Appendices for the

Noise Exposure Map Update

Pursuant to Title 14 of the Code of Federal Regulations Part 150

Louisville Muhammad Ali International Airport

Prepared for:

LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT

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Appendix A: Noise Terminology

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A.1 Aircraft Noise Terminology

Noise is a complex physical quantity. The properties, measurement, and presentation of noise involve specialized terminology that can be difficult to understand. To provide a basic reference on these technical issues, this section introduces fundamentals of noise terminology, the effects of noise on human activity, and noise propagation.

A.1.1 Introduction to Noise Terminology

Analyses of potential impacts from changes in aircraft noise levels rely largely on a measure of cumulative noise exposure over an entire calendar year, expressed in terms of a metric called the day-night average sound level (DNL). However, DNL does not provide an adequate description of noise for many purposes. A variety of measures, which are further described in subsequent subsections, are available to address essentially any issue of concern, including:

- Sound Pressure Level (SPL) and the decibel (dB)
- A-Weighted Decibel (dBA)
- Maximum A-Weighted Sound Level (L_{max})
- Time Above (TA)
- Sound Exposure Level (SEL)
- Equivalent A-Weighted Sound Level (L_{eq})
- Day-Night Average Sound Level (DNL)

A.1.2 Sound Pressure Level, SPL, and the Decibel, dB

All sounds come from a sound source—a musical instrument, a voice speaking, an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any sound source travels through the air in sound waves—tiny, quick oscillations of pressure just above and just below atmospheric pressure. The ear senses these pressure variations and, with much processing in our brain, translates them into "sound."

Our ears are sensitive to a wide range of sound pressures. The loudest sounds that we can hear without pain contain about one million times more energy than the quietest sounds we can detect. To allow us to perceive sound over this very wide range, our ear/brain "auditory system" compresses our response in a complex manner, represented by a term called sound pressure level (SPL), which we express in units called decibels (dB).

Mathematically, SPL is a logarithmic quantity based on the ratio of two sound pressures, the numerator being the pressure of the sound source of interest (P_{source}), and the denominator being a reference pressure ($P_{reference}$).[1]

$$\textit{Sound Pressure Level (SPL)} = 20 * Log\left(\frac{P_{source}}{P_{reference}}\right) dB$$

[1] The reference pressure is approximately the quietest sound that a healthy young adult can hear.

The logarithmic conversion of sound pressure to SPL means that the quietest sound that we can hear (the reference pressure) has a sound pressure level of about 0 dB, while the loudest sounds that we hear without pain have sound pressure levels of about 120 dB. Most sounds in our day-to-day environment have sound pressure levels from about 40 to 100 dB[2].

Because decibels are logarithmic quantities, we cannot use common arithmetic to combine them. For example, if two sound sources each produce 100 dB operating individually, when they operate simultaneously, they produce 103 dB, not the 200 dB we might expect. Increasing to four equal sources operating simultaneously will add another 3 dB of noise, resulting in a total SPL of 106 dB. For every doubling of the number of equal sources, the SPL goes up another 3 dB.

If one noise source is much louder than another is, the louder source "masks" the quieter one and the two sources together produce virtually the same SPL as the louder source alone. For example, a 100 dB and 80 dB sources produce approximately 100 dB of noise when operating together.

Two useful “rules of thumb” related to SPL are worth noting: (1) humans generally perceive a six to 10 dB increase in SPL to be about a doubling of loudness,[3] and (2) changes in SPL of less than about 3 dB for any particular sound are not readily detectable outside of a laboratory environment.

A.1.3 A-Weighted Decibel

An important characteristic of sound is its frequency, or "pitch.” This is the per-second oscillation rate of the sound pressure variation at our ear, expressed in units known as Hertz (Hz).

When analyzing the total noise of any source, acousticians often break the noise into frequency components (or bands) to consider the “low,” “medium,” and “high” frequency components. This breakdown is important for two reasons:

- Our ear is better equipped to hear mid and high frequencies and is least sensitive to lower frequencies. Thus, we find mid- and high-frequency noise more annoying.
- Engineering solutions to noise problems differ with frequency content. Low-frequency noise is generally harder to control.

The normal frequency range of hearing for most people extends from a low of about 20 Hz to a high of about 10,000 to 15,000 Hz. Most people respond to sound most readily when the predominant frequency is in the range of normal conversation, typically around 1,000 to 2,000 Hz. The acoustical community has defined several “filters,” which approximate this sensitivity of our ear and thus, help us to judge the relative loudness of various sounds made up of many different frequencies.

The so-called "A" filter (“A weighting”) generally does the best job of matching human response to most environmental noise sources, including natural sounds and sound from common transportation sources. A-weighted decibels are abbreviated dBA. Because of the correlation with our hearing, the U. S. Environmental Protection Agency (EPA) and nearly every other federal and state agency have adopted

[2] The logarithmic ratio used in its calculation means that SPL changes relatively quickly at low sound pressures and more slowly at high pressures. This relationship matches human detection of changes in pressure. We are much more sensitive to changes in level when the SPL is low (for example, hearing a baby crying in a distant bedroom), than we are to changes in level when the SPL is high (for example, when listening to highly amplified music).

[3] A “10 dB per doubling” rule of thumb is the most often used approximation.

A-weighted decibels as the metric for use in describing environmental and transportation noise. **Figure A-1** depicts A-weighting adjustments to sound from approximately 20 Hz to 10,000 Hz.

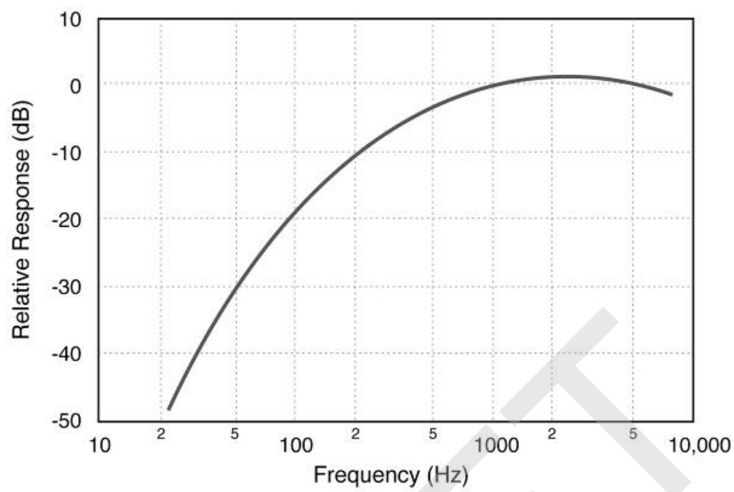

Figure A-1. A-Weighting Frequency Response

Source: Extract from Harris, Cyril M., Editor, "Handbook of Acoustical Measurements and Control," McGraw-Hill, Inc., 1991, pg. 5.13; HMMH

As the figure shows, A-weighting significantly de-emphasizes noise content at lower and higher frequencies where we do not hear as well, and has little effect, or is nearly "flat," in for mid-range frequencies between 1,000 and 5,000 Hz. All sound pressure levels presented in this document are A-weighted unless otherwise specified.

Figure A-2 shows representative A-weighted levels for many common sounds.

