Noise Technical Report for the Fairchild Air Force Base Joint Land Use Study

HMMH Report No. 303020
11/11/08

Prepared for:

Matrix Design Group Inc.
1601 Blake St., Suite 200
Denver, CO 80202

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Matrix Design Group Inc.
1601 Blake St., Suite 200
Denver, CO 80202

Prepared by:

Robert Behr
Robert Mentzer Jr.

HARRIS MILLER MILLER & HANSON INC.
8880 Cal Center Drive, Suite 430
Sacramento, CA 95826

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1 BACKGROUND

As part of the Noise analysis for the Fairchild Air Force Base (AFB) Joint Land Use Study (JLUS), HMMH was asked to review the most current Air Installation Compatible Use Zone (AICUZ) study and associated Noisemap modeling files to verify the accuracy of the files. The AICUZ program uses the current version of NOISEMAP for its noise modeling around USAF installations. These files will then be used as the baseline for the JLUS modeling. HMMH received the AICUZ reports and all associated files from e^2M. The AICUZ report was published in October of 2007 and the operations were based on data collected by the Air Force Center for Environmental Excellence (AFCEE) in 2004. The NOISEMAP modeling was completed in 2004.

Four future mission scenarios will be modeled using the baseline input files. These scenarios involve replacement of the KC-135 tanker aircraft with new tanker aircraft which are based on civilian passenger aircraft. In all cases these aircraft are larger and more modern than the KC-135 they would be replacing.

The results of each of the four Fairchild scenarios will be combined with the 20-year forecast modeling results for Spokane International Airport (SIA) to provide an overall perspective on the effect of aircraft operations on the local environs. SIA staff provided the Integrated Noise Model (INM) data files from the 2001 Master Plan Update. HMMH then used the INM data files and aircraft operations for year 2020 without any alterations for the long term forecast scenario. The Master Plan reviewed several alternatives to the airport runway configuration. For the purposes of this study, HMMH was directed to use the airport configuration with a third runway (Runway 05-23) and an extension to the end of Runway 03 of approximately 3,000 feet.

2 2007 AICUZ REPORT REVIEW

The 2007 AICUZ report contains a good description of the noise modeling and the land use in the area around Fairchild AFB. Section 2.1 of the report presents the mission of the base and the based aircraft types. Section 2.4 of the report discusses Airfield Planning and presents the modeled operations and modeled flight tracks. Section 3 of the report discusses Land Use Compatibility Guidelines and displays the computed noise contours along with various Land use maps.

2.1 Based Aircraft

The AICUZ Report in Section 2.1 presents the based aircraft at Fairchild AFB as of 2004. The airfield is home to the 92d Air Refueling Wing (ARW) and the 141st ARW of the Washington Air National Guard (WAANG). This large concentration of air refueling aircraft is the largest in the United States Air Force and they provide support for U.S. and allied forces around the world. The based aircraft at Fairchild AFB are summarized in the following table.

Table 1 Fairchild AFB Based Aircraft

Group	Number of Aircraft	Type of Aircraft
92 ARW	30	KC-135R
141st ARW WAANG	8	KC-135R
36th Rescue Flight	4	UH-1

2.2 AICUZ Modeled Operations

The AICUZ report in Table 2-4 reports the number of operations modeled. The contour in the report reflects the KC-135 operations which were increased by 250% to account for the high level of deployments in support of current war operations. The table below displays the operations modeled in the AICUZ report.

Table 2 Fairchild AFB Aircraft Daily Operations

Category	2004 Baseline	With 250% increase in KC-135R Operations
Based	195.80	471.29
Transient	8.15	14.36
Total Operations per day	203.95	485.65

2.3 Runway Use

The airport reported the runway use below in 2004 and this was used for all modeling. The airport was in a southwest flow 75% of the time and in northeast flow 25% of the time. All modeled operations at the airfield use these runway use percents.

