emissions and Dispersion Modeling System (EDMS)
    • AEDT version 2b / Noise Integrated Routing System (NIRS)
  – FAA tool for computation of
    • Noise
    • Emissions
    • Air Quality
    • Fuel Burn