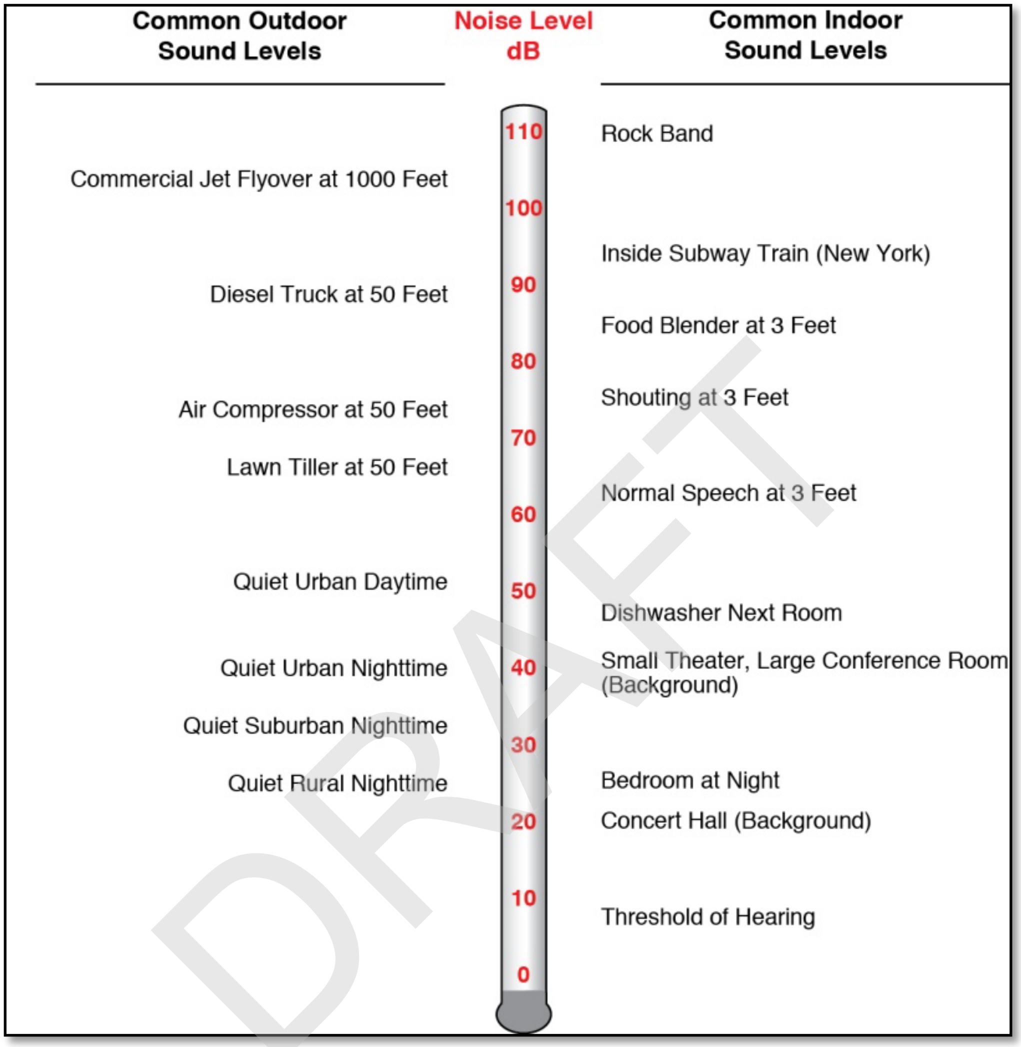

Figure A-2. A-Weighted Sound Levels for Common Sounds

Source: HMMH

A.1.4 Maximum A-Weighted Sound Level, L_{max}

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as a car or aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance. The background or “ambient” level continues to vary in the absence of a distinctive source, for example due to birds chirping, insects buzzing, leaves rustling, etc. It is often convenient to describe a particular noise "event" (such as a vehicle passing by, a dog barking, etc.) by its maximum sound level, abbreviated as L_{max}.

Figure A-3 depicts this general concept, for a hypothetical noise event with an L_{max} of approximately 102 dB.

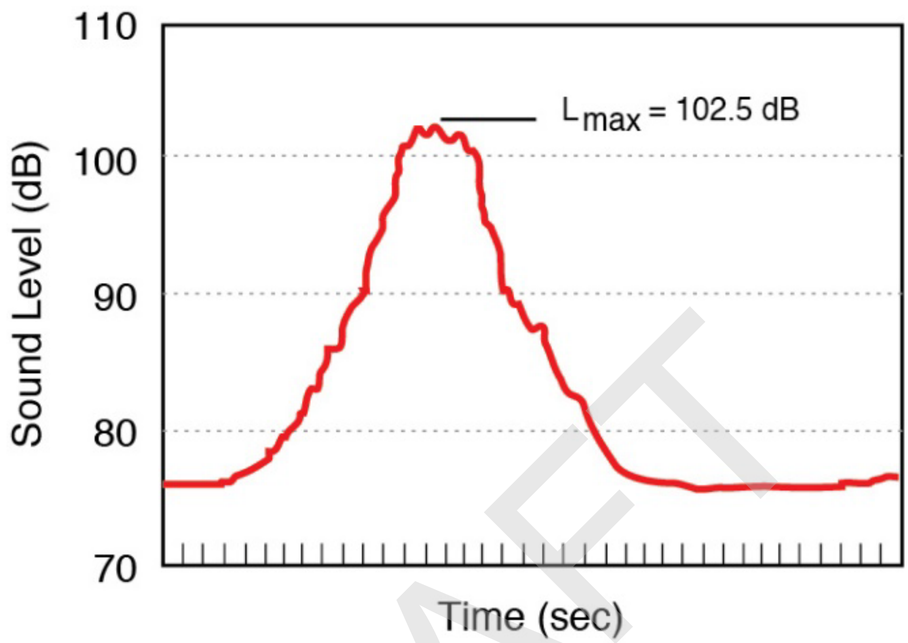

Figure A-3. Variation in A-Weighted Sound Level over Time and Maximum Noise Level

Source: HMMH

While the maximum level is easy to understand, it suffers from a serious drawback when used to describe the relative "noisiness" of an event such as an aircraft flyover; i.e., it describes only one dimension of the event and provides no information on the event's overall, or cumulative, noise exposure. In fact, two events with identical maximum levels may produce very different total exposures. One may be of very short duration, while the other may continue for an extended period and be judged much more annoying.

The next section introduces a measure that accounts for this concept of a noise "dose," or the cumulative exposure associated with an individual "noise event" such as an aircraft flyover.

A.1.5 Sound Exposure Level, SEL

The most commonly used measure of cumulative noise exposure for an individual noise event, such as an aircraft flyover, is the Sound Exposure Level, (SEL). SEL is a summation of the A-weighted sound energy over the entire duration of a noise event. SEL expresses the accumulated energy in terms of the one-second-long steady-state sound level that would contain the same amount of energy as the actual time-varying level.

SEL provides a basis for comparing noise events that generally match our impression of their overall "noisiness," including the effects of both duration and level. The higher the SEL, the more annoying a noise event is likely to be. In simple terms, SEL "compresses" the energy for the noise event into a single second. **Figure A-4** depicts this compression, for the same hypothetical event shown in **Figure A-3**. Note that the SEL is higher than the L_{max}.

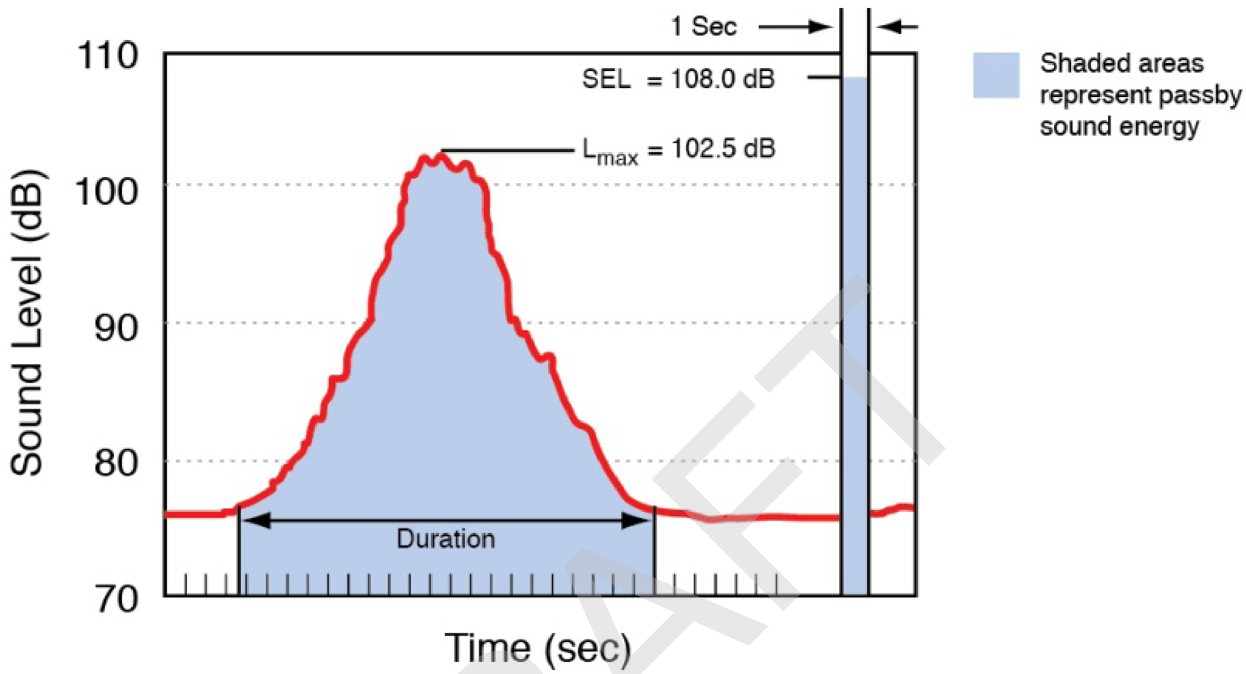

Figure A-4. Graphical Depiction of Sound Exposure Level

Source: HMMH

The "compression" of energy into one second means that a given noise event's SEL will be a higher numerical value than its L_{max} if the event lasts longer than one second. For most aircraft flyovers, SEL is roughly five to 12 dB higher than L_{max}. Adjustment for duration means that relatively slow and quiet propeller aircraft can have the same or higher SEL than faster, louder jets, which produce shorter duration events.

A.1.6 Equivalent A-Weighted Sound Level, L_{eq}

The Equivalent Sound Level, abbreviated L_{eq}, is a measure of the exposure resulting from the accumulation of sound levels over a particular period of interest; e.g., one hour, an eight-hour school day, nighttime, or a full 24-hour day. L_{eq} plots for consecutive hours can help illustrate how the noise dose rises and falls over a day or how a few loud aircraft significantly affect some hours.

L_{eq} may be thought of as the constant sound level over the period of interest that would contain as much sound energy as the actual varying level. It is a way of assigning a single number to a time-varying sound level. **Figure A-5** illustrates this concept for the same hypothetical event shown in **Figure A-3** and **Figure A-4**. Note that the L_{eq} is lower than either the L_{max} or SEL.