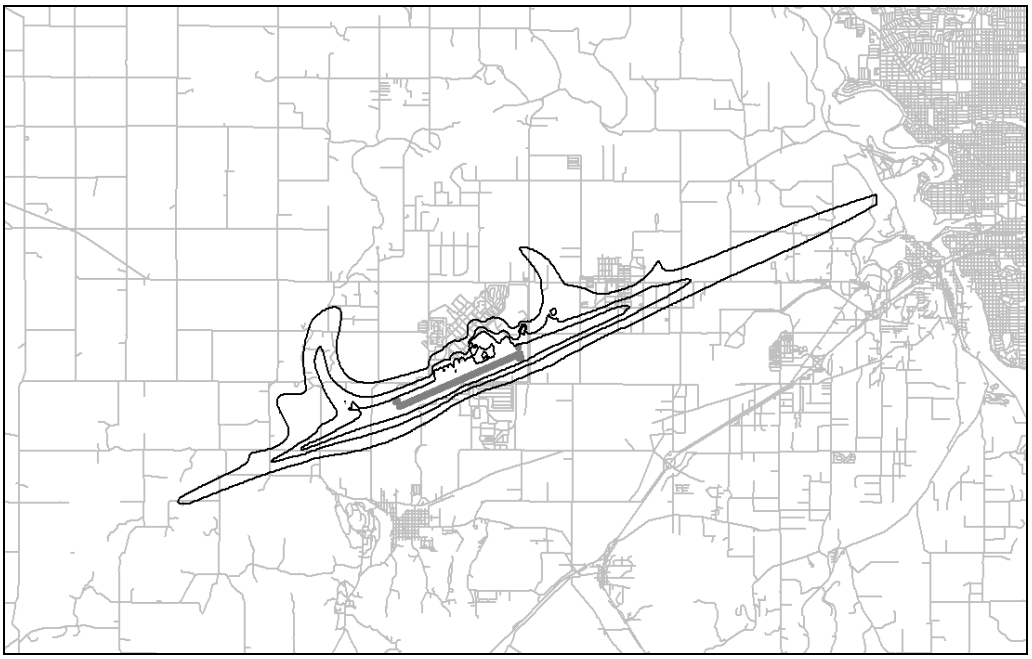
Table 3 Fairchild AFB Runway Use

Runway	Percent Use
05	25%
23	75%

2.4 Contours

The contours in the AICUZ report were run using 1000' grid spacing. The modeling was developed using three scenarios (Based, Transient, and Maintenance). The Based scenario only contained operations and flight tracks for the based aircraft at the airfield. The Transient scenario represents aircraft that use the airfield during the year but are not stationed at Fairchild AFB. The Maintenance scenario contains all of the ground noise operations from maintenance activities for the Based aircraft only. For the AICUZ study DNL 65, 70 and 75 contours were produced. The 1000' grid spacing seems large and resulted in wavy contours. HMMH reran the AICUZ contours with a 200' grid spacing for the Based, Transient, and Maintenance scenarios with the results shown in the following figure.

Figure 1 Fairchild AFB AICUZ DNL Contours



3 FAIRCHILD AFB NOISE MODELING

3.1 Study Area Definition

To capture the effects of changes at the Air Base as well as at SIA, the Study Area must include not only the immediate airport environs where aircraft flight paths are aligned with the runways, it should also include other potentially affected areas beyond that, over which aircraft will fly as they follow flight corridors that join the surrounding airspace.

Communities in the local area include, Airway Heights, Medical lake, Spokane and Spokane County.

3.2 Methodology

Existing and future aircraft noise levels at Fairchild AFB were analyzed by evaluating noise contours using the USAF NOISEMAP Model version 7.32. Noise contours for 60 to 75 DNL in 5-dB increments were developed for each scenario. Specific DNL levels were also predicted at two noise sensitive sites on the airfield. The modeling grid was expanded (over 50 miles from the base) to ensure that it included all of the surrounding communities and SIA

3.2.1 USAF NOISEMAP Noise Model

The basic tool used to model aircraft flight operations is NOISEMAP developed by the USAF. Similar to the FAA's INM, NOISEMAP uses airport geometry, descriptions of aircraft operations, and an internal database of noise and performance characteristics to compute the noise of individual

flights. NOISEMAP then adds noise of individual flights together and presents the accumulation as a set of contours and/or noise calculations at specific points.

Detailed operational inputs to NOISEMAP fall generally into three categories of information including:

- Daily numbers of daytime and nighttime takeoffs and landings by specific aircraft types,
- Typical flight path and runway geometry, and
- Average statistics on usage of each runway and flight path by various aircraft groups.

