Patrick Leahy International Airport

PATRICK LEAHY
BURLINGTON
INTERNATIONAL AIRPORT

BTV Noise Exposure Map Update
Technical Advisory Committee Meeting #2

November 30, 2023

Agenda

- Introductions and Study Roles
- Part 150 Overview
- Noise Modeling Overview
- Proposed Noise Model Inputs
- Wrap up & Discussion

Consultant Team

Diane Carter | Principal-in-Charge
Brianna Whiteman | Assistant Project Manager

Responsible for:
- Overall Project Management/Client/Agency Coordination
- Community Outreach

Gene Reindel | Principal-in-Charge
Kate Larson | Project Manager
Paul Krusell | Assistant Project Manager
David Crandall | Technical Advisor

Responsible for:
- Noise Modeling
- Compliance with Federal Regulations

TAC Membership

- Vermont National Army Guard
- Burlington Airport Commission
- Burlington International Airport
- Chittenden County Regional Planning Commission (CCRPC)
- City of South Burlington
- City of Winooski
- Community College of Vermont
- FAA (Air Traffic Manager)
- FAA (New England Regional Office) – Advisory
- Heritage Aviation (FBO)
- South Burlington School District
- Town of Williston
- Vermont National Air Guard (VTANG)
- Williston School District
- Winooski School District

Roles and Responsibilities

City of Burlington

- As airport owner and operator, the City is responsible for conducting the Noise Exposure Map (NEM) analysis and submitting the study for acceptance
- Consulting team is retained to conduct technical work and prepare documentation related to the NEM process

Federal Aviation Administration (FAA)

- Determines whether the NEM process has met Part 150 requirements and approves individual noise mitigation measures

Technical Advisory Committee (TAC)

- Provides representation for stakeholder organizations, including local jurisdictions, airlines, local business interests

Part 150 NEM Overview

FAA "accepts" NEM as compliant with Part 150 standards

NEM must include detailed description of:

- Airport layout, aircraft operations, and other inputs to noise model
- Aircraft noise exposure in terms of Day-Night Average Sound Level (DNL)
- Land use compatibility assessment

NEM must address two calendar years

- Year of submission
- Forecast (at least five years from year of submission)

Noise Modeling Overview

- FAA requires use of their Aviation Environmental Design Tool (AEDT) for civilian aircraft operations
  - Version 3e is the most current version (at study's commencement)
  - https://aedt.faa.gov
- Military aircraft operations will be modeled with the Department of Defense noise model, NOISEMAP Version 7.3
- Military noise model results will be combined with AEDT results of the civilian aircraft operations

AEDT requires noise model input data in three categories:

1 Aircraft Noise and Performance Data

- Aircraft performance profiles
- Noise level vs. distance curves

2 Airport Physical Inputs

- Runway end coordinates
- Ground engine runup locations
- Weather data
- Terrain data

3 Aircraft Operational Inputs

- Number of aircraft operations
- Aircraft fleet mix
- Day-night split of operations
- Runway utilization
- Flight track geometry and utilization

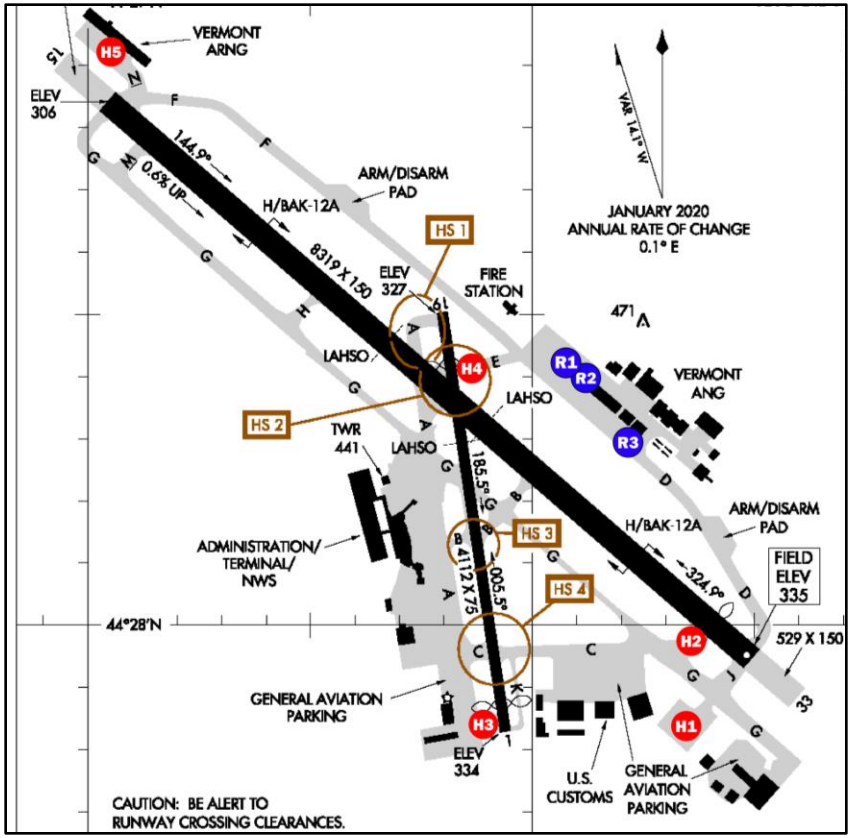
Proposed Noise Modeling Inputs

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

- *TAC review*
- *Airport review, approval and/or change*
- *FAA review and approval.*

Model Input Category	Typical Data Source
Airport Layout	FAA 5010 data and airport
Aircraft noise and performance	Standard AEDT database, pilot interviews (NOISEMAP)
Aircraft operations	FAA ATADS, airport forecasts, FAA TAF, BTV NOMS, operator interviews
Aircraft runup operations	Airport staff/log
Runway use rates	BTV NOMS, ATCT personnel, Airport staff
Flight track geometry and use rates	BTV NOMS, ATCT personnel, observations
Meteorological conditions	Standard AEDT database
Terrain data	USGS National Map Viewer, National Land Cover Database
Note: "BTV NOMS" is the noise and operations monitoring system currently installed at BTV.	

Physical Input Requirements



Airport layout

Runways:

- Runway 15/33 – primary
- Runway 1/19 – crosswind

Helipads:

- Civilian helipads at H1 and H3
- VTARNG uses 4 locations as helipads
  - H2, H3, H4 (taxiways E, C, and L)
  - H5 (VTARNG ramp)

Runups:

- Marked R1, R2, R3

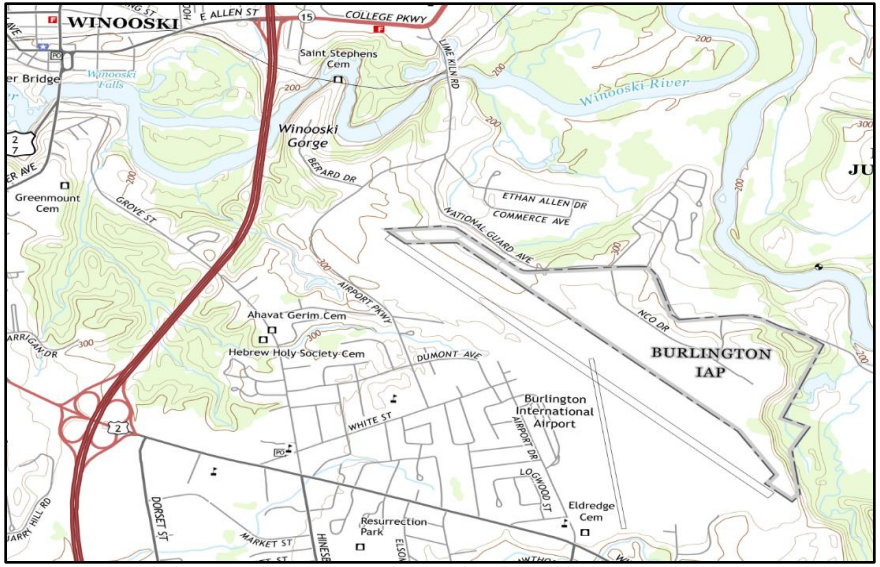
Physical Input Requirements

Airport elevation & surrounding terrain

- Data obtained from the United States Geological Survey (USGS) National Elevation Dataset

Airport weather

- The AEDT database includes recent 10-year averages:
  - Temperature* – 47.0°F
  - Station pressure* – 1002.6 mb
  - Relative humidity* – 65.9%
  - Dew point – 36.2°F
  - Wind speed – 6.7 knots
- *Applied to NOISEMAP modeling



Source: USGS; Nov 2023

Operational Input Requirements

Annual-Average Day Operations
Existing year 2024
Forecast year 2029

Aircraft Type
Jet, Turboprop, Helicopter, Piston

AEDT or NOISEMAP Equipment Type
EMB175, CNA172, F-35A, etc.