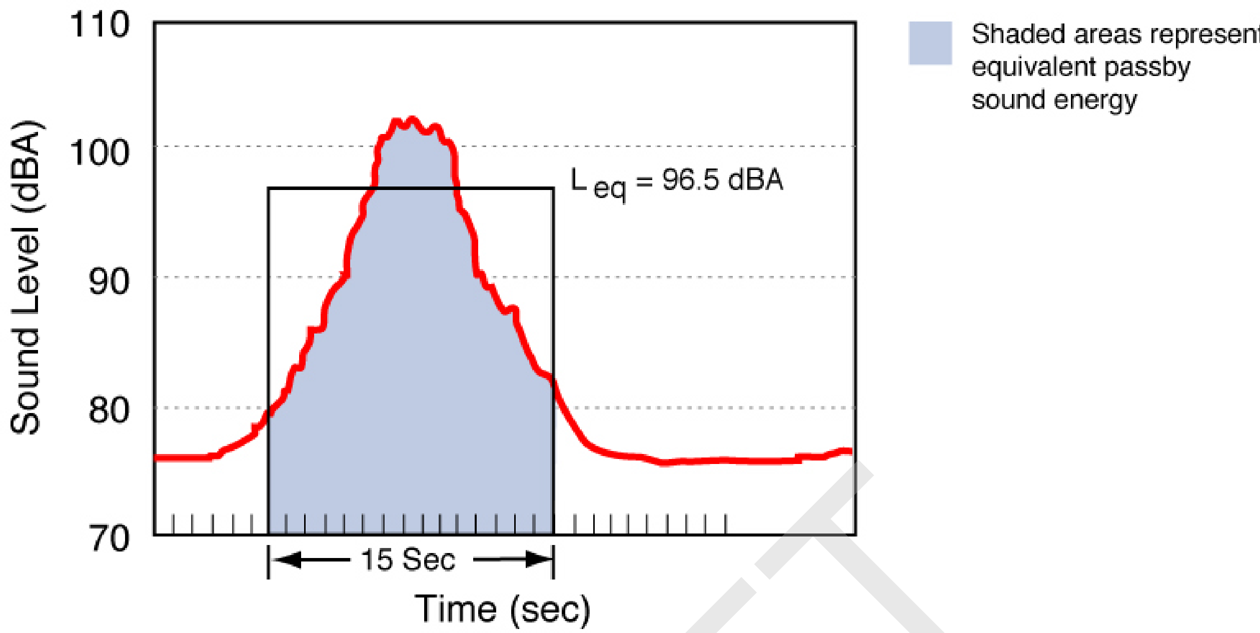

Figure A-5. Example of a 15-Second Equivalent Sound Level

Source: HMMH

A.1.7 Day-Night Average Sound Level, DNL or L_{dn}

The FAA requires that airports use a measure of noise exposure that is slightly more complicated than L_{eq} to describe cumulative noise exposure: the day-night average sound level (DNL).

The EPA identified DNL as the most appropriate means of evaluating airport noise based on the following considerations:[4]

- The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods.
- The measure should correlate well with known effects of the noise environment and on individuals and the public.
- The measure should be simple, practical, and accurate. In principle, it should be useful for planning as well as for enforcement or monitoring purposes.
- The required measurement equipment, with standard characteristics, should be commercially available.
- The measure should be closely related to existing methods currently in use.
- The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.

[4] "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," U. S. EPA Report No. 550/9-74-004, March 1974.

- The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods.

Most federal agencies dealing with noise have formally adopted DNL. The Federal Interagency Committee on Noise (FICON) reaffirmed the appropriateness of DNL in 1992. The FICON summary report stated, "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric."

In 2015, the FAA began a multi-year effort to update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports.[5] This was the most comprehensive study using a single noise survey ever undertaken in the United States, polling communities surrounding 20 airports nationwide. The FAA Reauthorization Act of 2018 under Section 188 and 173, required FAA to complete the evaluation of alternative metrics to the DNL standard within one year. The Section 188 and 173 Report to Congress was delivered on April 14, 2020[6] and concluded that while no single noise metric can cover all situations, DNL provides the most comprehensive way to consider the range of factors influencing exposure to aircraft noise. In addition, use of supplemental metrics is both encouraged and supported to further disclose and aid in the public understanding of community noise impacts. The full study supporting these reports was released in January 2021. If changes are warranted in the use of DNL, which DNL level to assess or the use of supplemental metrics, FAA will propose revised policy and related guidance and regulations, subject to interagency coordination, as well as public review and comment.

In simple terms, DNL is the 24-hour L_{eq} with one adjustment; all noises occurring at night (defined as 10 p.m. through 7 a.m.) are increased by 10 dB, to reflect the added intrusiveness of nighttime noise events when background noise levels decrease. In calculating aircraft exposure, this 10 dB increase is mathematically identical to counting each nighttime aircraft noise event ten times.

DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for limited numbers of points, and, in the absence of a permanently installed monitoring system, only for relatively short periods. Most airport noise studies use computer-generated DNL estimates depicted as equal-exposure noise contours (much as topographic maps have contours of equal elevation).

The annual DNL is mathematically identical to the DNL for the average annual day, i.e., a day on which the number of operations is equal to the annual total divided by 365 (366 in a leap year). **Figure A-6** graphically depicts the manner in which the nighttime adjustment applies in calculating DNL. **Figure A-7** presents representative outdoor DNL values measured at various U.S. locations.

[5] Federal Aviation Administration. Press Release – FAA To Re-Evaluate Method for Measuring Effects of Aircraft Noise. https://www.faa.gov/news/press_releases/news_story.cfm?newsId=18774

[6] Federal Aviation Administration. Report to Congress on an evaluation of alternative noise metrics. https://www.faa.gov/about/plans_reports/congress/media/Day-Night_Average_Sound_Levels_COMPLETED_report_w_letters.pdf