Predicted aspects of an airport's operations are used to evaluate alternative assumptions regarding growth, future aircraft fleets, shifting of flight paths, new runway and taxiway configurations, delay, noise mitigation measures, and other critical planning efforts.

3.2.2 Development of Model Input for NOISEMAP Analysis

The following sub-sections summarize the operational inputs used to model aircraft noise exposure for the JLUS future mission scenarios, such as fleet mix and operations, flight tracks, runway use, and average weather conditions.

3.2.2.1 Fleet Mix and Operations

The fleet mix and operations determine the overall size of the noise contours. Generally, increases in operations cause increases in the noise area. The fleet mix or aircraft types modeled also affect the contour size. Older, noisier aircraft when replaced by newer, quieter ones generally result in small noise contours. The NOISEMAP model is using the annual average busy day to represent operations at the airfield. The fleetmix developed represents the based aircraft operations and the transient aircraft operations

3.2.2.2 Flight Tracks

The modeled flight tracks were developed for the AICUZ study. These tracks extend well beyond the modeling area. They are used to represent the average flight corridors.

3.2.2.3 Runway use

Runway use refers to the frequency with which aircraft utilize each runway during the course of a year, as dictated or permitted by wind, weather, aircraft weight, air traffic control conditions, and noise considerations. The more often a runway is used throughout the year, the more noise is created in communities located off the ends of that runway.

3.2.2.4 Average Weather Conditions

The weather data which was used in the AICUZ study was also used for the future mission JLUS scenarios:

- Average temperature for the period was 59 degrees F,
- Average sea-level pressure for the period was 29.92 in Hg,
- Average relative humidity for the period was 54 percent.

4 FAIRCHILD FUTURE MISSION CONTOURS

4.1 JLUS Scenarios

The JLUS study will present contours for four future scenarios at the base. Transient operations for each scenario will remain the same as the AICUZ study. Each scenario will replace the based KC-135R operations with the following aircraft types.

- 48 based KC-767A aircraft
- 48 based A330 aircraft
- 32 based KC-767A aircraft and 16 B-52 aircraft
- 32 based A330 aircraft and 16 B-52 aircraft

Maintenance operations will remain the same as in the AICUZ study but reflect the new based aircraft types.

4.2 Modeling Assumptions

4.2.1 Runway Use and Track Use

The runway use used in the AICUZ study is proposed to be used for the four JLUS scenarios. Table 4 presents the modeled runway use used for each of the JLUS scenarios.

Table 4 Fairchild JLUS Runway Use

Runway	Percent Use
05	25%
23	75%

Existing tracks will be used and the track use will be the same as the AICUZ study. The aircraft modeled in each of the JLUS scenarios will use the same flight tracks as the KC-135R aircraft use.

4.2.2 Operations

Based KC-135R operations in the AICUZ study were broken down into Arrivals, Departures and Closed patterns. Table 5 presents the breakdown of these operations. This same breakdown will apply to the new based aircraft for each scenario.

Table 5 Fairchild JLUS Operational Use

Operation Mode	Day	Night	Total
Arrival	93.2%	6.8%	100%
Departure	96.7%	3.3%	100%
Closed Pattern	90.0%	10.0%	100%

The Based helicopter operations and Transient operations will be assumed to remain the same as the AICUZ study. The new based aircraft will have the same number of operations and day-night breakdown as the KC-135R. The operations to be modeled for each scenario are presented in Table 6.

Table 6 Fairchild JLUS Scenario Operations

Scenario 1			
KC-767A	**Day**	**Night**	**Total**
Arrivals	27.0	3.0	30.0
Departures	29.0	1.0	30.0
Closed patterns	180.0	20.0	200.0
Scenario 2			
Airbus 330	**Day**	**Night**	**Total**
Arrivals	27.0	3.0	30.0
Departures	29.0	1.0	30.0
Closed patterns	180.0	20.0	200.0
Scenario 3			
B-52	**Day**	**Night**	**Total**
Arrivals	9.3	0.7	10.0
Departures	9.7	0.3	10.0
Closed patterns	60.0	6.0	66.0
KC-767A	**Day**	**Night**	**Total**
Arrivals	18.6	1.4	20.0
Departures	19.3	0.7	20.0
Closed patterns	120.6	13.4	134.0
Scenario 4			
B-52	**Day**	**Night**	**Total**
Arrivals	9.3	0.7	10.0
Departures	9.7	0.3	10.0
Closed patterns	60.0	6.0	66.0
Airbus 330	**Day**	**Night**	**Total**
Arrivals	18.6	1.4	20.0
Departures	19.3	0.7	20.0
Closed patterns	120.6	13.4	134.0

4.2.3 Flight Profiles

The NOISEMAP model includes data for several civil aircraft types. However, the model does not include data for the KC-767A Tanker or the A330-Tanker which are the subjects of this effort.

The KC-767A Tanker is expected to have PW4062 engines and the 767-300 which is available in NOISEMAP has data for the PW4060 engines. Therefore for this analysis the 767-300 will be the aircraft modeled for the KC-767A Tanker. The 767-300 has noise data in NOISEMAP but it does not have any aircraft performance profiles. Standard aircraft performance profiles for the 767-300 were prepared in the FAA's INM and imported into NOISEMAP. One standard arrival profile was used and seven departure profiles were imported. Each of the seven departure profiles represents the aircraft performance for various weights with the seventh profile being the heaviest. The fourth profile was selected to be used for all departures for this modeling effort, as this profile represents the middle of the range of weights and is a reasonable profile to be used when one is not known.

The A330 Tanker is expected to have GE CF6-80 or RR Trent 700 engines and the A310 which is available in NOISEMAP has data for the CF6-80C2A2 engines. Therefore for this analysis the A310 will be the aircraft modeled for the A330 Tanker. The A310 has noise data in NOISEMAP but it does not have any aircraft performance profiles. Standard aircraft performance profiles for the A330 were prepared in the FAA's Integrated Noise Model (INM) and imported into NOISEMAP as A310 profiles. One standard arrival profile was used and seven departure profiles were imported. Each of the seven profiles represents the aircraft performance for various weights with the seventh profile being the heaviest. The fourth profile was selected to be used for all departures for this modeling effort, as this profile represents the middle of the range of weights and is a reasonable profile to be used when one is not known.

INM aircraft performance profiles for various pattern heights were developed and this data was entered into the NOISEMAP model for the closed pattern performance profiles for the A310/A330 and for the 767-300. The distances and altitudes reached during the patterns were not altered from the KC-135R patterns but appropriate thrust and speed values were used.

4.2.4 Maintenance JLUS Scenarios

Unlike the based JLUS scenarios, the maintenance JLUS scenarios could not use the same aircraft substitutions as the noise data needed for this type of modeling was not available. After reviewing the available aircraft types and noise data, it was determined that none of the types/engines were a suitable match for the future tanker operations. However, based on available data in the INM, the KC-135R produces a similar noise footprint than the two newer types of tanker. Also, the maintenance run is only for ground operations on the Airbase and would likely not cause changes to the noise contours outside of the airbase.. Therefore, the Maintenance scenarios reflect the same levels of operations and types used in the AICUZ study.

5 SPOKANE INTERNATIONAL AIRPORT MODELING

The SIA modeling used the latest version of the FAA's INM, Version 7.0a, with the 20-year forecast operations from the 2001 Master Plan Update. Operations, runway use, flight tracks and use were derived directly from the Master Plan INM study and input into the current INM version. No changes were made to these inputs. The airport configuration included a third runway, Runway 05-23, and an approximate 3,000-foot extension to Runway 03-21 by displacing the end of Runway 03.

5.1 Fleet Mix and Operations

The fleet mix of aircraft types was determined from the Master Plan INM data files. The INM data files also provided the approximately 172,746 total operations as shown in Table 7. HMMH used the input aircraft types and operations, and runway and flight track use provided to model the year 2020 forecast operations.

