

Noise Exposure Map Update

Community Noise Forum Meeting January 22, 2024



SDF NOISE EXPOSURE MAP UPDATE Meeting Agenda

- 1 Introductions, Roles & Responsibilities
- 2 Part 150 Overview
- 3 Noise Modeling Overview
- **4** Aviation Forecast
- 5 Required Noise Metric (DNL)

- **6** Supplemental Noise Metrics
- Health Effects
- 8 Project Schedule
- Wrap Up & Discussion

INTRODUCTIONS Consultant Project Team

hmmh

- Project Management
- Noise Lead
- Documentation



- Aviation Forecast
- Land Use Verification

Kimley **»Horn**

 Aviation Forecast Review



 Community/ CNF Liaison



ROLES AND RESPONSIBILITIES Noise Exposure Map Update

LRAA

- Project sponsor
- Contracts with consultant team
- Certifies the NEM is accurate and complete
- Submits NEM Update to the FAA for acceptance

FAA

- Provides federal funding for NEM Update
- Accepts NEM update
- Certification that the documentation meets federal regulations and guidelines

Consultant Team

- Overall project management, documentation, and outreach
- Aircraft noise analysis
- Land use compatibility analysis
- Aviation forecast and airfield analysis

Community Noise Forum

- Review study inputs, assumptions, analyses, documentation, etc.
- Input, advice, and guidance related to NEM development

Public

- Provide input on study during comment period
- Review public draft documents



PART 150 OVERVIEW Airport Noise Compatibility Planning

REGULATION

Title 14 of the Code of Federal Regulations Part 150 (14 CFR Part 150 or "Part 150"), "Airport Noise Compatibility Planning"

- Voluntary FAA-defined process for airport noise studies
 - Over 250 airports have participated
- Sets national standards for analysis
- Provides access to FAA funding of some approved measures

TECHNICAL ELEMENTS

Part 150 has two technical elements:

- 1. Noise Exposure Map (NEM)
 - This project is an NEM update only
- 2. Noise Compatibility Program (NCP)
 - This project will **<u>not</u>** update the NCP



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PART 150 OVERVIEW Noise Exposure Map (NEM)

The NEM describes:



- NEM must provide information for two timeframes:
 - Year of submission (2024)
 - Five-year forecast (2029)
- FAA <u>checklist</u> identifies NEM requirements and documentation
- Annual average daily noise exposure is depicted using contour lines on a map



Noise Modeling Overview

- FAA requires use of their Aviation Environmental Design Tool (AEDT) for civilian aircraft operations
 - Version 3f is the most current version (at study's commencement)
 - https://aedt.faa.gov

AEDT requires noise model input data in three categories:





NOISE MODELING OVERVIEW Noise Modeling Input Categories

AEDT Input Category	Data Source
Aircraft Noise and Performance Characteristics	Standard AEDT database
Physical Description of the Airfield Layout	FAA 5010 data and AEDT database
Meteorological Conditions	AEDT database - National Climatic Data Center data
Terrain Data	U.S. Geological Survey National Elevation Dataset - geoTIFF
Aircraft Flight Operations	SDF NOMS system data for baseline conditions fleet mix and SDF forecast data for 2024 and 2029
Aircraft Ground Runup Operations	Aircraft Operators
Runway Utilization Rates	SDF NOMS system data
Flight Track Geometry And Utilization Rates	SDF NOMS system data

All materials presented on the following slides are draft and subject to:

- Community Noise Forum review
- Airport review and approval
- FAA review and approval

The acronym NOMS (Noise and Operations Monitoring System) refers to SDF's Aircraft Flight Tracking and Noise Management System (sometimes called AFTNMS)



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NOISE MODELING OVERVIEW Aircraft Noise and Performance Data

AEDT's 3f database contains: 181 fixed-wing civilian aircraft 84 military aircraft 26 Helicopters Aircraft performance profiles – how the aircraft is flown Altitude, Speed, and Engine Thrust along flight track Curves of noise level vs. distance Any adjustments to default AEDT profile database require FAA approval





Example profile graphics from SDF 2016 NEM memorandum to FAA requesting approval of Boeing corporation's profile data in modeling certain aircraft



NOISE MODELING OVERVIEW Physical Input Requirements

AIRFIELD LAYOUT

Runways

- Runway 17L/35R Parallel
- Runway 17R/35L Parallel
- Runway 11/29 Crosswind

Helipad (red dot)

• On Taxiway E4

Diagram Source: https://www.faa.gov/airports/runway_safety/diagrams, accessed October 12, 2023 Annotations added by HMMH for noise modeling purposes; data sources are SDF NOMS and information from SDF staff





NOISE MODELING OVERVIEW Physical Input Requirements

METEOROLOGICAL CONDITIONS

• AEDT database includes recent 10-year (2013-2022) averages:

Temperature	58.6° F	
Station Pressure	999.66 mbar	
Relative Humidity	65.01 %	
Dew Point	46.9° F	
Wind Speed	6.94 knots	