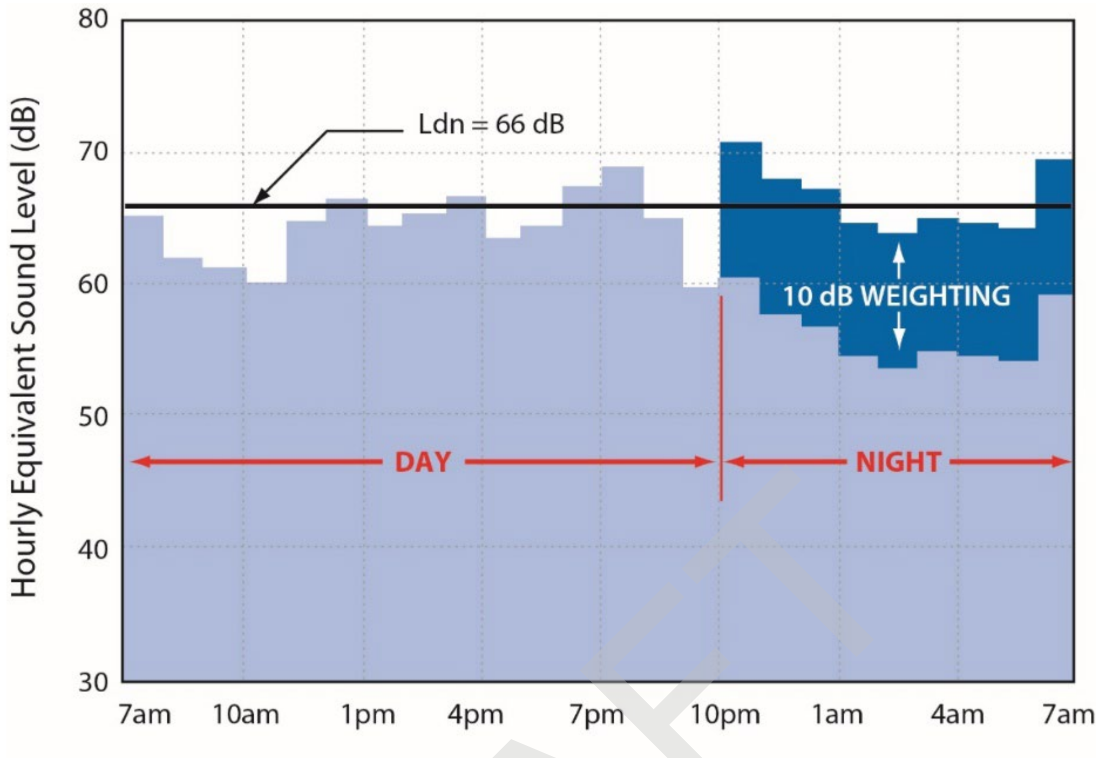

Figure A-6. Example of a Day-Night Average Sound Level Calculation

Source: HMMH

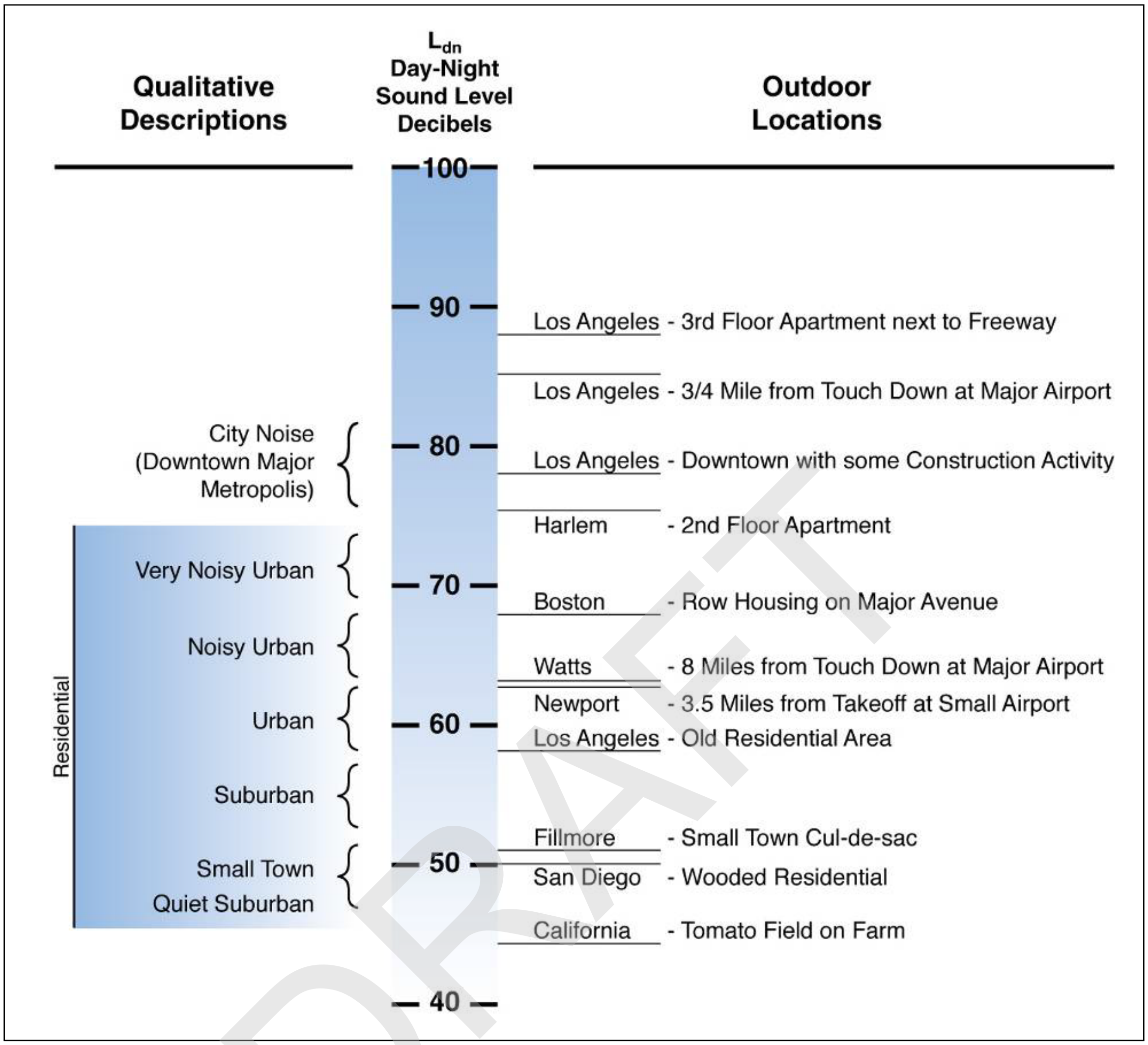

Figure A-7. Examples of Measured Day-Night Average Sound Levels, DNL

Source: U.S. Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," March 1974, p.14.

Appendix B: Existing Noise Compatibility Program Documents

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Part 150: Records of Approval

Louisville International Airport, Louisville, Kentucky

Approved on 5/14/04

The approvals listed herein include approvals of actions that the Regional Airport Authority of Louisville and Jefferson County, Kentucky (RAA) recommends be taken by the Federal Aviation Administration (FAA). It should be noted that these approvals indicate only that the actions would, if taken, be consistent with the purposes of Part 150. These approvals do not constitute decisions to implement the actions. Later decisions concerning possible implementation of the actions may be subject to applicable environmental or other procedures or requirements.

The recommendations below summarize as closely as possible the airport operator's recommendations in the noise compatibility program and are cross-referenced to the program. The statements contained within the summarized recommendations and before the indicated FAA approval, disapproval, or other determination do not represent the opinions or decisions of the FAA.

The Noise Compatibility Program (NCP) for Louisville International Airport is divided into three interrelated types of measures: the Noise Abatement Measures (primarily operational), the Noise Mitigation Measures (land uses), and the Program Management Measures. These recommendations are documented in Chapter 11, Volume 1, Federal Aviation Regulation (FAR) Part 150 Noise Study Update.

I. NOISE ABATEMENT MEASURES

(Air Traffic Measures)

NA-1: Maintain South flow runway preference. This measure would continue the current daytime preference for south flow when wind conditions permit except as revised in measure NA-3 below. (pages 8-6 & 7, table 8-2, & table 11-2).

(Previous ROA, Measure NAA #7.3 in the 1994 & 1995 ROAs)

FAA Action: Approved as voluntary. This measure continues a previously approved measure that places flights over areas to the south that are less densely populated.

NA-2: Reverse East-West preference (Day and Night). Reverse the current runway use program to prefer the west runway. The trigger of 3 aircraft in the landing or departure queue currently used to direct air traffic to both runways would be retained. (pages 8-6, 8-49 thru 8-53, 8-79, table 8-2, & table 11-2). This measure would reduce the noise impacts within the DNL 65 contour to about 2,175 residents and 1,079 dwelling units but would increase noise over the University of Louisville, Old Louisville and neighborhoods to the northwest. Because students at U of L were not included in the impact analysis the number of students experiencing noise impacts are not known. The measure, if combined with Measure NA-7, would take advantage of a corridor of compatible land uses immediately north of the airport.

FAA Action: No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). A technical analysis of this measure in concert with Measures NA-3 and NA-7, and an environmental analysis, are required to determine its feasibility and environmental impacts. The FAA also will determine during any follow-on analysis whether the measure provides an overall net benefit to populations impacted, including the U of L, a requirement for approval under Part 150.

NA-3: Morning North flow Preference; Revision of Existing Measure NA-1. In conjunction with the offset approach and departure recommendation (NA-7), reverse the normal daytime runway use preference from south flow to north flow during morning hours 9:30 a.m. to 12:30 p.m. to minimize overflights of the University of Louisville and residential areas to the north of the airport. (page 8-79, table 11-2). There are more aircraft arrivals than departures during this period at SDF.

FAA Action: No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). A technical analysis of this measure in concert with Measures NA-2 and NA-7, and an environmental analysis, are required to determine its feasibility and environmental impacts. Implementation of this measure would be in conjunction with NA-2 and NA-7 if approved. (This measure would modify measure NAA 7.1 in the 1995 ROA.)

NA-4: Southbound Divergence According to Destination; Continuation of Existing Air Traffic Control procedure. (page 8-83, table 8-2, table 11-2 and supplemental table 11-2). Continue the current practice of obtaining necessary divergence between aircraft departing to the south by assigning aircraft to departure tracks based on their route of flight.

FAA Action: Approved as voluntary. This is a continuation of a previously approved measure. The NCP states that no other tracks to the south would provide a greater noise benefit.

NA-5: Maintain Contraflow Program; Continuation of Existing ATC Procedure. Contraflow at SDF means that arrivals between 10:00p.m. and 7:00 a.m. are to the north and departures are to the south (subject to weather, wind and operational demand). (pages 8-7, 8-64, table 8-2, & table 11-2). This directs air traffic south of the airport over southern Jefferson and Bullitt counties which are less densely populated and where mitigation (relocation) measures have been and continue to be implemented.

FAA Action: Approved as voluntary. This measure is a combination of previously approved measures 7.1, 7.3 and 7.5 in the 1995 ROA and would help reduce the DNL 65 dB noise contour to the north over noise-sensitive areas.

NA-6: Reduce exceptions to contraflow; Enhancement of existing measure. (pages 8-64, 8-42, 8-91, table 8-2 table 11-2, & supplemental table 11-2). Airport owner would work with airlines to adjust arrival and departure times for scheduled flights to more closely conform to normal peak arrival and departure periods.

FAA Action: Disapproved for purposes of Part 150. The FAA disapproves reducing exceptions to contraflow. Contraflow requires departing aircraft to be "aimed" directly at arriving aircraft, and greater use increases the potential for loss of separation between arriving and departing aircraft. This could cause substantial delay. This disapproval under Part 150 does not prohibit airport management from seeking cooperation from the airlines to adjust schedules on a voluntary basis to more closely conform to normal peak periods. Scheduling changes that reduce exceptions to contraflow will require consultation with FAA's Air Traffic office to determine whether they impact aircraft operational safety.

NA-7: Use an Offset Departure from Runway 35L and Offset Approach to Runway 17R. (pages 8-61, 8-74, 8-81, table 8-2, & table 11-2). This measure is to take advantage of an industrial corridor to the northwest of the runway to reduce the adverse effects of the recommended change in preferential use of the east and west runways (Measure NA-2). Aircraft not equipped with GPS/FMS would require installation of a Localizer type directional aid (LDA). It is assumed that a Local Area Augmentation System (LAAS) would be required for a Global Positioning System (GPS) approach. This measure would remove about 423 homes north of the airport from the DNL 65 contour.

FAA Action: No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). A technical analysis of this measure in concert with Measures NA-2 and NA-3, and an environmental analysis, are required to determine its feasibility and environmental impacts. FAA is concerned that adoption of the arrival portion of this measure would reduce runway arrival capacity by approximately one-third when the offset approach is in use. While we do not object in principle to the departure procedure as a voluntary measure, the NCP does not provide separate analysis for the departure procedure alone. The FAA will review the study results to determine whether this measure is feasible. At present, when parallel approaches are being conducted, current procedures allow for lateral separation of 2 miles between two aircraft landing on the parallel runways. Using an offset approach to RWY 17R, this separation standard would increase to 3 miles.

NA-8: Designate departure and arrival flight tracks to be used by all turbojet and applicable turboprop aircraft weighing over 12,500 pounds. These measures have the effect of reducing the width of noise contours and noise exposure as measured in grid point analyses by reducing aircraft dispersion around the existing flight tracks (New Measure). (pages 8-9 & 10, 8-61, 8-84 thru 8-86, table 8-2 & table 11-2). Conformance to recommended noise abatement flight tracks by non GPS/FMS or RNAV equipped aircraft would require the installation of navigational aids to define each course segment.

FAA Action: Approved in part, as voluntary. Airport management may work with SDF ATCT to designate flight tracks within existing approved corridors. FAA's Flight Standard's office (ESO-31) must review these procedures before they may take effect.

This measure is disapproved for new noise abatement flight tracks outside of existing corridors. It is noted that there is no request in this NCP for FAA approval, or a commitment by FAA, to install NAVAIDS to be used as departure navigational aids. At this time, FAA has suspended RNAV departure procedure development.

NA-9: Assign GPS/FMS or RNAV equipped aircraft to defined FMS/GPS Departure and Arrival Flight Tracks for Turbojet and Military Aircraft (New Measure). (pages 8-9 7 10, 8-62, 8-87, table 8-2, & table 11-2). The tracks recommended for this measure are generally consistent with those defined in Measure NA-8 above but are defined using area navigation (RNAV) capabilities, either satellite or ground based to reduce or eliminate the need for additional ground based facilities to define tracks.

FAA Action: Approved in part, as voluntary. Flight tracks may be defined within existing or approved flight corridors. There are a number of actions necessary to implement the recommended ANAV procedures. Most of the required actions are the responsibility of FAA, primarily its Air Traffic Division.

This measure is disapproved for new noise abatement flight tracks outside of existing corridors. There is no request for approval in this NCP, nor any commitment by FAA, to install NAVAIDS to be used as departure navigational aids. At this time, FAA has suspended RNAV departure procedure development.

NA-10: FMS/GPS Departure and Arrival Flight Tracks for Turboprop Aircraft weighing over 12,500 pounds (New Measure). (pages 8-9 & 10, 8-62, 8-87, table 8-2, & table 11-2). Place FMS/GPS equipped turboprop aircraft on different departure tracks from those defined for turbojet aircraft in Measure NA-9 to minimize impact on departure capacity. This is to reduce aircraft dispersion around the existing flight tracks. Direct routes or earlier turns would be provided consistent with noise abatement goals to enhance conformance.

FAA Action: Approved in part, as voluntary. Flight tracks may be defined within existing or approved flight corridors. This measure is disapproved for new noise abatement flight tracks outside of existing corridors.

NA-11: Request FAA ATCT to require all aircraft to intercept the runway centerline at or beyond the initial approach fix. (pages 8-11, 8-63, 8-88, table 8-2 & table 11-2). Compliance with this measure would require limiting use of visual approaches that do not conform to the approach paths defined by the instrument approaches and result in arriving aircraft intercepting the glide slope at higher altitudes.

FAA Action: No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). A technical evaluation on feasibility and environmental impacts should examine the measure's effects on aircraft safety, capacity, and efficiency.

NA-12: Request FAA to publish a Standard Instrument Departure (SID) Procedure for each runway to be used in all weather conditions, including VFR conditions (New Measure). (pages 8-10, 8-15, 8-102, table 8-2, & table 11-2). SIDs would be developed to enhance conformance to the recommended noise abatement departure procedures. These procedures would include instructions for following each segment of proposed departure flight tracks based on navigational equipment available. Inclusion of the ANAV would reduce dispersion of aircraft over noncompatible land uses.

FAA Action: No action required at this time under 49 U.S.C. section 47504(b). This measure is to publish SIDs for flight procedures proposed in the NCP. The FAA has deferred action on those flight procedures because they require additional technical and other analyses.

Implementation of this measure would be subject to: FAA approval of the proposed equipment to be used; development of the procedures in conjunction with airlines operating at SDF (primary carriers); and development of special charting and flight-testing. The FAA notes that there is no request in this NCP for FAA approval, or a commitment by FAA, to install NAVAIDS to be used as departure navigational aids. Not all air carrier aircraft would be equipped with devices that would allow them to utilize these procedures.

NA-13: Request FAA to publish a Standard Terminal Arrival Route (STAR) for each runway to be used in all weather conditions including VFR conditions (New Measure). (pages 8-11, 8-13, 8-103, table 8-2, & table 11-2). These procedures would include instructions for following each segment of proposed arrival flight tracks based on navigational equipment available.

FAA Action: No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). The FAA has deferred action on noise abatement approach procedures that would use the recommended STARs (NA-7, NA-11). The FAA notes that STAR guidance typically terminates 15-20 miles from the airport, and may be of little value in reducing noise. The results of the required studies for the deferred measures should specify changes to impacts and benefits so that FAA can make an informed determination under Part 150.

NA-14: As part of an ongoing noise management program, extend noise abatement flight tracks beyond those identified in Measures NA-8 through NA-11 (New Measure). (page 8-97, table 8-2,

& table 11-2) This would enable aircraft operators to conform more closely to recommended flight tracks over noise sensitive areas that are beyond the noise contours. Implementation would require more detailed information on the land uses affected and the effects on airspace and air traffic control than is possible in this [part 150] study. Development of flight procedures should be conducted in consultation with FAA, aircraft operators, and members of potentially affected communities.

FAA Action: No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). There is insufficient information to determine either the noise benefits or operational impacts of extending the flight tracks. Environmental analysis would be required. This measure attempts to address impacts outside of the DNL 65 dB noise contour. Because it could introduce operational delay, analysis should show how any additional aircraft operational delay is offset by the expected benefits in those areas.

NA-15: Elimination of early descent (New Measure). (No analysis found in NCP) Current approach procedures allow aircraft to descend to the initial approach altitude prior to the initial approach point if directed by ATC. Under this measure, RAA would discourage ATC from directing descents earlier than required to maintain a constant rate of descent to the initial approach while maintaining adequate safety margins.

FAA Action: Disapproved. This measure, if changed as described, would have the effect of "prohibiting descents" rather than "discourage descents" below the minimum, published altitude at those fixes. Any aircraft, including smaller fixed-wing and helicopters operating from any nearby base of operations would be required to climb to a minimum of the published altitude for any given fix until reaching that fix. The existing 2500' authorization for reduced altitudes was added at ATC's request for operational efficiency.

Requiring aircraft to remain at or above 5000 feet would remove two IFR altitudes (3000 and 4000 feet) from ATC use, effectively reducing airspace by 25%. Implementing this proposal would restrict the ability of ATC to perform functions in a safe efficient manner. The NCP acknowledges, at page 8-10, that "In practice, modification to approach procedures are likely to entail unacceptable reductions in safety margins."

(Operator Procedures)

NA-16: Request the airlines serving the airport to use the FAA Distant Noise Abatement Departure Procedure in Advisory Circular (AC) 91-53A, Noise Abatement Departure Procedure. (pages 8-13 thru 8-15, 8-93, table 8-2, & table 11-2) This measure would benefit areas exposed to departure noise of DNL 65+ from Runways 35R, 35L, and 17L.

FAA Action*:* Approved as voluntary. RAA can request the airlines follow the Distant Noise Abatement Procedure.

NA-17: Continue Airport regulation restricting aircraft engine run-ups to certain hours and locations. (pages 8-29, 8-95, table 8-2, & table 11-2)

FAA Action: Approved. FAA approved as noise beneficial in 1994 the following run-up measures in the RAA's previous Part 150 submittal:

§ Require RAA pre-approval to conduct static run-ups between 9:00 p.m. and 7:00 a.m.

§ Require run-ups lasting more than 1 minute to be conducted on the south end of Runway 1/19

§ Require run-ups lasting more than 1 minute to be conducted on the east parallel taxiway at the south end of Runway 17R/35L

NA-18: Limit use of North runway extension to aircraft needing full runway length and use south extension for departures to the north.

FAA Action: Disapproved pending submission of additional information to make an informed analysis. FAA's 2003 Finding of No Significant Impact for the proposed north runway extension included a mitigation commitment that only aircraft requiring the full runway length for departures would use *either* runway extension. The ATCT has granted a waiver allowing some procedures based on the runway being declared departure only between the hours of 3:30 AM to 6:00 AM local time. The NCP speculates, but does not show, how this measure is more noise beneficial than that included in the 2003 FONSI. Changes to operational procedures also would require environmental analysis.

II. NOISE MITIGATION MEASURES

These recommended measures would continue the ongoing property acquisition program and would expand the program to include noise insulation or soundproofing for residential and noise-sensitive public uses. Recommended noise mitigation measures include remedial, preventive, and compensatory measures. The NCP states that implementation of some measures would be dependent upon the availability of noise program funding through FAA grants and the ability of the RAA to devote the necessary matching funds for these programs.

Any new noncompatible development that takes place after October 1, 1998, normally is not eligible for approval under Part 150 for remedial mitigation, and is not included in any approval of the following land use measures. The location of noise sensitive structures described below may change in relation to the noise contour due to FAA disapproval and no action decisions in this ROA. If the overall approved NCP would yield maps different from those previously submitted to the FAA and determined in compliance with Part 150, Section B150.3 requires revised maps.

Remedial Measures

These measures would be implemented by the RAA to reduce or otherwise mitigate the effect of noise that cannot be eliminated through the aircraft operational/abatement measures.

M-1: Continue the current Voluntary Residential Acquisition Program including the Innovative Housing Program. (pages 9-2, 9-7, 9-34, table 9-2, & Table 11-2)

FAA Action: Approved. Voluntary acquisition must comply with the Uniform Relocation and Real Property Acquisition Policies Act in order to be eligible for Federal funding. (Approved as measure LU #11A, #11B, & #11C in ROA 1994 and amended in ROA 1995.)

M-2: Expanded Voluntary Residential Acquisition within the DNL 65 db to the south of the airport that will continue to be exposed to significant noise levels in 2008. (pages 9-2,9-7, 9-35, table 9-2, & table 11-2)

FAA Action: Approved. Voluntary acquisition must comply with the Uniform Relocation and Real Property Acquisition Policies Act in order to be eligible for Federal funding. (Expansion of measure LU #11C, ROA 1995.)

M-3: Provide soundproofing in residential areas within the DNL 65 db contour to the north of the airport. Eligibility of individual structures would depend on the feasibility of achieving at least a

5.0 db noise level reduction as required by FAA. (Pages 9-9, 9-35, table 9-2, & table 11-2) (Measure LU#11 in ROA 1995 and considered in the LAIP EIS but not implemented with new runways construction.)

FAA Action: Approved.

M-4: Offer sound insulation for noncompatible institutional areas within DNL 65 (Potentially University of Louisville & additional churches). (Pages 9-10, 9-38, table 9-1, & table 11-2)

FAA Action: Approved. The airport sponsor made a commitment to soundproof the University of Louisville in the FAA's 1991 EIS. The sponsor has not yet fulfilled that commitment (see LAIP EIS page 1-30, FEIS, Addendum I, page 8 and FAA Record of Decision, January 7, 1991, p.18). This approval under Part 150 acknowledges that the measure would be noise beneficial.

M-5: Residential Sales Assistance Program within DNL 65. (pages 9-10, 9-40, table 9-2, & table 11-2) Concurrently with the residential soundproofing program for areas within the DNL 65 contour, offer sales assistance to homeowners declining to participate in the soundproofing program.

FAA Action: Approved. Implementation of this measure must comply with the Uniform Relocation and Real Property Acquisition Policies Act to be eligible for Federal funding.

M-6: Construct an earth berm along the northwest side of the airfield to reduce ground noise associated with aircraft takeoffs on Runway 17R. (pages 9-11, 9-41, table 9-2, & table 11-2)

FAA Action: Approved. The RAA estimates that over 200 homes could receive a 5-7 dBA reduction in departure noise. This measure also was included in the November 21, 2003, FONSI for the runway extensions.

M-7: Study potential noise barrier for Preston Park neighborhood. New airport facilities are anticipated in the southeast portion of the airport. The RAA would fund a study to determine whether such facilities could be constructed and oriented to shield areas to the east of the airport from ground noise originating in the immediate vicinity of the structures. (pages 9-11, 9-41 & 43, table 9-2, & table 11-2)

FAA Action: Approved for study.

M-8: Construct Ground Run-up Enclosure (Hush Houses) if required to reduce noise from maintenance run-up activity. This measure should be given further consideration if changes in the pattern of engine run-ups generate community concerns. (page 9-43, table 9-2, & table 11-2)

FAA Action: Disapproved pending submission of additional information to make an informed analysis. Construction of run-up enclosures must be supported by sufficient analysis to demonstrate their noise benefits.

M-9: Residential sound insulation for areas between DNL 60 and DNL 65 that would experience a 3dB increase in noise levels as a result of recommended noise abatement measures. (page 9-36, table 9-2, & table 11-2)

FAA Action: Disapproved for purposes of Part 150. Section 189 of Public Law 108-176, Vision 100-Century Of Aviation Reauthorization Act, December 12, 2003**,** specifically prohibits FAA approval of Part 150 program measures that call for Federal funding to mitigate aircraft noise below DNL 65 (through Fiscal Year 2007).

M-10: Offer sound insulation to noncompatible institutional land uses (examples, portions of University of Louisville and churches) between DNL 60 to DNL 65 that would experience a 3 dB increase in noise levels from the noise abatement measures. (page 9-39, table 9-2 & table 11-2)

FAA Action: Disapproved for purposes of Part 150. Section 189 of Public Law 108-176, Vision 100-Century Of Aviation Reauthorization Act, December 12, 2003**,** specifically prohibits FAA approval of Part 150 program measures that call for Federal funding to mitigate aircraft noise below DNL 65 (through Fiscal Year 2007).

M-11: Compatible Land Use Planning - The RAA would coordinate with the Planning Commission to adopt policies in its Cornerstone 2020 Plan to discourage new noncompatible development and disclose noise levels for new residential development. Measures to provide notification for new development would apply to DNL 60 dB and to areas within DNL 65 dB that are already substantially developed. (page 9-49, 9-51, table 9-2, & table 11-2)

FAA Action: The portion of this measure that permits new incompatible development within the DNL 65 dB, even with sound attenuation and/or disclosure, is inconsistent with the FAA's guidelines and 1998 policy and is disapproved for the purposes of Part 150.

Other portions of this compatible land use planning measure that do not permit incompatible development within the DNL 65 dB noise contour are approved for the purposes of Part 150.

This decision relates to the measure's consistency with the purposes of Part 150. This measure is within the authority of the RAA and local planning jurisdiction. The Federal Government has no control over local land use planning.

M-12: RAA would coordinate with the Planning Commission to adopt a policy concerning rezoning from compatible to noncompatible uses in the Airport environs. (page 9-50, 9-58, table 9-2, & table 11-2)

FAA Action: Approved. This measure is within the authority of the RAA and local planning jurisdiction. The Federal Government has no control over local land use planning.

M-13: Subdivision Regulations-The RAA would coordinate with the Planning Commission to include a noise disclosure statement for new subdivisions in Policy Areas 1 & 2, Cornerstone 2020 Plan. This would allow future residents to make informed land purchase decisions. (page 9-51, 9-58 table 9-2, & table 11-2)

FAA Action: The portion of this measure that permits new incompatible development within the DNL 65 dB, even with sound attenuation and/or disclosure, is inconsistent with the FAA's guidelines and 1998 policy and is disapproved for the purposes of Part 150.

Other portions of this compatible land use planning measure that do not permit incompatible development within the DNL 65 dB noise contour are approved for the purposes of Part 150.

This decision relates to the measure's consistency with the purposes of Part 150. This measure is within the authority of the RAA and local planning jurisdiction. The Federal Government has no control over local land use planning.

M-14: RAA would consider participation in a Redevelopment Program (Renaissance Zone Program) initiative that would redevelop areas in the Airport environs as part of a joint effort with the Fairgrounds, UPS, and Ford Motor Company. In conjunction with other participants, the RAA will work with the City of Louisville and Jefferson County to develop incentives for compatible development. (pages 9-52 thru 53)

FAA Action: The portion of this measure that permits new incompatible development within the DNL 65 dB, even with sound attenuation and/or disclosure, is inconsistent with the FAA's guidelines and 1998 policy and is disapproved for the purposes of Part 150.

Other portions of this compatible land use planning measure that do not permit incompatible development within the DNL 65 dB noise contour are approved for the purposes of Part 150.

This decision relates to the measure's consistency with the purposes of Part 150. This measure is within the authority of the RAA and local planning jurisdiction. The Federal Government has no control over local land use planning.

Release of land under control of the RAA must comply with FAA grant agreements, be consistent with FAA's Eligibility Handbook to preserve compatible land uses, and is subject to environmental review.

M-15: RAA would work with the Planning Commission to develop an overlay zone, to supplement other land use planning techniques. This would be based on the 2007 NEM to be reflected in the Core Graphics section of the Cornerstone 2000 Plan. (pages 9-51, 9-58, table 9-2, & table 11-2)

FAA Action: The portion of this measure that permits new incompatible development within the DNL 65 dB, even with sound attenuation and/or disclosure, is inconsistent with the FAA's guidelines and 1998 policy and is disapproved for the purposes of Part 150.

Other portions of this compatible land use planning measure that do not permit incompatible development within the DNL 65 dB noise contour are approved for the purposes of Part 150.

This decision relates to the measure's consistency with the purposes of Part 150. This measure is within the authority of the RAA and local planning jurisdiction. The Federal Government has no control over local land use planning.

We note that the official NEMs (Chapter 10) are for the years 2003 and 2008. The document states that the 2008 NEM was based on a review of forecasts for the year 2007. The FAA assumes the reference to the "2007 NEM" in this measure is a reference to the official 2008 NEM.

M-16: Building Code Revision-The RAA would work with the Commonwealth of Kentucky to develop and adopt enabling legislation either permitting local building code provisions or incorporating sound insulation provisions in the statewide building code. (page 9-54, table 9-2, & table 11-2)

FAA Action: The portion of this measure that permits new incompatible development within the DNL 65 dB, even with sound attenuation and/or disclosure, is inconsistent with the FAA's guidelines and 1998 policy and is disapproved for the purposes of Part 150.

Other portions of this compatible land use planning measure that do not permit incompatible development within the DNL 65 dB noise contour are approved for the purposes of Part 150.