Day-Night Split
Day: 7 AM – 10 PM
Night: 10 PM – 7 AM

Stage length
Surrogate for aircraft weight; determined by distance from departure to destination airport

Year	Air Carrier	Air Taxi	General Aviation	Military	Total
2024	15,419	6,983	87,015	5,312	114,729
2029	16,814	7,384	89,327	5,292	118,817

Noise Modeling Process: Baseline Data Analysis

Commercial and General Aviation Operations

Based on 18 months of flight track and aircraft identification data:
January 1, 2022 through June 30, 2023

- Adjusted annual-average aircraft operations to the FAA tower counts:
  - Calculated additional nighttime operations not accounted for in the tower counts due to tower closures from midnight to 5:30 am daily
- Determined the following for each FAA category (Air Carrier, Air Taxi and GA):
  - Day-night split of operations
  - Fleet mix
- Determined the following for each aircraft type group (jets, non-jets and helicopters):
  - Model flight tracks and annual flight track use
  - Annual runway use

Noise Modeling Process: Baseline Data Analysis

Military Operations

Obtained from discussions with VTANG and VTARNG

- Three predominant military operators:
  - 158th Fighter Wing (VTANG): F-35A jet aircraft
  - 103rd Air Wing (VTARNG): UH-60M and UH-72 helicopters
  - Transient operators: fighter jets, freighter/tanker aircraft
- Numbers of arrival, departure, and closed pattern operations
- Flight profiles for each type of flight operation
- Runway usage
  (based on historical data)
- Flight track geometry
  (based on current operating procedures)

image source: https://www.dvidshub.net/image/6168204/vtang-maintains-f-35-readiness-during-covid-19-pandemic

Noise Modeling Process: Input Data

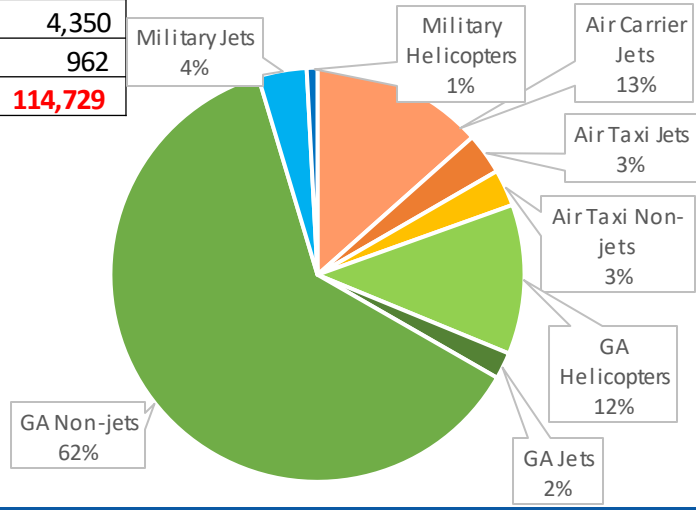
Preparation of Existing (2024) and Forecast (2029) Conditions

- Commercial and general aviation operations prepared through:
  - Scaling baseline aircraft operations and updating aircraft fleet
    - Publicly available information; announce airline service changes
    - Interviews with airport tenants
  - Applying growth rates from FAA's Terminal Area Forecast (TAF)
  - Assuming no changes to flight tracks, flight track use and runway use
- Military operations obtained from VTANG and VTARNG:
  - Assuming no changes to flight tracks, flight track use and runway use

2024 Annual Aircraft Operations

2024 Existing Conditions		Arrivals		Departures		Closed Patterns		Total
Category	Type	Day	Night	Day	Night	Day	Night	Operations
Air Carrier	Jets	5,134	2,575	5,015	2,695	-	-	15,419
Air Taxi	Jets	1,711	137	1,750	98	-	-	3,696
	Non-jets	1,491	152	1,576	68	-	-	3,287
GA	Helicopters	2,452	205	2,435	221	7,907	189	13,409
	Jets	1,120	47	1,086	81	39	9	2,382
	Non-jets	16,793	262	16,543	512	35,990	1,125	71,224
Military	Jets*	2,145	-	2,145	-	60	-	4,350
	Helicopters	450	31	443	38	-	-	962
Totals		**31,296**	**3,410**	**30,992**	**3,713**	**43,996**	**1,322**	**114,729**

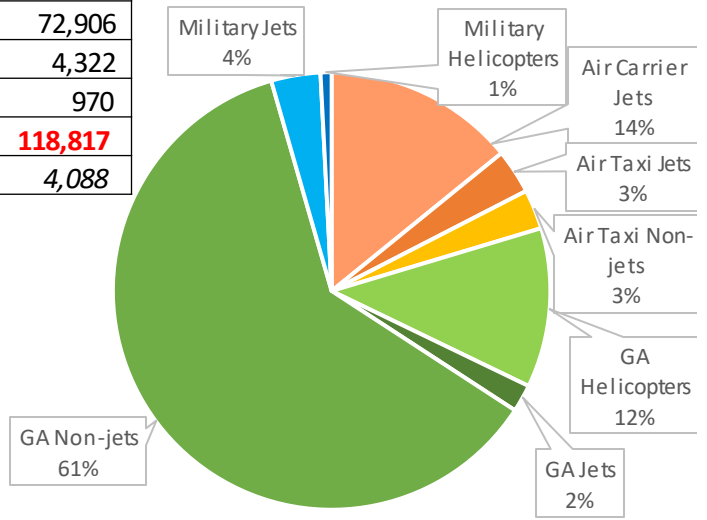
** Includes a small number of transient non-jet military aircraft*



2029 Annual Aircraft Operations

2029 Forecast Conditions		Arrivals		Departures		Closed Patterns		Total
Category	Type	Day	Night	Day	Night	Day	Night	Operations
Air Carrier	Jets	5,823	2,584	5,682	2,725	-	-	16,814
Air Taxi	Jets	1,817	137	1,856	98	-	-	3,908
	Non-jets	1,586	152	1,670	68			3,476
GA	Helicopters	2,552	205	2,536	221	8,300	198	14,011
	Jets	1,134	47	1,100	81	39	9	2,410
	Non-jets*	17,182	262	17,233	512	36,570	1,148	72,906
Military	Jets **	2,131	-	2,131	-	60	-	4,322
	Helicopters	450	35	450	35	-	-	970
Totals		**32,675**	**3,422**	**32,656**	**3,741**	**44,969**	**1,354**	**118,817**
Increase from 2024		*1,379*	*12*	*1,664*	*28*	*973*	*32*	*4,088*

* *Includes newly manufactured Beta electric aircraft*
** *Includes a small number of transient non-jet military aircraft*

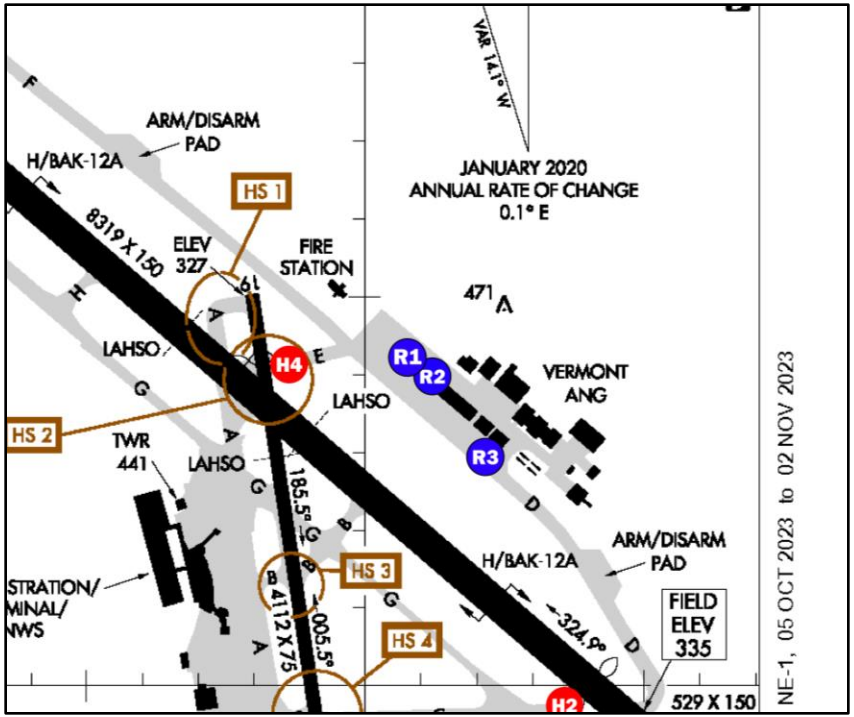


Additional Modeled Aircraft Operations

Engine Runups

Military runups on ANG Apron (restricted area)