TERRAIN DATA

• Data obtained from the U.S. Geological Survey National Elevation Dataset



USGS topographical map, excerpt of area southwest of SDF



NOISE MODELING OVERVIEW Operational Input Requirements

Annual Average Day Operations	Existing Year 2024 Forecast Year 2029				
Aircraft Type	Jet Turboprop Helicopter Piston	Matched to specific AEDT Aircraft Types			
Day-Night Split	Day: 7 AM – 10 PM Night: 10 PM – 7 AM				
Runway Use, Flight Tracks, Track Use	Represents where the flight operations occur				
Stage Length	Surrogate for aircraft weight; determined by distance from departure to destination airport				

Year	Air Carrier	Air Taxi	General Aviation	Military	Total
2024	150,554	15,502	10,031	1,771	177,858
2029	161,569	16,569	10,721	1,771	190,098

Note 1: Forecast Pending FAA Approval.

Note 2: Operations sums may appear to be off due to rounding. Source: Kimley-Horn and Associates, Inc.; C&S Engineers, Inc.; ATADS



NOISE MODELING OVERVIEW **Runway Use**

Runway End	11	17L	17R	29	35L	35R	Total	
	Day							
Departure	0.0%	24.4%	32.4%	3.1%	15.8%	24.3%	100%	
Arrival	<0.1%	26.9%	20.4%	2.8%	26.3%	23.5%	100%	
Night								
Departure	0.0%	32.6%	47.9%	0.2%	10.8%	8.5%	100%	
Arrival	<0.1%	13.3%	17.6%	0.5%	42.0%	26.4%	100%	
Overall								
Departure	0.0%	28.2%	39.6%	1.8%	13.5%	17.0%	100%	
Arrival	<0.1%	20.3%	19.0%	1.7%	34.0%	24.9%	100%	

Source: SDF NOMS data 9/1/2022 – 8/31/2023 and HMMH, 2024



NOISE MODELING OVERVIEW Runway Use





NOISE MODELING OVERVIEW Flight Tracks

HMMH AEDT-preprocessor software uses individual NOMS flight tracks for modeling

- Conventional modeling relies on consolidated, representative flight tracks
- Preprocessor method models each aircraft operation
 - On the specific runway it actually used
 - At the actual time of day of the arrival or departure
 - On the actual flight path (no need to estimate dispersion)
- Most military operations are removed from NOMS data
 - Nominal military flight tracks developed in the previous Part 150 will be used

FAA changes to SDF airspace routing / standard flight procedures

HMMH analysis - flight track changes for forecast conditions modeling



Image source: FAA Public Information Workshop, 11/14/2023



NOISE MODELING OVERVIEW Existing Flight Track Density (12 months)





NOISE MODEL OVERVIEW Existing Flight Tracks (10% of 12 months)





NOISE MODELING OVERVIEW

Flight Track Development (FAA Airspace Changes)

Example of development of new model flight tracks for a modified procedure

- Identify which current tracks are flying the current RNAV procedures
- Determine which aircraft would fly new procedures*
- Develop model tracks to represent new procedures
- Shift operations in forecast case onto new model tracks

*UPS does not currently fly the procedures at night, but they **will** fly the new procedures at night.





AVIATION FORECAST Baseline Data Analysis - Civilian

Data sources include:

- FAA Aircraft Tracking and Data System (ATADS)
- SDF NOMS
- Operator interviews

Based on 12 months of flight track and aircraft identification data: September 1, 2022 through August 31, 2023

Adjusted annual aircraft operations to FAA tower counts.

Category	NOMS Tracks	Tower Counts
Air Cargo	100,158	100,592
Air Carrier	47,275	47,511
Air Taxi	13,689	15,265
GA	8,303	9,877
Military	70	1,889
Total	169,495	175,134

Determined the following for each FAA category (air carrier, air taxi, air cargo, and general aviation):

- Day-night split of operations
- Fleet mix
- Departure stage length

Each flight in the scaled NOMS data is modeled on the actual flight track that was flown.

No need to apply runway use averages or develop average representative tracks.



AVIATION FORECAST Baseline Data Analysis - Military

Based on discussions with Kentucky Air National Guard and 2023 military aircraft refueling data from Atlantic Aviation FBO

Kentucky Air National Guard's 123rd Airlift Wing operates fleet of C-130J aircraft

- 1,100 annual operations
- The only nighttime operations are arrivals during summer

Military aircraft utilize the active runway at time of operation. C-130J aircraft operate:

- Tuesday Thursday
- 12:00 PM 3:00 PM
- 7:00 PM 9:00 PM

Data sources include:

- Kentucky Air National Guard interviews
- Atlantic Aviation military refueling counts

Transient military operations estimated at 671 annually

Transient military fleet determined from Atlantic Aviation refueling records:

 One refueling treated as two operations (one arrival, one departure)



AVIATION FORECAST Existing (2024) and Forecast (2029) Conditions

- Validation/Comparison of published operations activity at SDF since 2021 Master Plan forecast
- Review of OPSNET (ATADS) activity from 2018 to 2022
 - Trend analysis with 1.34% average annual growth rate (AAGR)
- Review of FAA Terminal Area Forecast activity from 2018 to 2022
 - Projected FAA TAF growth comparison
- SDF Forecast for NEM 2024 to 2029
 - Utilizes existing total operations (2023) from ATADS data
 - Projects growth at 1.34% AAGR through 2029