This decision relates to the measure's consistency with the purposes of Part 150. This measure is within the authority of the RAA and local planning jurisdiction. The Federal Government has no control over local land use planning.

M-17: Consider Disclosure Ordinances. Work with local governmental bodies to examine the feasibility of ordinances to require disclosure of airport noise exposure within designated distances from the airport and/or documented levels of exposure. Disclosure would be for vacant and residentially developed properties within the DNL 65+ dB and DNL 60-65 dB noise contours. (pages 9-53, 9-58, table 8-2, & table 11-2)

FAA Action: Approved. This measure is within the authority of the RAA and local planning jurisdiction. The Federal Government has no authority over local land use planning decisions.

Compensatory Measures-These measures would provide an alternative to remedial measures for homeowners that would not benefit from either sound insulation or sales assistance measures.

M-18: Avigation easement purchase within DNL 65-The RAA would purchase avigation easements from homeowners in areas eligible for residential soundproofing and sales assistance who do not believe they would benefit from either program. Program implementation would be contingent upon FAA grant funding. (pages 9-44, 9-56, table 9-2, & table 11-2)

FAA Action: Approved.

M-19: The RAA would offer to purchase avigation easements from home owners in areas exposed to DNL 60 to DNL 65 noise levels that experience a 3 dB increase in noise exposure and that are eligible for residential soundproofing and sales assistance

who do not believe they would benefit from either program. (pages 9-44, 9-56 table 9-2, & table 11-2)

FAA Action: Disapproved for purposes of Part 150. Section 189 of Public Law 108-176, Vision 100-Century Of Aviation Reauthorization Act, December 12, 2003**,** specifically prohibits FAA approval of Part 150 program measures that call for Federal funding to mitigate aircraft noise below DNL 65 (through Fiscal Year 2007).

III. Program Management

The recommended program management measures would enhance the effectiveness of both the noise abatement and mitigation measures through continuing stakeholder coordination, research and development, data collection, and dissemination of program information.

PM-1: Establish new RAA staff position dedicated to management of noise compatibility program. Incumbent performs duties associated with data collection and analysis, implementation, liaison and further study. (This position has been established.) (page 8-96, table 8-2, &table 11-2)

FAA Action: Approved.

PM-2: Establish advisory committee composed of community, user and air traffic control interests to maintain coordination among the stakeholders in the noise compatibility program. (page 8-96, table 8-2, & table 11-2)

FAA Action: Approved.

PM-3: Acquire portable noise monitoring equipment to enable the Authority's Noise/Environmental Programs Coordinator to monitor actual noise and provide accurate information to community members. (page 8-100, table 8-2, table 11-2)

FAA Action: Approved. For reasons of aviation safety, this approval does not extend to use of the monitoring equipment for enforcement purposes by in situ measurement of any present noise thresholds.

PM-4: Acquire equipment to monitor aircraft operations and establish a regular program of monitoring and reporting conformance with recommended noise abatement procedures. (page 8-101 and table 11-2)

FAA Action: Approved. For reasons of aviation safety, this approval does not extend to use of the monitoring equipment for enforcement purposes by in situ measurement of any present noise thresholds.

PM-5: The RAA would use the Airport Noise Office as a central point to collect and disseminate information. (page 9-55, table 9-2, & table 11-2)

FAA Action: Approved.

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FEDERAL AVIATION ADMINISTRATION

RECORD OF APPROVAL
14 CFR PART 150
NOISE COMPATIBILITY PROGRAM

LOUISVILLE INTERNATIONAL AIRPORT
LOUISVILLE, KY

Regional Counsel, ASO-7 — ✓ CONCUR — NONCONCUR

8/3/09
Date

Airports Division Manager
Southern Region — ✓ APPROVED — DISAPPROVED

8/4/09
Date

RECORD OF APPROVAL
LOUISVILLE INTERNATIONAL AIRPORT
Louisville, KY

BACKGROUND

On October 29, 2008, the Louisville Regional Airport Authority (LRAA) provided the Federal Aviation Administration (FAA) Air Traffic Organization with a letter and supporting documentation requesting an Offset Approach to Runway 17R at Louisville International Airport (SDF). In the request, LRAA referred to a noise abatement (NA) measure, NA-7, proposed when they submitted their Noise Compatibility Program under Part 150 to the FAA for action in 2003. Noise Abatement (NA) -7, included in part, a proposal for an offset approach to Runway 17R.

Following normal FAA protocol for reviewing flight procedure requests, the FAA Air Traffic Organization evaluated the approach request and supporting technical data that LRAA provided.

On, April 03, 2009, the FAA sent a response letter to LRAA disapproving their request to implement an offset approach to Runway 17R at SDF. The FAA disapproval letter identified serious concerns with safety, efficiency, and incompatibility with existing and proposed arrival routes at SDF as the basis for the disapproval.

INTRODUCTION

On May 14, 2004, of the 42 measures proposed by the LRAA for the Louisville International Airport (SDF) Noise Compatibility Program (NCP), the Federal Aviation Administration (FAA) approved 20; approved in part 8; disapproved 3; disapproved for FAR Part 150 purposes 4; and took no action on 7. The FAA took no action on 7 of the measures because they related to new or revised flight procedures for which insufficient data was provided to allow an approval/disapproval determination.

The FAA has determined that the technical information provided by LRAA in support of their request (outside of the Part 150 Process) for an offset approach to runway 17R and the subsequent analysis by ATO is sufficient information to issue a ROA in accordance with 40 CFR Part 150 for 3 of the 7 previously deferred Noise Compatibility Program (NCP) noise abatement measures.

This Record of Approval (ROA) contains the FAA's approval/disapproval decisions for 3 of the 7 NCP measures that were previously deferred: Noise Abatement Measure 2 (NA-2); Noise Abatement Measure 3 (NA-3); and Noise Abatement Measure 7 (NA-7). All other portions of the previously issued ROA remain in effect.

The approvals listed herein include approvals of actions that the airport recommends be taken by the Federal Aviation Administration (FAA). It should be noted that these approvals indicate only that the actions would, if implemented, be consistent with the purposes of 14 CFR Part 150. The FAA has provided technical advice and assistance to the airport to ensure that the operational elements are feasible (see 14 CFR 150.23(c)). These approvals do not constitute decisions to implement the actions. Later decisions concerning possible implementation of measures in this ROA will be subject to applicable environmental or other procedures or requirements, including Section 106 of the National Historic Preservation Act (NHPA).

The ROA summarizes as closely as possible the LRAA's recommendations for noise abatement measures which were identified in their NCP. Note, the recommendations/measures in this ROA were developed by the sponsor (LRAA), not the FAA. The ROA depicts the sponsors recommendation followed first by the FAA's action/determination executed in the May 14, 2004 ROA, and then by the FAA's current action/determination.

1) **NA-7: Use an Offset Departure from Runway 35L and Offset Approach to Runway 17R.** (pages 8-16, 8-74, 8-81, table 8-2, and table 11-2). This measure is to take advantage of an industrial corridor to the northwest of the runway to reduce the adverse effects of the recommended change in preferential use of the east and west runways (Measure NA-2). Aircraft not equipped with GPS/FMS would require installation of a Localizer type directional aid (LDA). It is assumed that a Local Area Augmentation System (LAAS) would be required for a Global Positioning System (GPS) approach. This measure would remove about 423 homes north of the airport from the DNL 65 contour.

   May 5, 2004 FAA Action (Previous):
   No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). A technical analysis of this measure in concert with Measures NA-2 and NA-3, and an environmental analysis, are required to determine its feasibility and environmental impacts. FAA is concerned that adoption of the arrival portion of this measure would reduce runway arrival capacity by approximately one-third when the offset approach is in use. While we do not object in principle to the departure procedure as a voluntary measure, the NCP does not provide separate analysis for the departure procedure alone. The FAA will review the study results to determine whether this measure is feasible. At present, when parallel approaches are being conducted, current procedures allow for lateral separation of 2 miles between two aircraft landing on the parallel runways. Using an offset approach to RWY 17R, this separation standard would increase to 3 miles.

   FAA Action (Current): Disapproved. Operational procedures necessary to implement this measure were detailed in the supplemental supporting information provided by LRAA requesting FAA approval for implementation of an Offset Approach to Runway 17R outside of the Part 150 process (See attachment 1). The result of the FAA's technical evaluation concluded the procedures were unacceptable and the request was disapproved (See attachment 2). This measure cannot be implemented without reducing the level of aviation safety provided and adversely affecting the efficient use and management of the navigable airspace and air traffic control systems. Because the measure was disapproved operationally, no additional environmental study or analysis is necessary.

2) **NA-2: Reverse East-West preference (Day and Night).** Reverse the current runway use program to prefer the west runway. The trigger of 3 aircraft in the landing or departure queue currently used to direct air traffic to both runways would be retained. (NCP pages: 8-6, 8-49 thru 8-53, 8-79, tables 8-2, and 11-2). This measure would reduce the noise impacts within the DNL 65 contour to about 2,175 residents and 1,079 dwelling units but would increase noise over the University of Louisville, Old Louisville and the neighborhoods to the northwest. Because students at U of L were not included in the impact analysis the number of students experiencing noise impacts are not known. The measure, if combined with Measure NA-7, would take advantage of a corridor of compatible land uses immediately north of the airport.