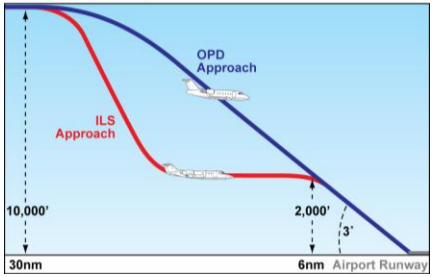
Aircraft Type	% of Full Power	Minutes/ year	Location	Aircraft Heading	% of Time at Location
F-35A	10%	3,888	R1	192°	33%
			R2	192°	33%
			R3	90°	34%
	31%	100	R1	192°	33%
			R2	192°	33%
			R3	90°	34%



Flight Profiles

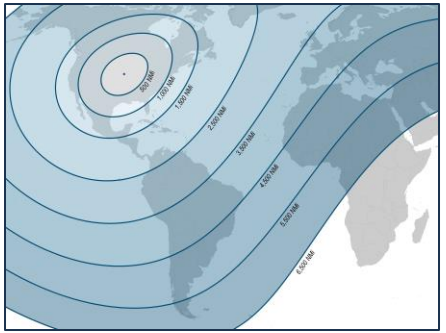
Arrivals

- AEDT database has standard arrival profiles
- NOISEMAP military aircraft flight profiles refined with VTANG input



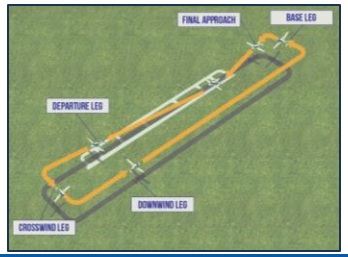
Departures

- AEDT database has departure profiles by stage length (a surrogate for weight)
  - Stage lengths determined from data city pairs; many small aircraft have a single departure profile
- NOISEMAP military aircraft flight profiles refined with VTANG/VTARNG input



Closed Pattern profiles

- Pattern width, length, and altitude derived from flight track data and VTANG input



Runway Use

Time of Day	Day				Night			
Runway End	15	33	1	19	15	33	1	19
Arrivals								
Non-military Jets	53%	47%	0%	0%	61%	39%	0%	0%
Non-Jets	26%	33%	16%	25%	52%	28%	9%	10%
Military Fighters	73%	27%	0%	0%	73%	27%	0%	0%
Departures								
Non-military Jets	50%	50%	0%	0%	64%	36%	0%	0%
Non-Jets	21%	28%	18%	33%	25%	31%	19%	25%
Military Fighters	73%	27%	0%	0%	73%	27%	0%	0%
Circuits								
Non-Jets	11%	25%	20%	43%	19%	24%	16%	41%

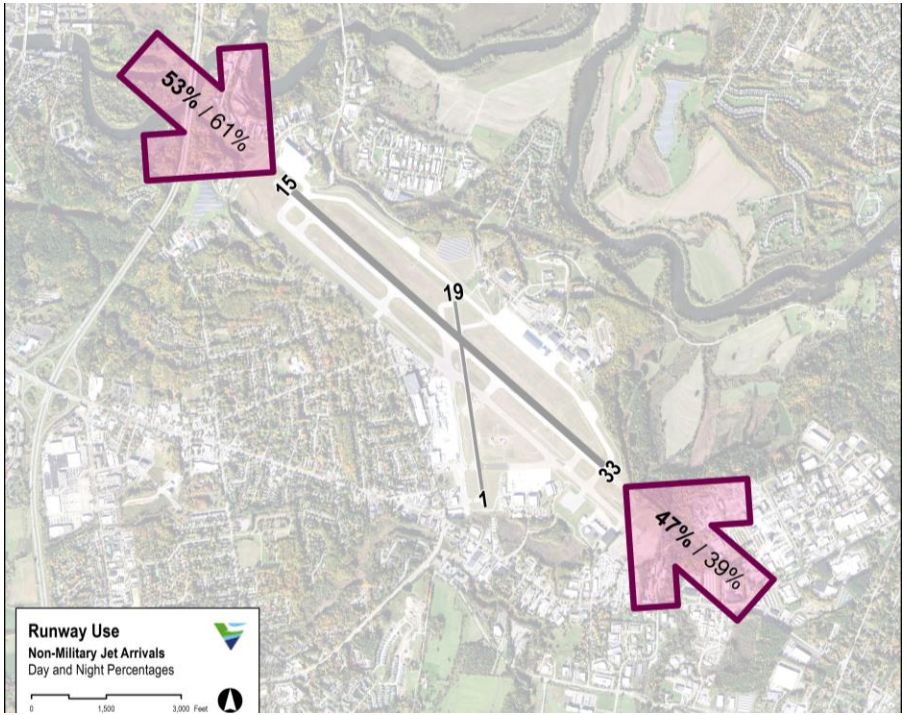
Runway 15/33 – primary

- Handles all jet traffic

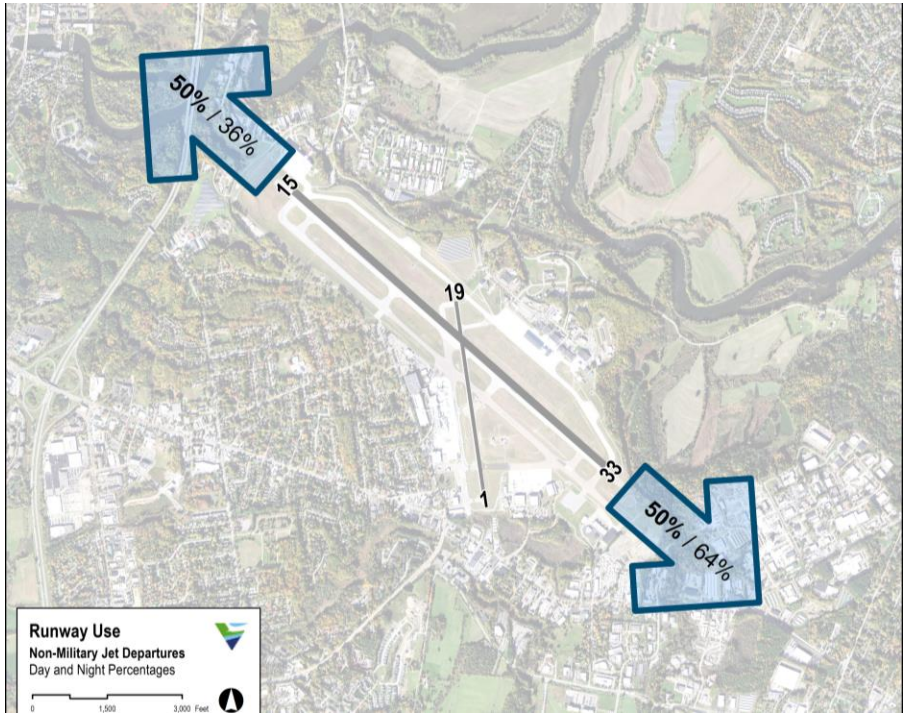
Runway 1/19 – crosswind

- Used only by GA propellor aircraft

Commercial Jet Runway Use

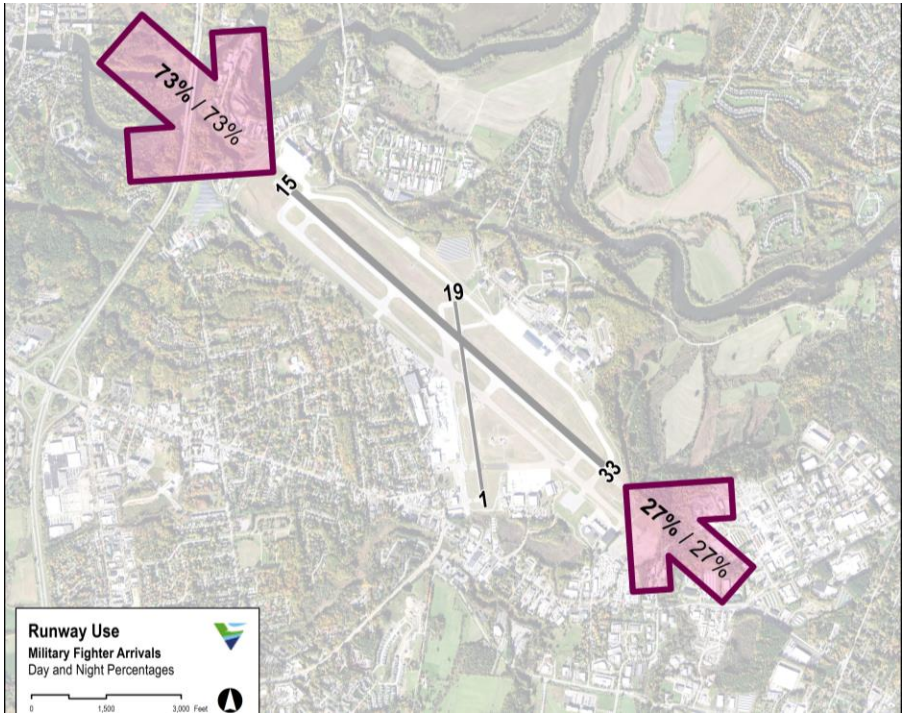


Arrivals (day% / night%)