AVIATION FORECAST 2024 Annual Aircraft Operations

Catagory	Turno		Arriv	<i>r</i> als	Depa	rtures	Total
Category	туре		Day	Night	Day	Night	Operations
Air Carrior	lots	Passenger	15,598	30,408	17,160	28,846	92,012
	Jets	Cargo	22,641	6,630	23,380	5,891	58,541
	Jets	Passenger	4,132	680	4,231	581	9,625
Air Taxi		Passenger	561	984	690	855	3,090
	Non-jets	Cargo	_	1,394	20	1,374	2,788
	Helicop	ters	41	57	46	52	195
GA	Jets		3,776	254	3,773	258	8,062
	Non-jets		819	68	798	90	1,774
Militory	KYANG	C-130s	550	-	550	-	1,100
iviiitai y	Transient		336	-	297	39	671
То	tals		48,454	40,475	50,944	37,958	177,858

Note 1: Forecast Pending FAA Approval

Note 2: Operations sums may appear to be off due to rounding

Source: C&S Engineers, Inc.; ATADS



AVIATION FORECAST 2029 Annual Aircraft Operations

Cotogory	Tuno		Arriv	<i>v</i> als	Depa	rtures	Total
Category	Турс		Day	Night	Day	Night	Operations
Air Carrior	lots	Passenger	16,799	32,031	18,476	30,355	97,661
	Jets	Cargo	24,511	7,177	25,311	6,377	63,376
	Jets	Passenger	4,416	727	4,522	621	10,287
Air Taxi	i New Sete	Passenger	599	1,052	737	914	3,303
	Non-jets	Cargo	_	1,490	21	1,469	2,980
	Helicop	ters	43	61	49	55	208
GA	Jets		4,036	272	4,032	276	8,616
	Non-jets		876	72	852	96	1,896
Militory	KYANG	C-130s	550	-	550	-	1,100
winitary	Transient		335	-	297	39	671
То	tals		52,167	42,882	54,848	40,201	190,098

Note 1: Forecast Pending FAA Approval

Note 2: Operations sums may appear to be off due to rounding

Source: C&S Engineers, Inc.; ATADS



AVIATION FORECAST Aircraft Fleet Mix

Air Carrier/Cargo	e	i types	Air Taxi	14 type
	2024	2029	Bombardier CRJ-200	17%
Airbus A300	23%	20%	Embraer ERJ145	7%
Boeing 747-400	7%	7%	corporate jet (8 types)	38%
Boeing 747-800	4%	4%	turboprop (2 types)	15%
Boeing 757-200	13%	14%	single engine (PC12)	5%
Boeing 767-300	37%	48%	SH36 turboprop - cargo	18%
Boeing MD-11	17%	7%		//
		-	General Aviation	14 type
Air Carrier/Passenger	14	types	corporate jet (9 types)	78%
Embraer ERJ170	5%		single engine (2 types)	15%
Embraer ERJ175	32%		turboprop (2 types)	5%
Boeing 737-700	10%		helicopter (EC35)	2%
Boeing 737-800	9%			
Boeing 717-200	5%		Military	12 type
Boeing 737-900	4%		Lockheed C-130	62%
Airbus A319	7%		T-38 Talon	6%
Airbus A320	8%		Beechcraft Texan	5%
Bombardier CRJ-900	10%		helicopter	9%
Others (Etherse)	100/			4.004





Category	2024	2029
Air Carrier/Cargo	51.7%	51.4%
Air Carrier/Passenger	32.9%	33.3%
Air Taxi	8.7%	8.7%
General Aviation	5.6%	5.6%
Military	1.0%	0.9%



REQUIRED NOISE METRIC Day-Night Average Sound Level (DNL)



DNL is a way to describe the noise dose for a 24hour period

- Accounts for event "noisiness" (SEL)
- Accounts for number of noise events
- Nighttime* noise gets a 10 dB weighting

*Nighttime is defined as 10:00 pm to 7:00 am





SUPPLEMENTAL NOISE METRICS FAA Recommended

Maximum Sound Level (Lmax)

- Flight track/procedure analyses
- Speech/sleep interference assessments

Sound Exposure Level (SEL)

• Flight track/procedure analyses

Time Above a Threshold (TA)

• Informational purposes

Equivalent Noise Level (Leq)

• School/learning assessments

Number of Events Above a Threshold (NA)

Informational purposes







PROJECT SCHEDULE **SDF Noise Exposure Map Update**

	Phase			
No.	Description	Expected Completion		
1	Project Initiation	September 2023		
2	Data Collection and Forecast	January 2024		
3	Prepare Draft Noise Exposure Maps and Documentation	May 2024		
4	Public Comment Period and Workshop	June 2024		
5	Prepare and Submit Noise Exposure Maps / Documentation	July 2024		



Discussion

Thank you! TOUISVILLE LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT