Ann Arbor Municipal Airport

Runway Extension EA

Aircraft Noise Analysis

July 20, 2009

FAA Policy and Guidance for NEPA Compliance

FAA Order 1050.1E

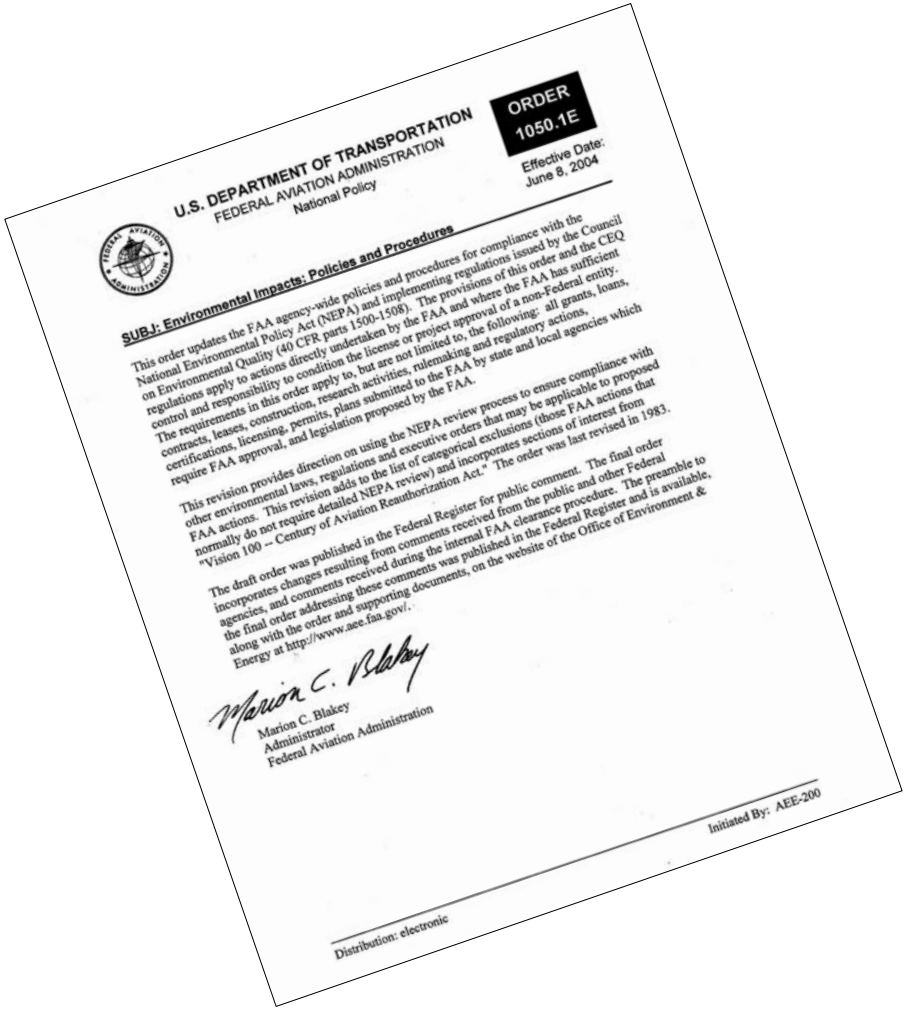
Environmental Impacts: Policies and Procedures

FAA Order 5050.4B

NEPA Implementing Instructions for Airport Actions

Title 14 CFR Part 150

Airport Noise Compatibility Planning



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
National Policy

ORDER 1050.1E

Effective Date: June 8, 2004

SUBJ: Environmental Impacts: Policies and Procedures

This order updates the FAA agency-wide policies and procedures for compliance with the National Environmental Policy Act (NEPA) and implementing regulations issued by the Council on Environmental Quality (40 CFR parts 1500-1508). The provisions of this order and the CEQ regulations apply to actions directly undertaken by the FAA and where the FAA has sufficient control and responsibility to condition the license or project approval of a non-Federal entity. The requirements in this order apply to, but are not limited to, the following: all grants, loans, contracts, leases, construction, research activities, rulemaking and regulatory actions, certifications, licensing, permits, plans submitted to the FAA by state and local agencies which require FAA approval, and legislation proposed by the FAA.

This revision provides direction on using the NEPA review process to ensure compliance with other environmental laws, regulations and executive orders that may be applicable to proposed FAA actions. This revision adds to the list of categorical exclusions (those FAA actions that normally do not require detailed NEPA review) and incorporates sections of interest from "Vision 100 – Century of Aviation Reauthorization Act." The order was last revised in 1983.

The draft order was published in the Federal Register for public comment. The final order incorporates changes resulting from comments received from the public and other Federal agencies, and comments received during the internal FAA clearance procedure. The preamble to the final order addressing these comments was published in the Federal Register and is available, along with the order and supporting documents, on the website of the Office of Environment & Energy at http://www.aee.faa.gov/.

Marion C. Blakey
Administrator
Federal Aviation Administration

Initiated By: AEE-200

Distribution: electronic

Assessment of Aircraft Related Noise

FAA Integrated Noise Model (INM) version 7.0a

- Has been distributed for use by the FAA since 1978
- Continual enhancements to stay consistent with evolving aircraft, technology, and best practices
- Required tool for FAR Part 150 Noise Compatibility Planning; Part 161 Approval of Airport Noise Restrictions; and FAA Order 1050 EA's and EIS's
- INM is an average value model designed to estimate long-term effects

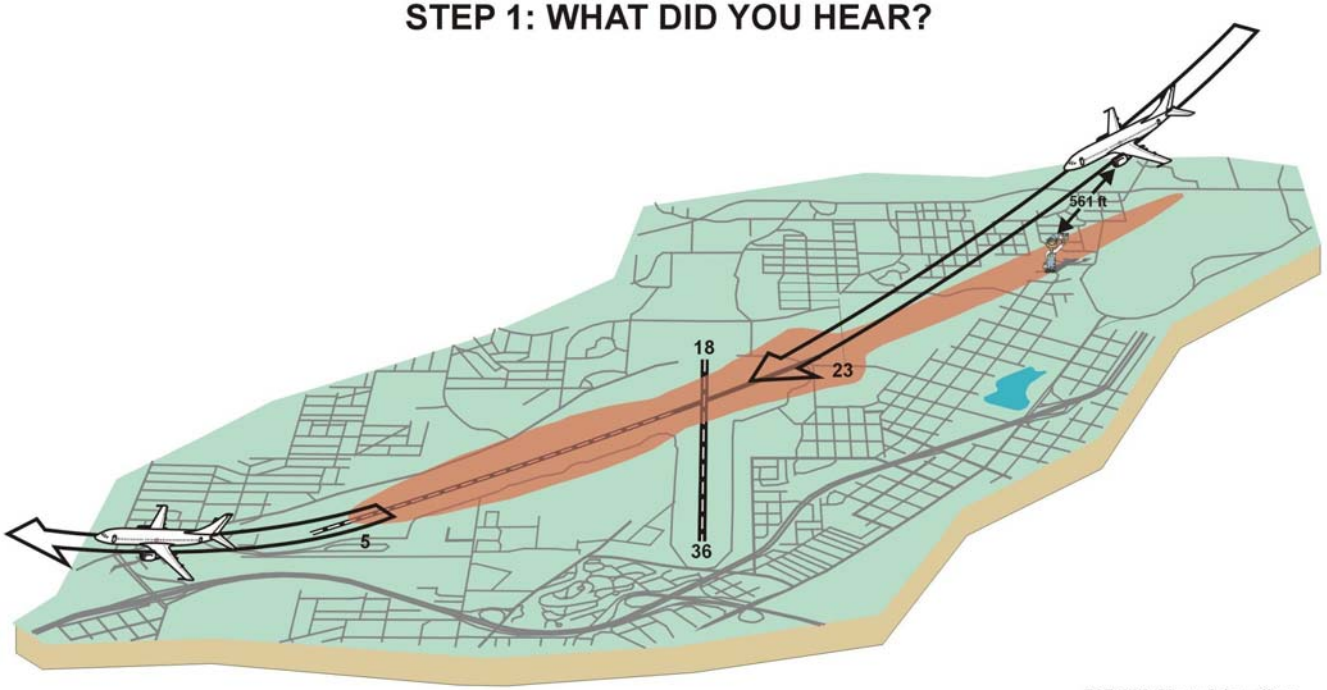
Assessment of Aircraft Related Noise

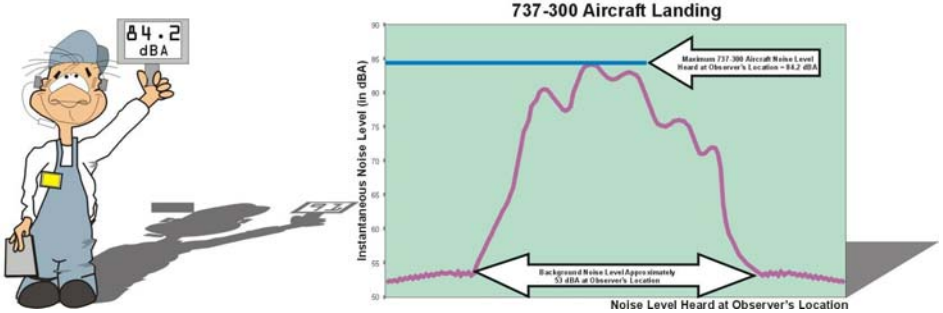
- EA determines noise impacts on INM DNL contours
- Analysis will include:
  - Base year - 2009
  - Future year - 2014
    - With and without proposed project
  - Standard DNL Metric

Aircraft Noise: How Do We Measure and Assess Impacts

AIRCRAFT NOISE: HOW WE MEASURE IT AND ASSESS ITS IMPACT

STEP 1: WHAT DID YOU HEAR?

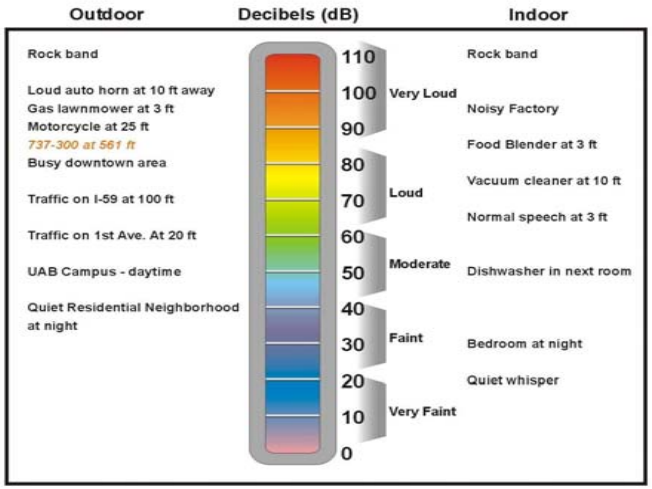




Aircraft Noise: How Do We Measure and Assess Impacts

AIRCRAFT NOISE: HOW WE MEASURE IT AND ASSESS ITS IMPACT

STEP 2: HOW LOUD IS THAT?



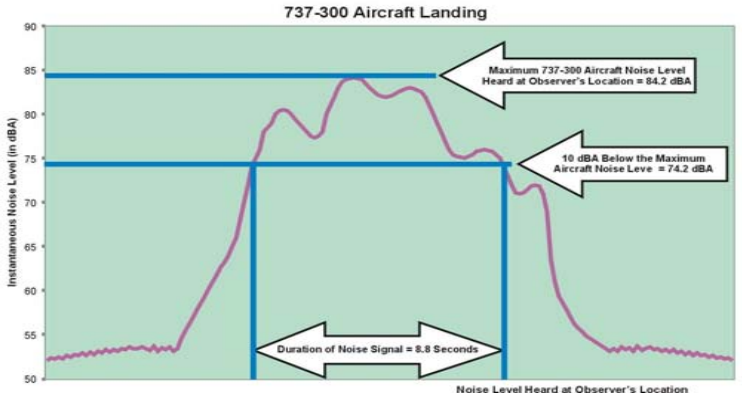
STEP 3: HOW LONG DID IT LAST?

The duration of an aircraft noise event is defined as the number of seconds between the first and last values of the instantaneous noise level which are a minimum of 10 dBA below the maximum aircraft noise level (Lmax).

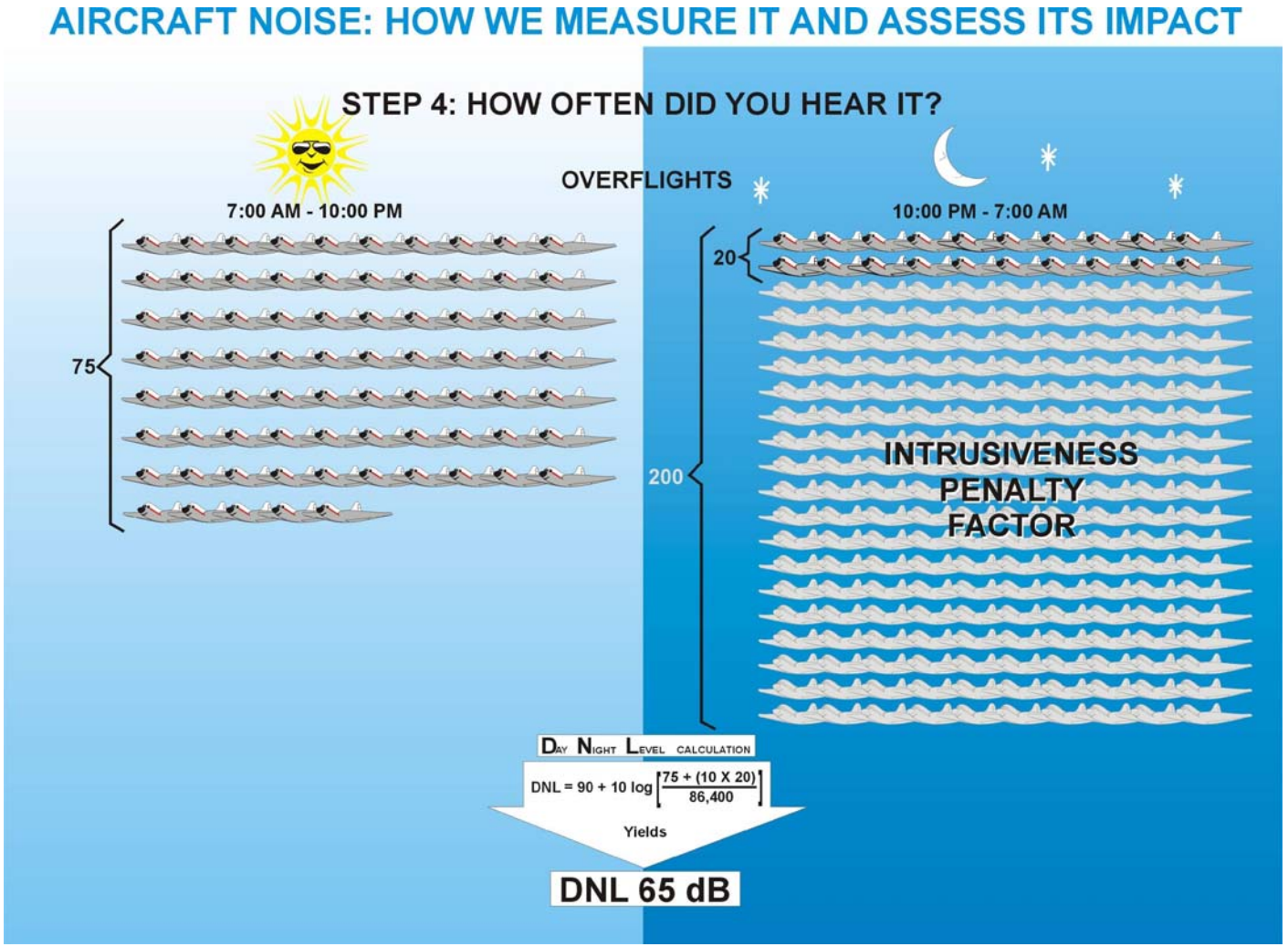
The Sound Exposure Level (SEL) describes with a single number the sound energy during an aircraft noise event. SEL takes into account both the duration and the magnitude of the aircraft noise event. The duration correction increases the magnitude in an attempt to account for the increased noisiness of sounds of long duration versus sounds of short duration. Because the duration of aircraft noise events are greater than one second, the numerical value of the SEL for an aircraft noise event is always greater than the numerical value of the maximum level, Lmax.

For Example:

Lmax = 84.2 dBA Duration = 8.8 seconds SEL = 90 dBA



Aircraft Noise: How Do We Measure and Assess Impacts



Noise Metric

- **Day-Night Average Sound Level (DNL)**:

DNL logarithmically averages aircraft sound levels at a location over a complete 24-hour period, with a 10-decibel adjustment added to those noise events occurring between 10:00 p.m. and 7:00 a.m. (local time) the following morning. Primary metric for airport noise impacts.

Noise Modeling Methodology

INM Input Data:

- Aircraft Operations
  - 2009 Base Year: FAA ATADS Data from April 08 through March 09
  - Forecast for Future Year 2014: FAA 2009 ARB TAF
- Flight Operations by Aircraft Type and Time of Day
  - From MDOT User's Survey and Flight Explorer® data
- Runways and Runway Utilization
  - From discussion with Air Traffic Control
- Flight Tracks and Flight Track Utilization
  - From discussion with Air Traffic Control and published flight procedures

Noise Modeling Methodology

INM Input Data:

- Aircraft Operations
  - 2009 Base Year: 61,969
  - Future Year 2014: 69,717
- Day / Night Split (Day 7:00 am to 9:59 pm, Night 10:00 pm to 6:59 am)
  - Air Taxi/Commuter: Arrivals 100% Day, Departures 96/4%
  - GA: Arrivals 95/5%, Departures 96/4%
- Flight Tracks:
  - Arrivals and departures are all straight in and straight out
  - Runways 06 and 12 have right turn patterns, Runways 24 and 30 have left turn patterns

Runway Utilization

Aircraft Type	Runway 06	Runway 24	Runway 12	Ruwnay 30
Jet	30 %	70 %		
Turbo prop	30 %	70 %		
Multi-engine Piston	30 %	70 %		
Single Engine Piston	27.5 %	67.5 %	2.5 %	2.5 %

Aircraft Operations – Air Taxi/Commuter

Table X-2
Fleet Mix and Annual Operations
Ann Arbor Municipal Airport
Runway Extension EA

Aircraft Category	INM Aircraft	Aircraft Name	Aircraft Type	Fleet Mix Percentage (%)		Annual			
				Itinerant	Local	Itinerant		Local	
						2009	2014	2009	2014
Air Taxi / Commuter	BEC58P	Beech 58 Baron	MEP	48.6	---	439	745	---	---
	CNA172	Cessna 172 Skyhawk	SEP	3.4	---	31	52	---	---
	CNA206	Cessna 206 Super Skywagon/Stationair	SEP	1.4	---	12	21	---	---
	CNA441	Cessna 441 Conquest II	TP	14.4	---	130	220	---	---
	CNA500	Cessna 500 / Citation II	Jet	1.4	---	12	21	---	---
	DC910	Douglas DC 9-10	Jet	0.7	---	6	10	---	---
	DHC6	de Havilland Dash 6	TP	8.2	---	74	126	---	---
	GASEPF	Composite - Single Engine Fixed Pitch Prop	SEP	0.7	---	6	10	---	---
	GASEPV	Composite - Single Engine Variable Pitch Prop	SEP	4.1	---	37	63	---	---
	LEAR35	Lear 35	Jet	2.7	---	25	42	---	---
	MU3001	Mitsubishi 300-10 Diamond	Jet	2.7	---	25	42	---	---
	PA28	Piper 28 Cherokee	SEP	7.5	---	68	115	---	---
	PA31	Piper 31 Navajo	MEP	4.1	---	37	63	---	---
	Total			**100**	---	**902**	**1,532**	---	---

Source: Flight Explorer®, 2009
Michigan DOT ARB User's Survey, 2009,
URS Corporation 2009.

Note: Numbers may not add due to rounding
SEP – Single Engine Piston
MEP – Multi Engine Piston
Jet – Turbofan/Turbo Jet
TP – Turbo Prop

Aircraft Operations

Table X-2 (cont)
Fleet Mix and Annual Operations
Ann Arbor Municipal Airport
Runway Extension EA

Aircraft Category	INM Aircraft	Aircraft Name	Aircraft Type	Fleet Mix Percentage (%)		Annual			
				Itinerant	Local	Itinerant		Local	
						2009	2014	2009	2014
General Aviation	B206L	Bell 206L LongRanger	Helo	13.5	---	3,039	3,255	---	---
	BEC58P	Beech 58 Baron	MEP	5.6	6.8	1,269	1,360	2,585	2,954
	CIT3	Cessna Citation III	Jet	0.01	---	2	2	---	---
	CNA172	Cessna 172 Skyhawk	SEP	32.6	42.0	7,326	7,848	16,219	18,536
	CNA206	Cessna 206 Super Skywagon/Stationair	SEP	3.8	4.5	863	925	1,732	1,980
	CNA441	Cessna 441 Conquest II	Tp	0.6	0.3	126	135	113	129
	CNA500	Cessna 500 / Citation II	Jet	0.05	---	12	12	---	---
	CNA510	Cessna 510 Mustang	Jet	0.01	---	2	2	---	---
	DHC6	de Havilland Dash 6	Tp	0.2	---	40	42	---	---
	GASEPF	Composite - Single Engine Fixed Pitch Prop	SEP	3.9	4.8	887	950	1,845	2,109
	GASEPV	Composite - Single Engine Variable Pitch Prop	SEP	10.3	11.9	2,315	2,480	4,613	5,272
	H500D	Hughes 500D	Helo	4.4	---	990	1,060	---	---
	IA1125	IAI Astra	Jet	0.01	---	2	2	---	---
	LEAR25	Lear 25	Jet	0.01	---	2	2	---	---
	LEAR35	Lear 35	Jet	0.01	---	3	4	---	---
	MU3001	Mitsubishi 300-10 Diamond	Jet	1.5	---	338	362	---	---
	PA28	Piper 28 Cherokee	SEP	23.1	29.7	5,180	5,550	11,472	13,111
	PA30	Piper 30 Twin Comanche	MEP	0.1	0.1	22	24	42	48
	PA31	Piper 31 Navajo	MEp	0.1	---	25	27	---	---
	R22	Robinson R22B	Helo	0.01	---	3	4	---	---
	SA365N	Aerospatiale (Eurocopter) SA-365N Dauphin	Helo	0.01	---	2	2	---	---
	Total			**100**	**100**	**22,446**	**24,047**	**38,621**	**44,138**
TOTAL				---	---	**23,348**	**25,579**	**38,621**	**44,138**

Source: Flight Explorer®, 2009
Michigan DOT ARB User's Survey, 2009,
URS Corporation 2009.

Note: Numbers may not add due to rounding
SEP – Single Engine Piston
MEP – Multi Engine Piston
Jet – Turbofan/Turbo Jet
TP – Turbo Prop

FAA INM Aircraft Substitutions
(INM Database contains 274 Aircraft and 260 substitutions)

SUB_ID	SUB_DESCR	ACFT_ID1
BEC200	Beech Super King Air 200	DHC6
BEC300	Beech Super King Air 300	DHC6
BEC30B	Beech Super King Air 300B	DHC6
BEC400	Beechcraft Beechjet 400	MU3001
BEC45	Beechcraft Model 45 Mentor (T34A & T34B)	GASEPV
BEC90	Beech King Air C90	CNA441
BEC9F	Beech F90 Super King Air	CNA441
BECM35	Beechcraft Model M35 Bonanza	GASEPV
CNA182	Cessna 182 Skylane	CNA206
CNA185	Cessna Skywagon	CNA206
CNA404	Cessna 404 Titan	BEC58P
CNA501	Cessna Citation I Single Pilot (SP)	CNA500
CNA525	Cessna Citation Jet	CNA500
CNA550	Cessna Model 550 Citation II	MU3001
CNA551	Cessna Citation II Single Pilot (SP)	MU3001
CNA560	Cessna 560 Citation V	MU3001
CNA650	Cessna 650 Citation VII	CIT3
FAL200	Falcon 200	LEAR35
FAL20A	Falcon 2000	CL600
IA1123	IAI 1123 Westwind	LEAR25
IA1124	IAI 1124 Westwind	IA1125
IARAVA	IAI Arava	DHC6
IL114	Ilyushin-114	CVR580
IL62	Ilyushin-62	707QN
IL76	Ilyushin-76	DC8QN
IL86	Ilyushin-86	DC8QN
IL96	Illyushin-96	747200
JST1TF	Jetstar 1 Turbofan	LEAR35
JST1TJ	Jetstar 1 Turbojet	LEAR25
JST2TF	Lockheed Jetstar 2	LEAR35
KC135E	Boeing KC135 Stratotanker (Re-engined)	707320
LA42	Lake LA-4-200 Buccaneer	GASEPV
LEAR23	Learjet 23	LEAR25
LEAR24	Learjet 24	LEAR25
LEAR31	Learjet 31	LEAR35
LEAR36	Learjet 36	LEAR35
LEAR45	Learjet 45	LEAR35
LEAR55	Learjet 55	LEAR35
LEAR60	Learjet 60	LEAR35

FAA INM Aircraft Substitutions
(INM Database contains 274 Aircraft and 260 substitutions)

SUB_ID	SUB_DESCR	ACFT_ID1
BEC200	Beech Super King Air 200	DHC6
BEC300	Beech Super King Air 300	DHC6
BEC30B	Beech Super King Air 300B	DHC6
BEC400	Beechcraft Beechjet 400	MU3001
BEC45	Beechcraft Model 45 Mentor (T34A & T34B)	GASEPV
BEC90	Beech King Air C90	CNA441
BEC9F	Beech F90 Super King Air	CNA441
BECM35	Beechcraft Model M35 Bonanza	GASEPV
CNA182	Cessna 182 Skylane	CNA206
CNA185	Cessna Skywagon	CNA206
CNA404	Cessna 404 Titan	BEC58P
CNA501	Cessna Citation I Single Pilot (SP)	CNA500
CNA525	Cessna Citation Jet	CNA500
CNA550	Cessna Model 550 Citation II	MU3001
CNA551	Cessna Citation II Single Pilot (SP)	MU3001
CNA560	Cessna 560 Citation V	MU3001
CNA650	Cessna 650 Citation VII	CIT3
FAL200	Falcon 200	LEAR35
FAL20A	Falcon 2000	CL600
IA1123	IAI 1123 Westwind	LEAR25
IA1124	IAI 1124 Westwind	IA1125
IARAVA	IAI Arava	DHC6
IL114	Ilyushin-114	CVR580
IL62	Ilyushin-62	707QN
IL76	Ilyushin-76	DC8QN
IL86	Ilyushin-86	DC8QN
IL96	Illyushin-96	747200
JST1TF	Jetstar 1 Turbofan	LEAR35
JST1TJ	Jetstar 1 Turbojet	LEAR25
JST2TF	Lockheed Jetstar 2	LEAR35
KC135E	Boeing KC135 Stratotanker (Re-engined)	707320
LA42	Lake LA-4-200 Buccaneer	GASEPV
LEAR23	Learjet 23	LEAR25
LEAR24	Learjet 24	LEAR25
LEAR31	Learjet 31	LEAR35
LEAR36	Learjet 36	LEAR35
LEAR45	Learjet 45	LEAR35
LEAR55	Learjet 55	LEAR35
LEAR60	Learjet 60	LEAR35

Assessment of Aircraft Related Noise Impacts in an Environmental Assessment

- Noise Exposure Contours at DNL 65, 70, and 75 dB
- No-Action and Proposed Project
- Average Annual Day: Daily average of annual operations
- **Impacts determined by**:

    Yearly Day/Night Average Sound Level (DNL)

Assessment of Aircraft Related Noise Impacts

- Impacts are determined by comparing future Proposed Project DNL contours to the No-action alternative DNL contour.
- Significant impact occurs at noise sensitive locations with an increase of 1.5 dB or greater within the DNL 65 Contour
- If significant impact exists, analysis within the DNL 60 for an increase of 3 dB or greater is required.

INM Output Data

- INM provides the following noise data for existing and future conditions for comparison purposes:
  - Noise contours (DNL 65, 70 and 75 dB)
  - Noise levels at identified noise sensitive sites (if necessary)
  - Noise levels in metrics other than DNL, such as L_{max}, L_{eq}, SEL, and Number of Events Above (if necessary)