Table 7 SIA INM Aircraft Types and Annual and Daily Operations

INM Aircraft	Annual Operations	Daily Operations
1900D	2,188	5.99
707320	119	0.33
737300	30,913	84.69
737400	8,094	22.18
737700	10,792	29.57
747200	164	0.45
74720B	119	0.33
757PW	540	1.48
757RR	5,409	14.82
767300	820	2.25
A310-304	5,245	14.37
A319-131	1,619	4.44
A320-211	2,698	7.39
BAE146	1,619	4.44
C130	123	0.34
CL601	14,439	39.56
CNA441	1,198	3.28
COMJET	1,201	3.29
DC1030	328	0.90
DHC6	3,938	10.79
DHC8	1,750	4.79
DHC830	10,939	29.97
EMB120	12,117	33.20
F28MK4	4,376	11.99
GASEPF	32,328	88.57
GASEPV	14,307	39.20
KC135	3,256	8.92
MD11PW	492	1.35
MD81	1,619	4.44
Total	172,746	473.28

Source: SIA MP INM Data Files

5.2 Flight Tracks

HMMH used the existing flight tracks and flight track use provided in the Master plan INM study. The flight tracks represent the average flight corridors and extended well beyond the immediate modeling or study area.

5.3 Runway Use

The runway use is generally determined by the prevailing wind direction and/or the preferred direction of flight. Based on the Master Plan INM study, SIA operates primarily in a southwesterly flow for both daytime and nighttime periods. Table 8 lists the day/night runway use derived from the INM input data files.

Table 8 Runway Use from INM Data Files

Runway	Day	Night
03	16.28%	15.41%
05	16.37%	20.89%
07	2.36%	2.18%
21	27.79%	26.29%
23	27.79%	26.29%
25	9.42%	8.94%

Source: SIA MP INM Data Files

5.4 Flight Profiles

The INM provides Standard flight profiles for aircraft in the database. The departure profiles are based on takeoff weights associated with each aircraft and the distance to its destination or stage length. The approach profiles are based on an average landing weight. HMMH mirrored the Master Plan INM study by using these same Standard flight profiles.

6 NOISE CONTOURS FOR EACH FAIRCHILD SCENARIO

HMMH forwarded the shapefiles in Washington State Plane Projection to the Matrix Group under separate cover. For reference, the following figures show the combined contours for each Fairchild scenario and SIA over a basic street level data base. Each figure shows the 60, 65, 70, and 75 DNL contours for the combined aircraft operations.

Figure 2 Fairchild Scenario 1 (KC-767A) and Spokane International Airport DNL Contours

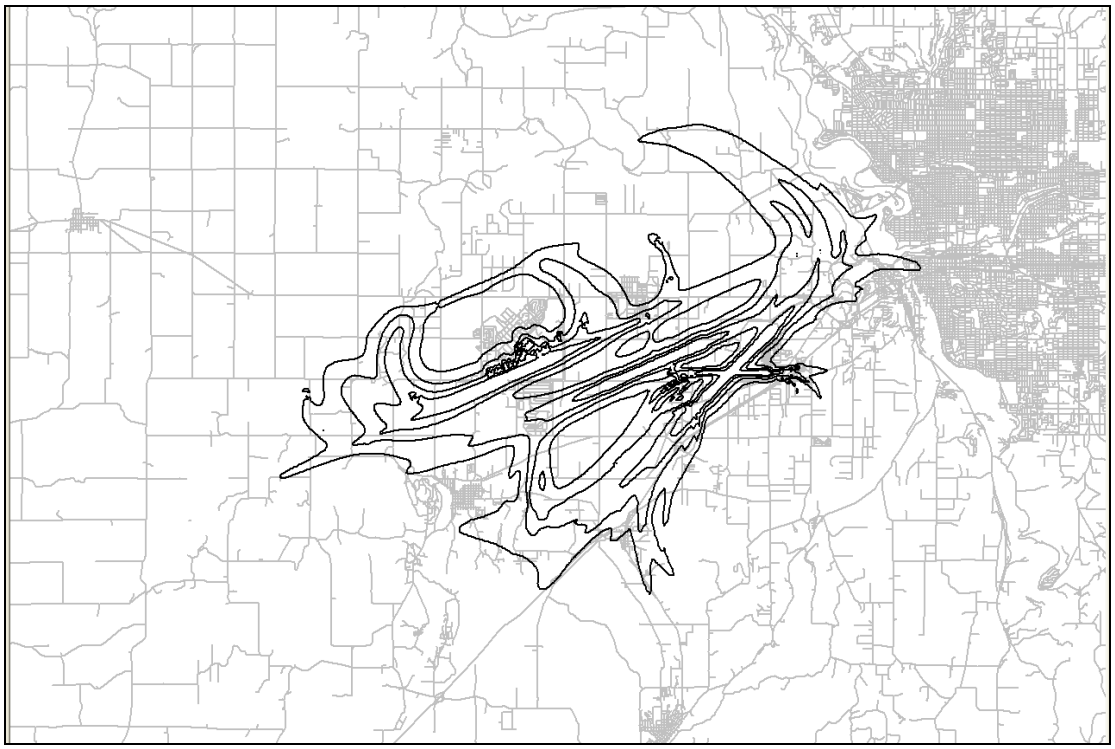


Figure 3 Fairchild Scenario 2 (A330) and Spokane International Airport DNL Contours

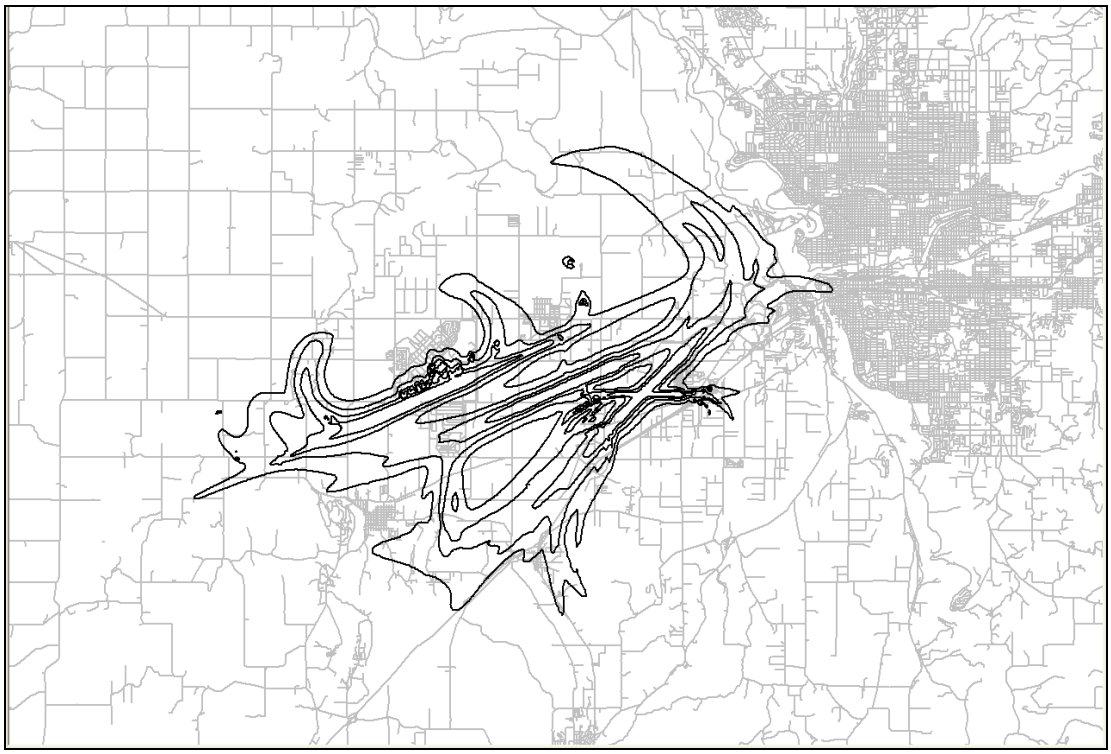


Figure 4 Fairchild Scenario 3 (KC-767A and B-52) and Spokane International Airport DNL Contours