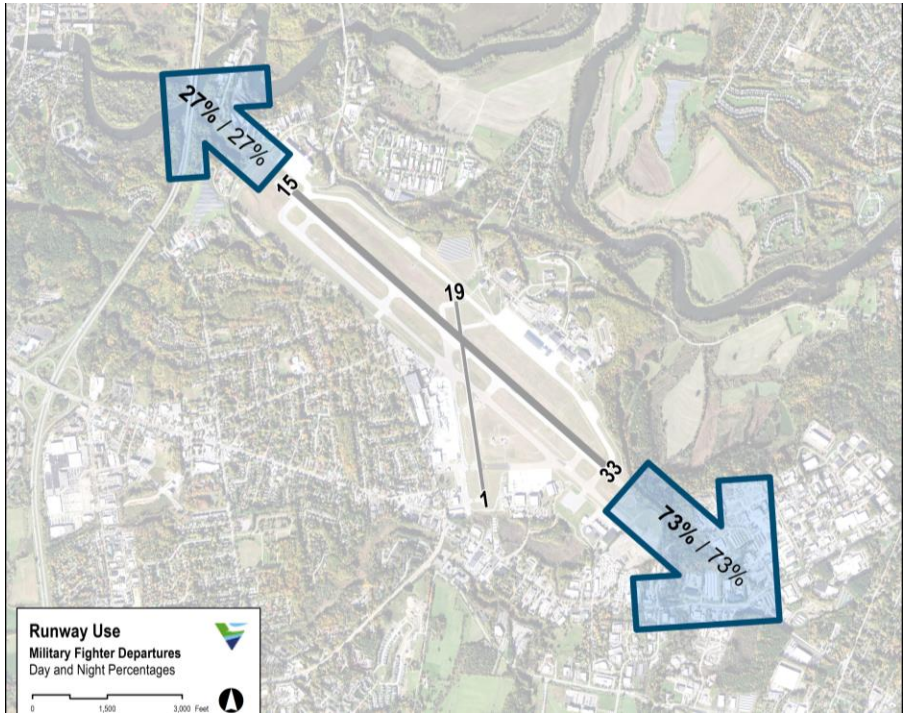


Departures (day% / night%)

Military Jet Runway Use

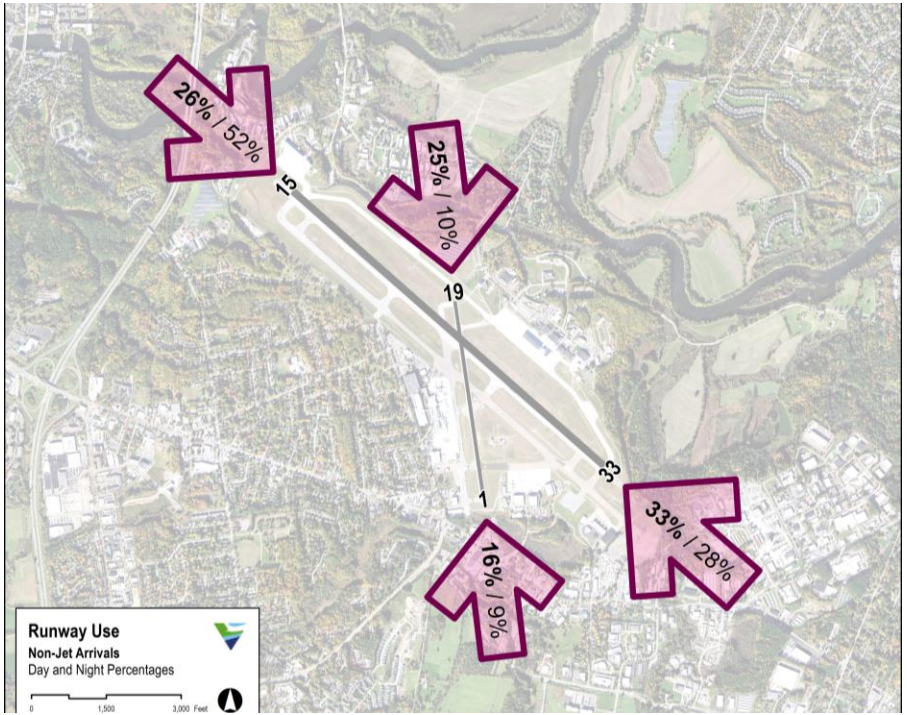


Arrivals (day% / night%)

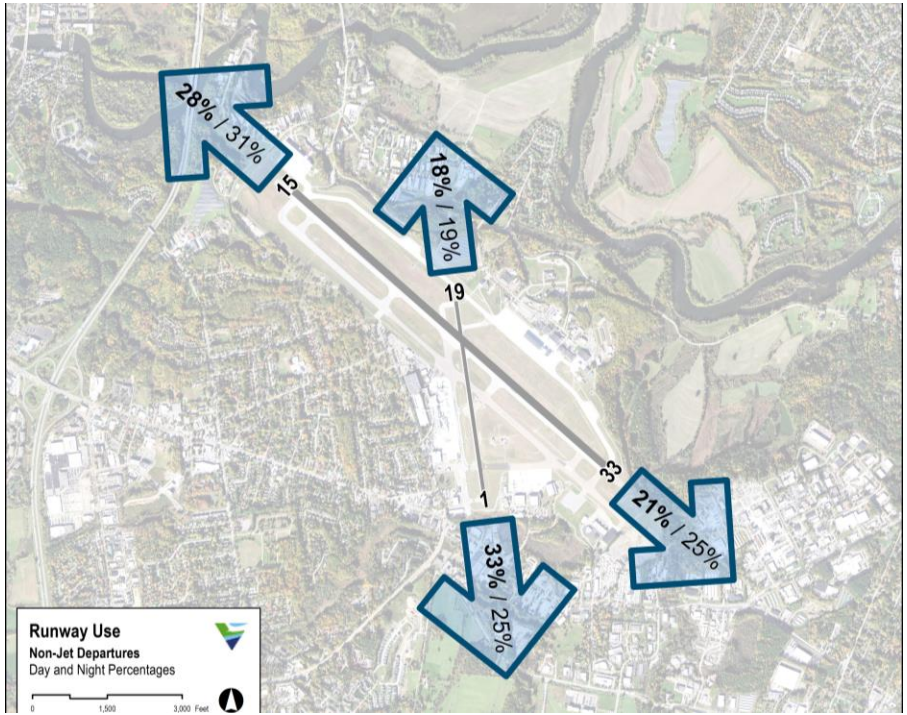


Departures (day% / night%)

Non-Jet Runway Use

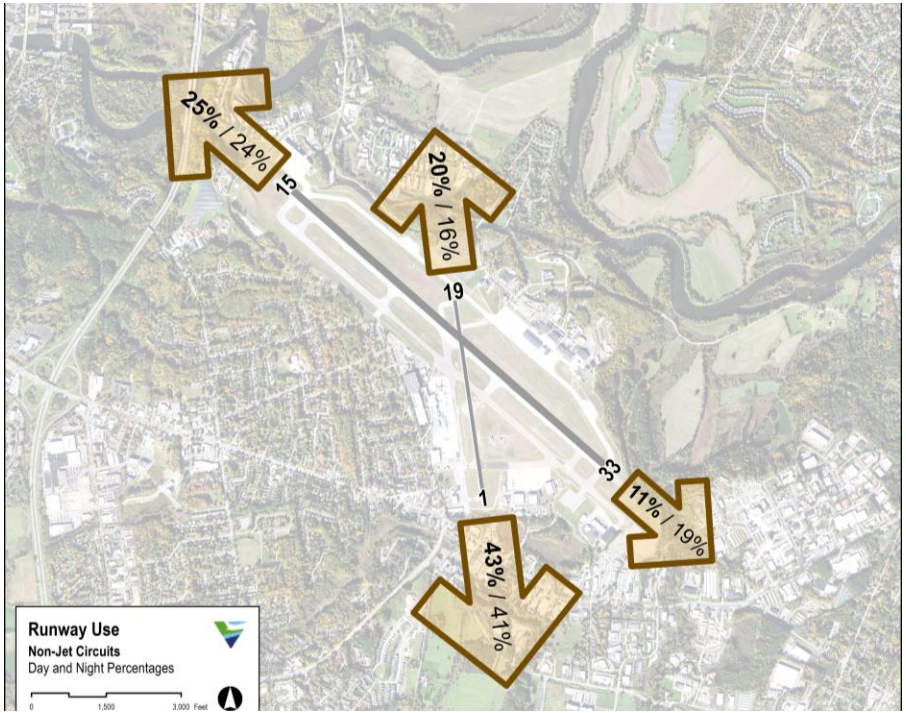


Arrivals (day% / night%)



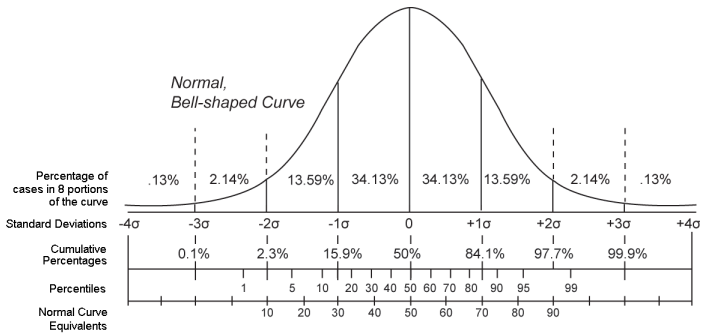
Departures (day% / night%)

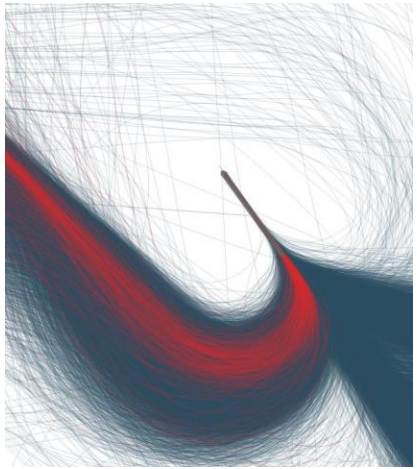
Non-Jet Runway Use

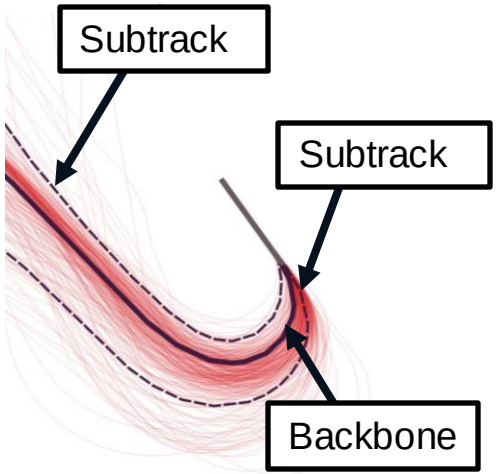


Closed Patterns (day% / night%)

Development of AEDT Model Flight Tracks



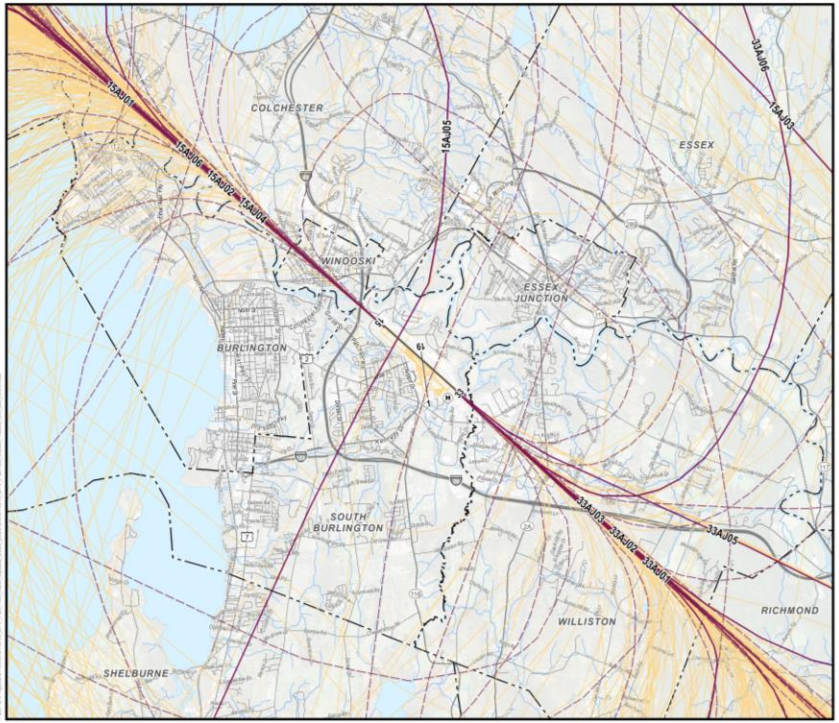




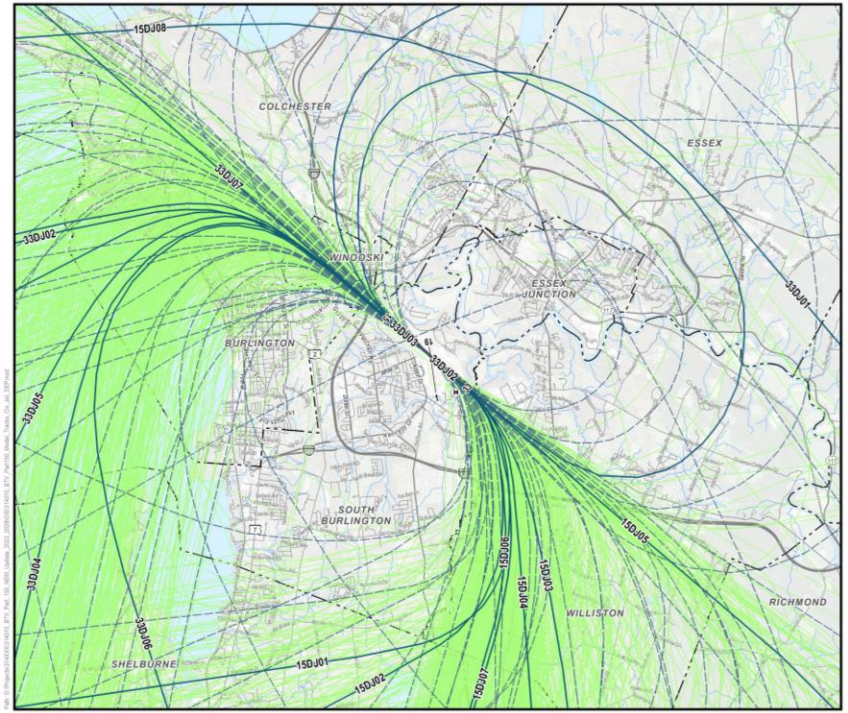
- "Backbone tracks" represent statistical center of a distinct flight path corridor (122)
- "Subtracks" represent flight dispersion across the flight path corridors (390)

	Arrivals		Departures		Circuits	
Runway	Backbones	Subtracks	Backbones	Subtracks	Backbones	Subtracks
01	9	24	7	22	2	4
15	13	52	17	64	2	0
19	10	28	8	28	2	6
33	16	46	16	68	2	4
H1	6	14	12	30	0	0
Total	54	164	60	212	8	14

Flight Tracks: Commercial Jet Arrivals & Departures

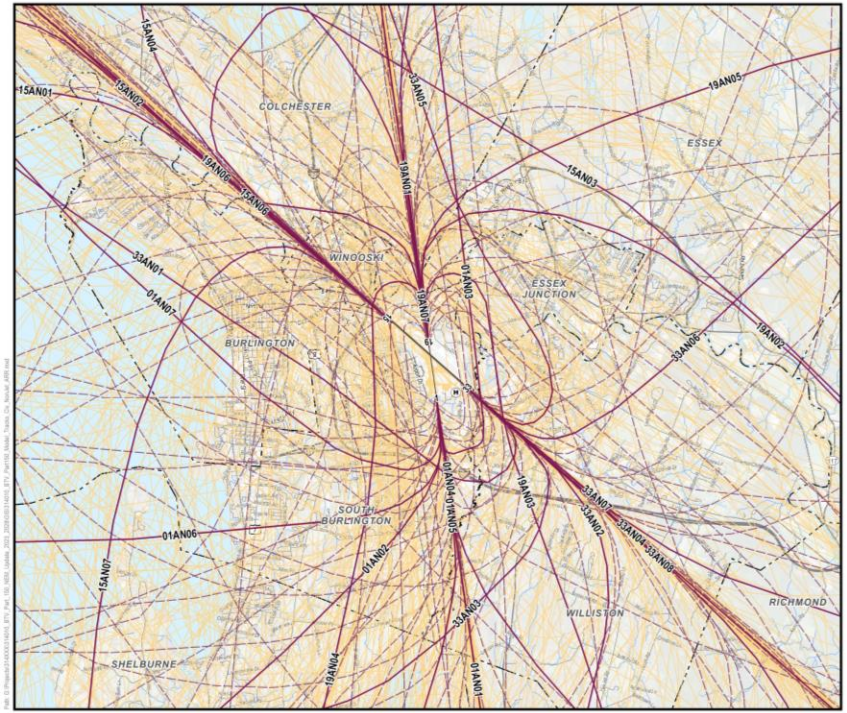


Arrivals

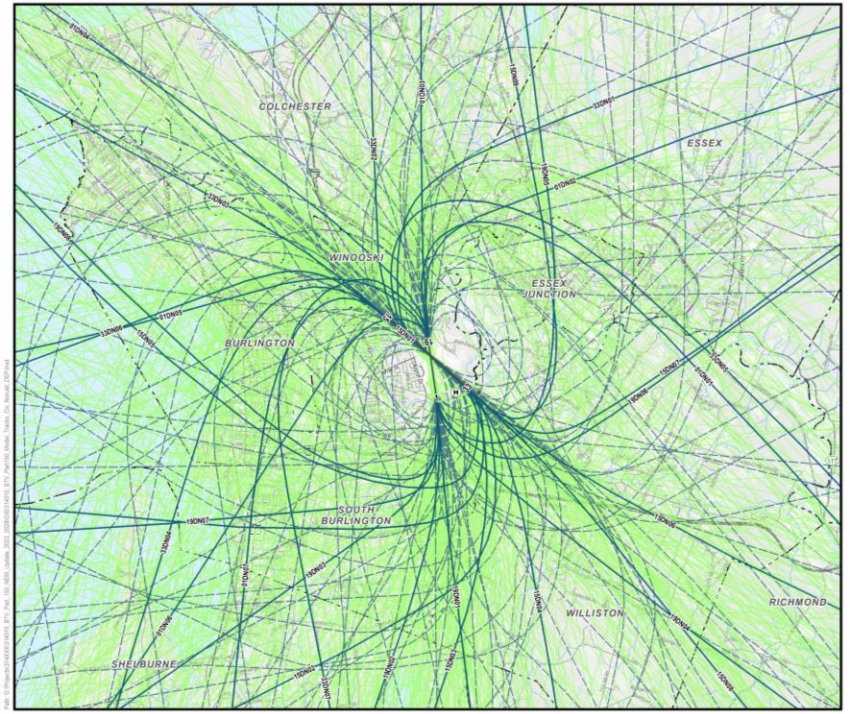


Departures

Flight Tracks: Commercial Non-Jet Arrivals & Departures

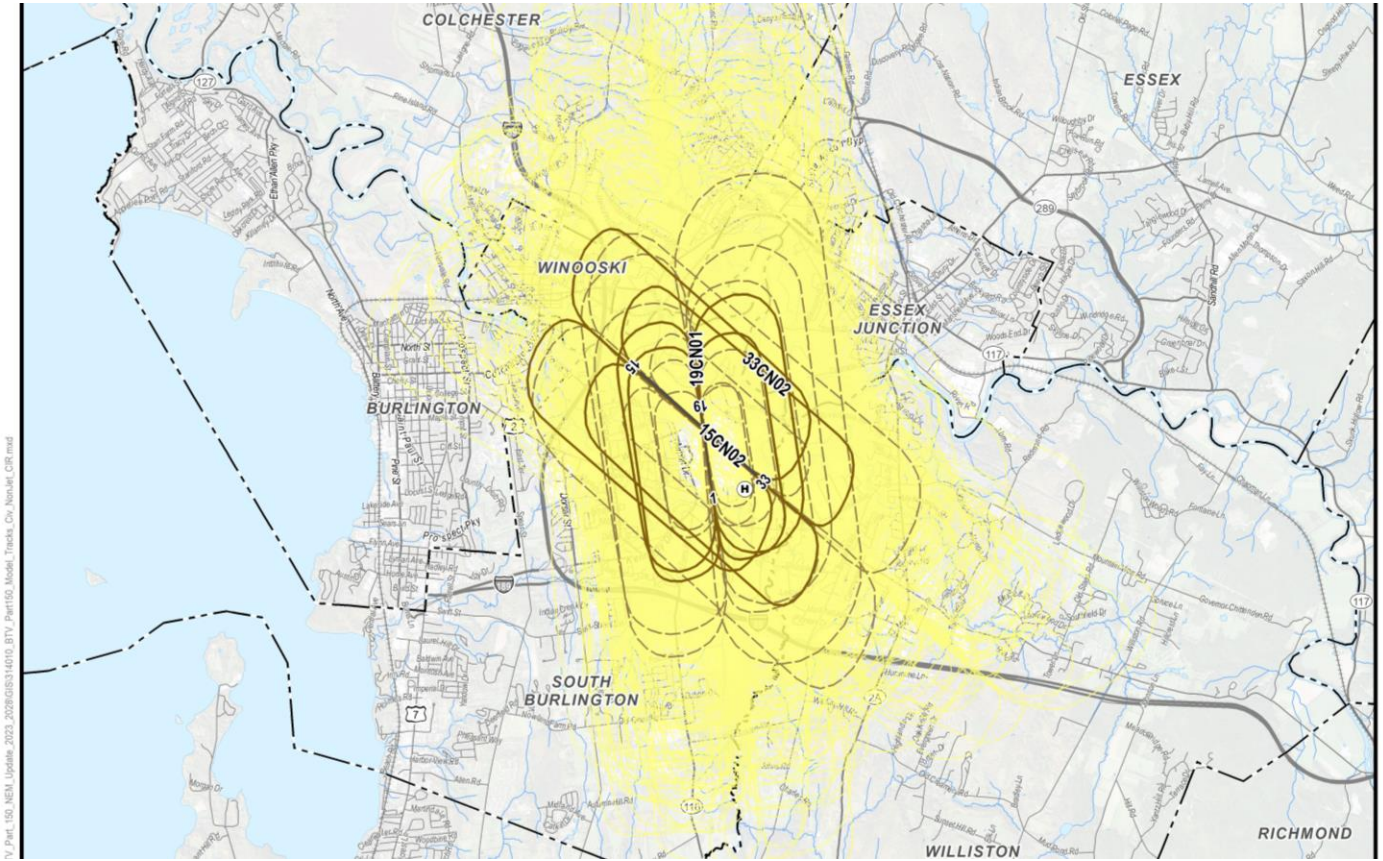


Arrivals

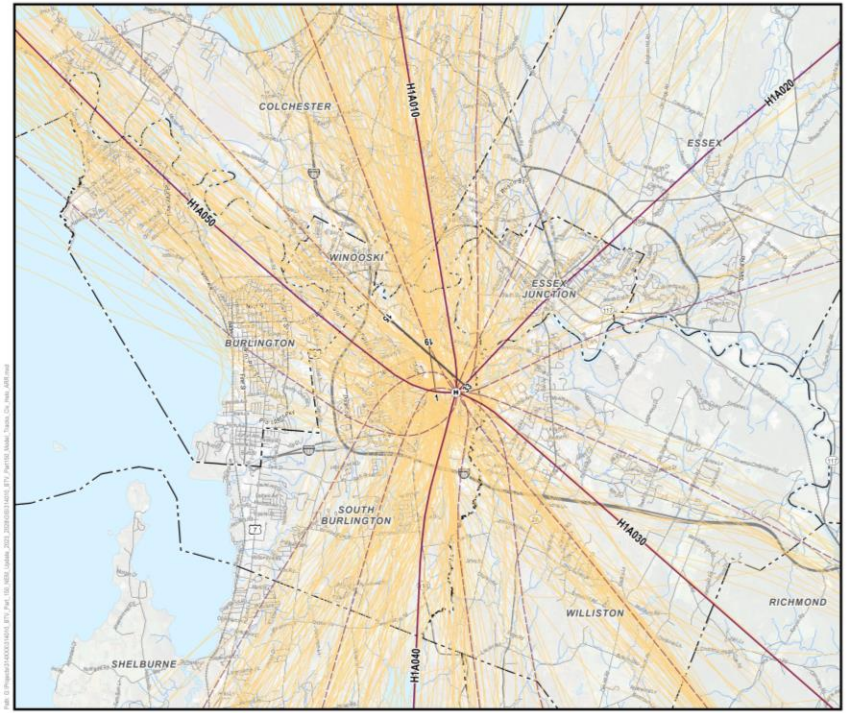


Departures

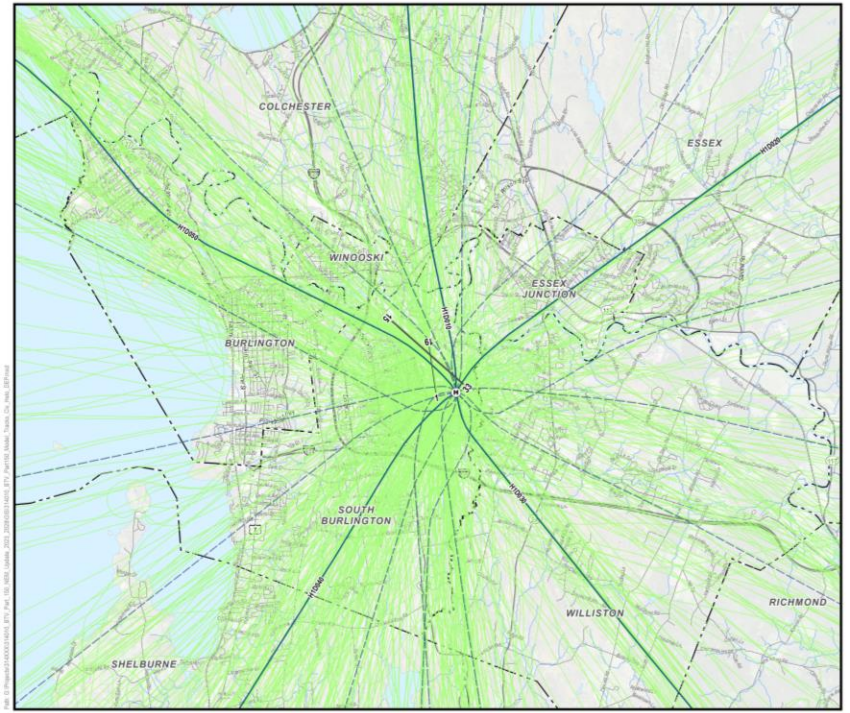
Flight Tracks: General Aviation Closed Patterns



Flight Tracks: Helicopter Arrivals & Departures



Arrivals



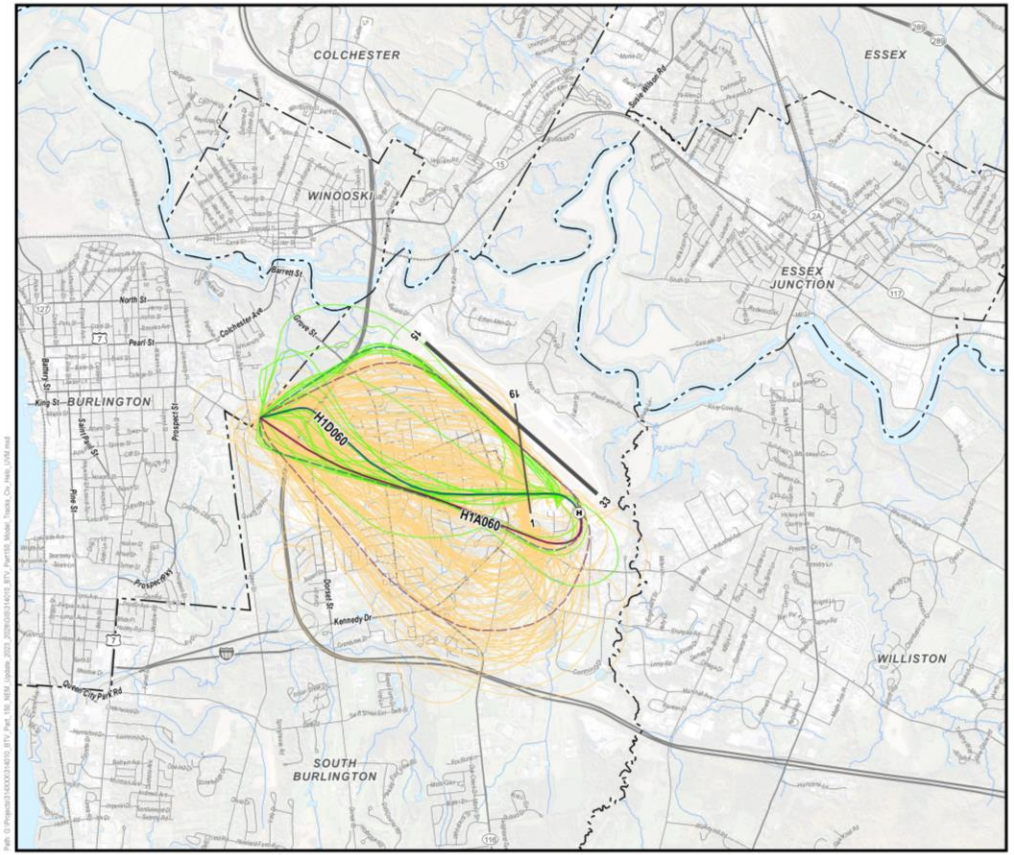
Departures

Flight Tracks: Helicopter Short Hops

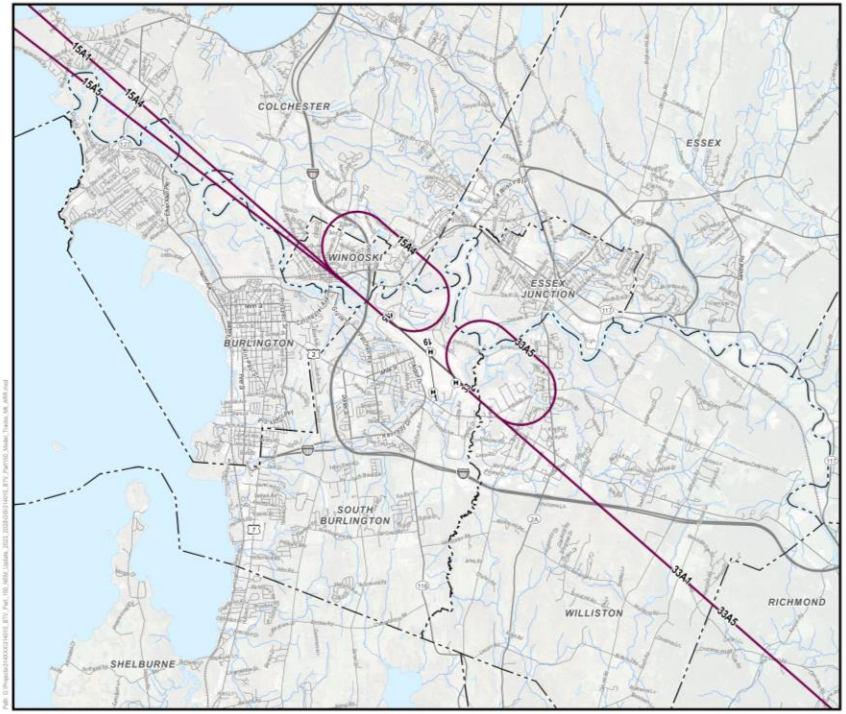
Helicopter flights between BTV and UVM medical center

Color indicates direction:

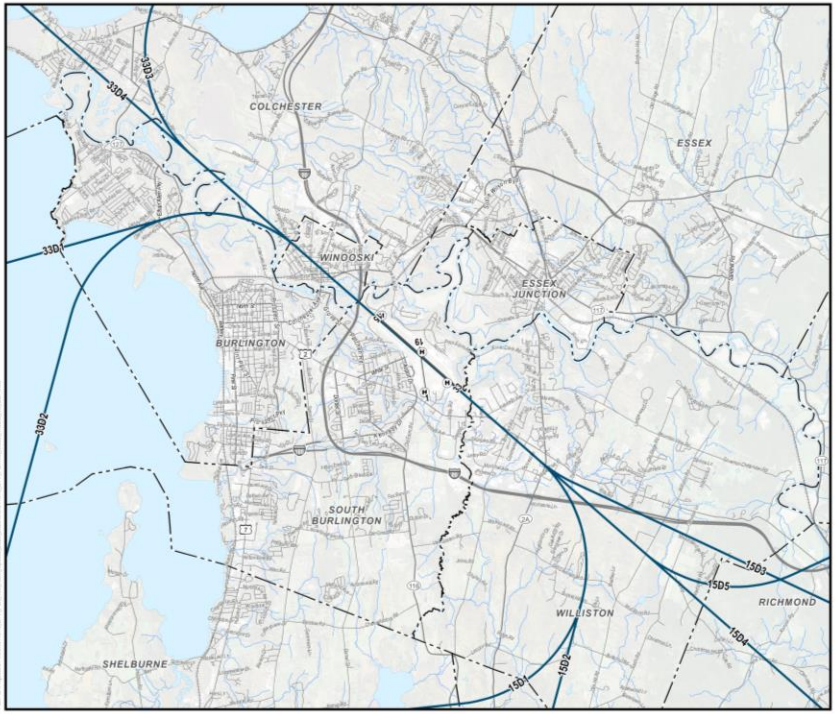
- Green = arrivals
- orange = departures



Flight Tracks: Military Jet Arrivals & Departures

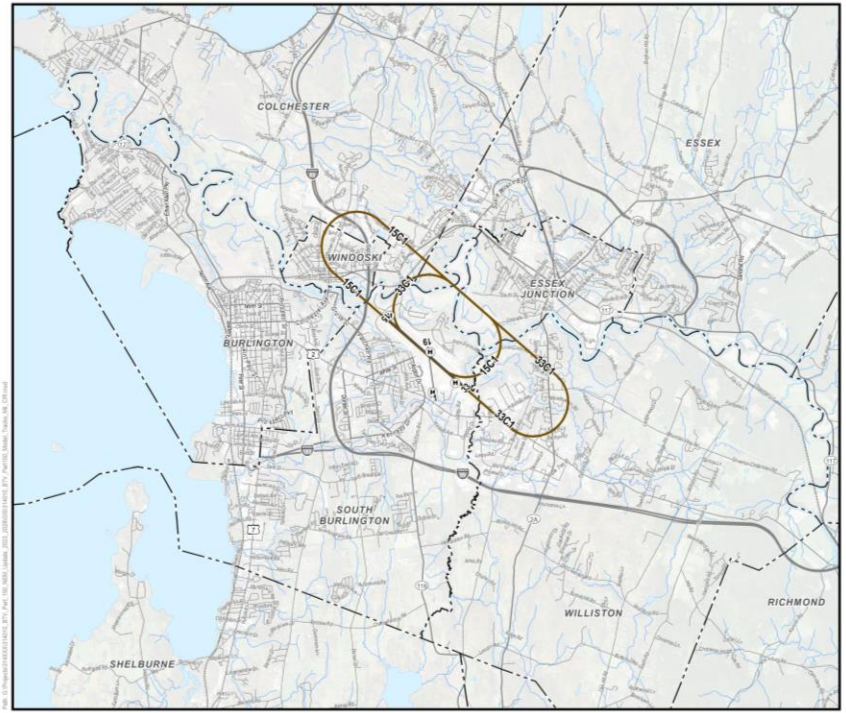


Arrivals

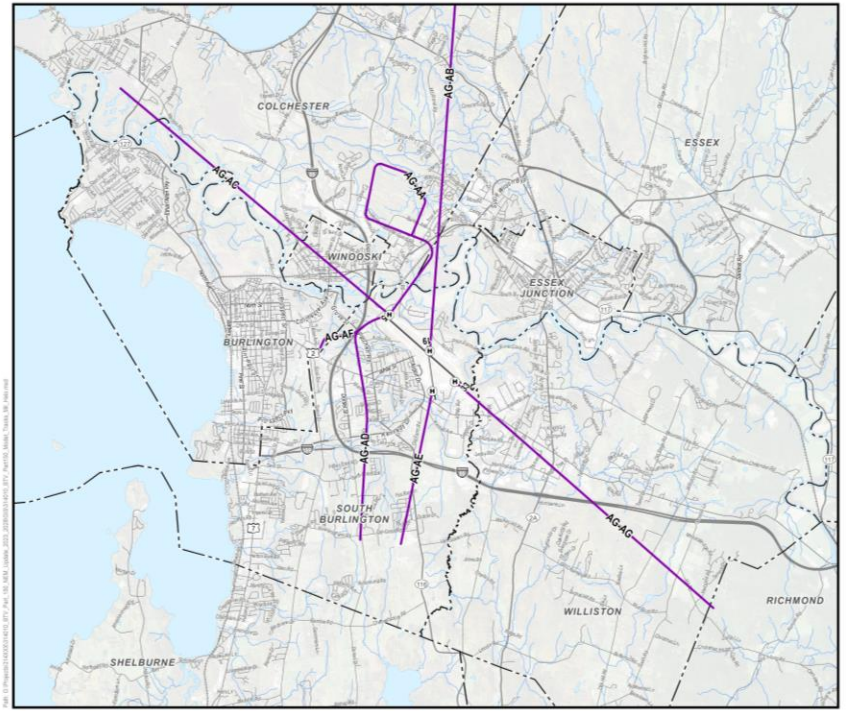


Departures

Flight Tracks: Military Circuits & Helicopters

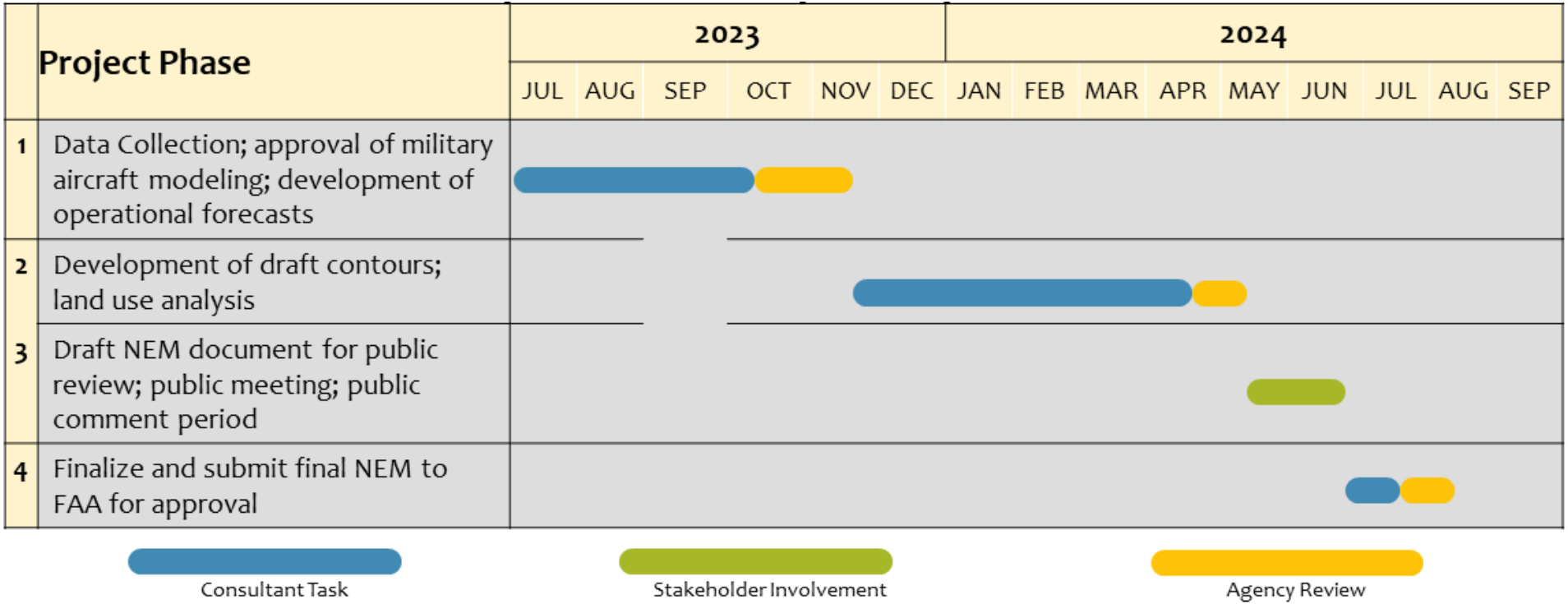


Closed Patterns



Helicopters

NEM Project Schedule



TAC Preliminary Topics and Schedule

TAC Meeting 2	Thursday, November 30, 2023

- Noise Model Inputs

TAC Meeting 3	Thursday, January 18, 2024

- Noise Compatibility Program Review

TAC Meeting 4	Thursday, April 11, 2024

- Noise Modeling Results – Presentation of the Noise Exposure Maps

TAC MEMBER DISCUSSION