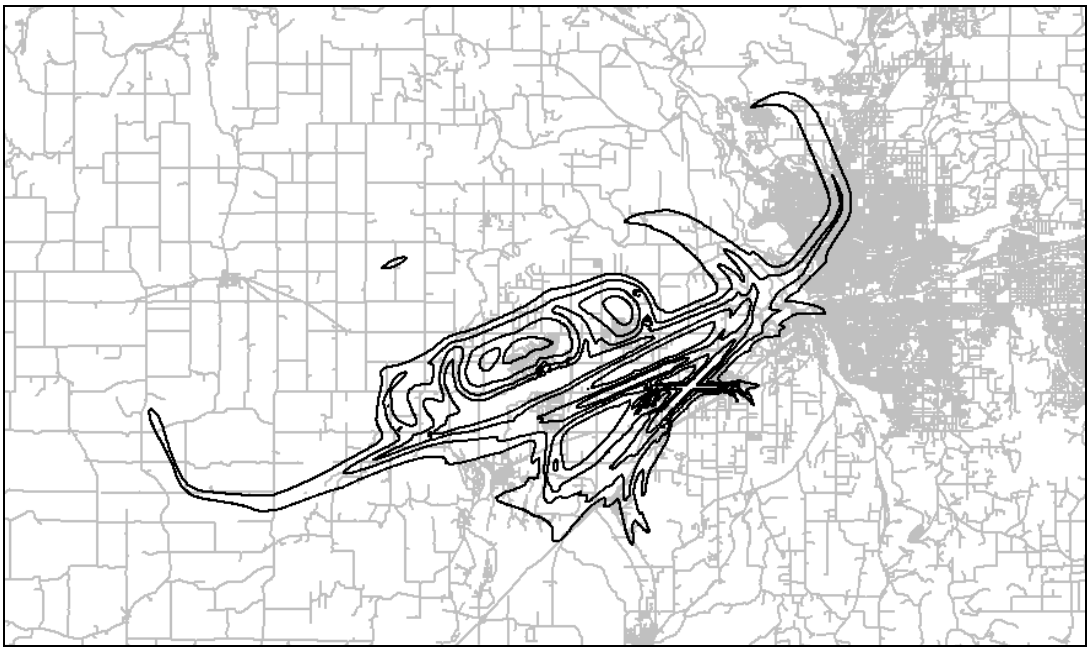
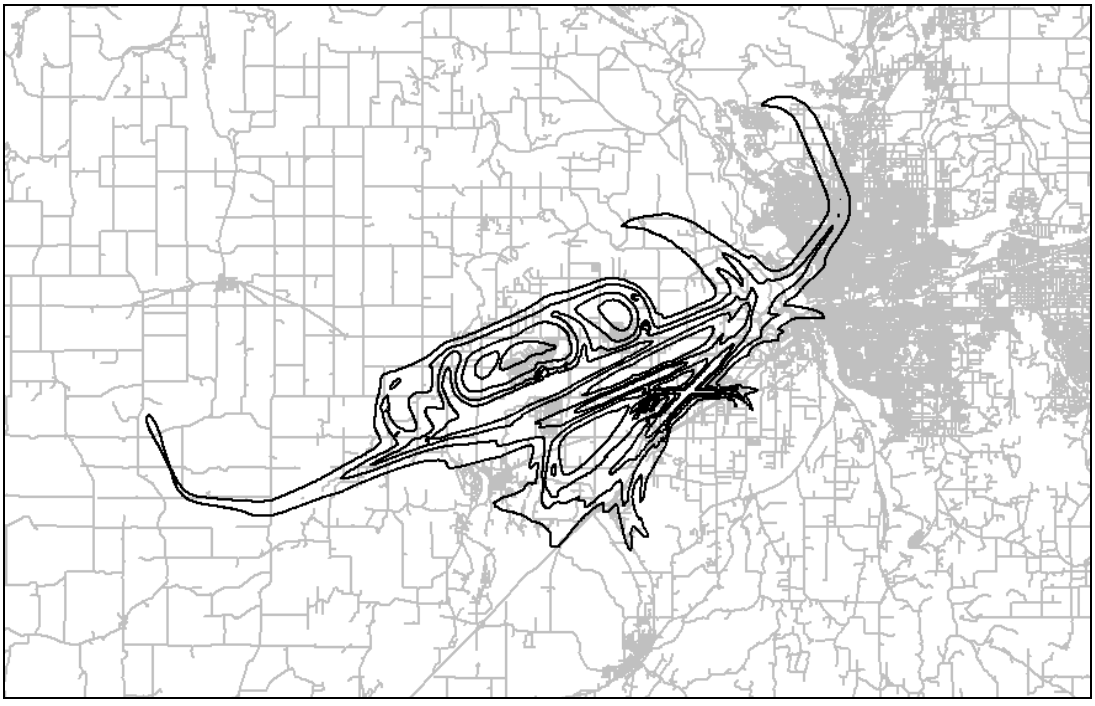


Figure 5 Fairchild Scenario 4 (A330 and B-52) and Spokane International Airport DNL Contours



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