May 5, 2004 FAA Action (Previous):
No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). A technical analysis of this measure in concert with Measures NA-3 and NA-7, and an environmental analysis, are required to determine its feasibility and environmental impacts. The FAA also will determine during any follow-on analysis whether the measure provides an overall net benefit to populations impacted, including the U of L, a requirement under Part 150.

FAA Action (Current):
Disapproved. This measure is disapproved because it is dependent/relational to NA-7 which is disapproved. Because the measure was disapproved operationally, no additional environmental study or analysis is necessary.

3) **NA-3: Morning North flow Preference; Revision of Existing Measure NA-1.** In conjunction with the offset approach and departure recommendation (NA-7), reverse the normal daytime runway use preference from south flow to north flow during morning hours 9:30 a.m. to 12:30 p.m. to minimize overflights of the University of Louisville and residential areas to the north of the airport. (page 8-79, table 11-2). There are more aircraft arrivals than departures during this period at SDF.

May 5, 2004 FAA Action (Previous):

No action required at this time. This measure relates to flight procedures under 49 U.S.C. section 47504(b). A technical analysis of this measure in concert with Measures NA-2 and NA-7, and an environmental analysis, are required to determine its feasibility and environmental impacts. Implementation of this measure would be in conjunction with NA-2 and NA-7 if approved (This measure would modify measure NAA 7.1 in the 1995 ROA).

FAA Action (Current):
Disapproved. This measure is disapproved because it is dependent/relational to NA-7 and NA-2 which were disapproved. Because the measure was disapproved operationally, no additional environmental study or analysis is necessary.

LOUISVILLE REGIONAL AIRPORT AUTHORITY
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Louisville International Airport
Bowman Field

October 29, 2008

Mr. David Senechal
Federal Aviation Administration
Louisville-Standiford ATCT/TRACON
755 Grade Lane
Louisville, KY 40213

Re: Request for the Implementation of the Louisville International Airport FAR Part 150 Update Noise Abatement Measure 7 Offset Approach

Dear Mr. Senechal:

The Louisville Regional Airport Authority (RAA) formally requests the implementation of the offset approach component of Noise Abatement Measure 7 as detailed in the Louisville International Airport FAR Part 150 Update dated May 24, 2004. The intent of this measure is to implement an offset approach to Runway 17R at the Louisville International Airport (SDF) through an industrial corridor northwest of the airport and south of the University of Louisville campus, alleviating noise and reducing the need for sound insulation in neighborhoods north of the airport.

As you know, the LRAA has conducted various working meetings with UPS and local Air Traffic Control personnel over the past two years in order to determine the feasibility of the approaches and define the steps for implementation. UPS has conducted flight simulator tests of these procedures and has indicated a willingness to fly the procedures provided capacity is not impacted and that proper vertical guidance is available (electronic or visual).

Implementation of the measure involves the development of two procedures: 1) an RNAV (GPS), and 2) an LDA to Runway 17R. Modification of the existing Precision Approach Path Indicator (PAPI) serving Runway 17R and the installation of a localizer and DME are also required.

The following paragraphs detail the history of this project, define the project purpose and need, identify NAVAID equipment requirements, and provide general costs associated with the implementation of the measure.

Project History, Purpose and Need:

In January of 2003 an FAA FAR Part 150 Noise Study Update for the Louisville International Airport, prepared by airport consultants Leigh Fisher Associates was submitted to the Federal Aviation Administration. This Noise Compatibility Study (the Study) was initiated to update aircraft noise and land use compatibility plans first completed in 1993. A number of recommendations came out of the Study, two of which will be addressed in this request: measures NA-2 and NA-7.

October 29, 2008
Page 2 of 7

Measure NA-2 is an Air Traffic Control measure that calls for the reversal of the current East-West Runway Preference (Day and Night). The proposal is to reverse the current runway use program to prefer the west runway. The "trigger" of three aircraft in the landing or departure queue currently used to direct ATC to use both parallel runways would be retained as part of this measure. This measure would be combined with measure NA-7, described below, to mitigate potential noise increases at the University of Louisville and in Old Louisville, a community located immediately north of the University.

Measure NA-7 is an Approach and Departure Procedure measure which recommends an offset departure from Runway 35L and an offset approach to Runway 17R. The purpose of the measure is to route air traffic through a noise compatible industrial corridor to the northwest of Runway 17R, thereby reducing the number of homes and noise sensitive facilities within the DNL 65 noise contours in the areas north of the airport. Implementation of this measure could reduce the cost of sound insulation (to be funded through FAA AIP grants) by $36 million.

As previously discussed, only the approach procedures are being requested at this time. The intent is to utilize the approaches during VFR conditions only when capacity is not impacted. The concept is modeled after the Simultaneous Offset Instrument Approach (SOIA) currently in use at the San Francisco International Airport. The SOIA approach has been implemented successfully and has accommodated arrival rates ranging from 30 to 60 operations per hour as detailed in **Table 1**.

Table 1
Simultaneous Offset Instrument Approach (SOIA)
San Francisco International Airport (SFO)
Historical Operations

Date	Began	Ended	Duration	Arrivals 28L/28R	Rate	LDA/PRM 28R	Sky Conditions	Vis.
10/25/04	11:31	12:04	0:33	22	40	9	BKN 42 to BKN 50	10
10/27/04	8:54	9:42	0:48	25	31	10	BKN 22	10
10/27/04	11:07	12:48	1:41	61	36	22	FEW 25 to SCT 40	10
11/08/04	9:32	11:26	1:54	65	34	32	BKN 30	10
11/08/04	11:57	12:46	0:49	25	30	11	OVC 31	10
11/08/04	14:38	15:28	0:50	26	31	4	OVC 30 to OVC 37	10
11/27/04	10:35	11:09	0:34	18	32	8	BKN 29 to BKN 32	10
12/07/04	9:33	9:59	0:26	21	48	11	BKN 21 to BKN 24	10
12/07/04	11:25	11:42	0:17	14	49	7	BKN 26	10
01/28/05	9:42	11:30	1:48	61	34	30	SCT 028 BKN 038 BKN 055	9
01/28/05	14:13	15:12	0:59	32	33	11	SCT 024 BKN 037	10
02/07/05	11:07	11:38	0:31	21	41	10	FEW 037 SCT 045 BKN 60	10
02/24/05	9:31	11:14	1:43	59	34	27	OVC 021	10
02/24/05	12:08	12:41	0:33	19	35	10	SCT 019 OVC 021	10
02/24/05	16:06	19:37	1:31	54	36	25	OVC 021	10
02/25/05	10:18	10:38	0:20	12	36	7	SCT 024 OVC 029	10
02/25/05	11:11	12:31	1:20	51	38	24	OVC 031	10
03/13/05	10:07	10:21	0:14	8	34	4	SCT 023	10

03/22/05	9:40	11:44	2:03	68	33	38	SCT 15 BKN 22 OVC 34	7
03/23/05	9:22	10:13	0:51	37	43	21	BKN 025 OVC 048	10
03/23/05	11:12	12:04	0:52	36	43	19	SCT 025 SCT 042 OVC 055	10
04/07/05	10:06	10:34	0:26	20	43	9	FEW 020 SCT 035 OVC 180	10
04/08/05	12:51	14:17	1:26	50	35	22	SCT 031 BKN 065	8
04/11/05	9:42	10:28	0:46	31	40	16	BKN 020 BKN 038	10
04/11/05	11:34	12:08	0:34	26	46	11	SCT 018 BKN 028	10
04/24/05	11:15	11:50	0:35	27	46	15	SCT 027 BKN 035 BKN 060	10
04/29/05	9:12	10:16	1:04	49	46	24	FEW015 BKN025	10
05/05/05	10:15	10:47	0:32	23	43	12	FEW012 SCT023 BKN065	10
05/05/05	14:21	14:56	0:34	17	29	8	SCT033 BKN055	10
05/05/05	11:12	11:33	0:21	16	44	8	SCT025 SCT055	10
05/06/05	18:45	20:00	1:15	39	31	18	SCT022 BKN033 BKN090	10
05/06/05	20:52	21:34	0:42	31	44	16	FEW017 SCT038 BKN070	10
05/07/05	9:04	12:30	3:26	123	36	62	FEW017 SCT024 BKN 041	10
05/09/05	9:36	10:36	0:59	44	44	21	SCT021 BKN033 BKN050	6
05/16/05	11:11	11:42	0:31	21	41	11	SCT022 SCT028	10
05/17/05	9:34	10:14	0:40	31	48	14	SCT024 BKN180	10
05/19/05	17:04	17:42	0:38	24	37	8	FEW021 SCT025 BKN040	10
05/28/05	10:23	10:49	0:26	16	37	8	FEW009 SCT014 BKN250	10
06/17/05	9:33	10:26	0:53	37	42	19	FEW028 BKN034 BKN041	10
06/18/05	9:30	10:23	0:53	31	35	16	SCT024 SCT034 BKN043	10
06/18/05	11:05	11:57	0:52	34	38	15	SCT024 SCT036 BKN050	10
06/25/05	9:49	12:08	2:19	81	35	39	BKN024	10
06/2705	10:34	11:25	0:51	35	41	18	BKN024	10
10/15/05	9:19	9:56	0:37	29	47	14	BKN018 OVC032	7
10/15/05	11:05	11:37	0:32	28	53	10	FEW015 SCT023	10
10/19/05	9:27	11:52	2:25	99	40	41	FEW015 OVC024	10
10/26/05	15:18	15:47	0:29	9	21	5	FEW012	10
12/12/05	17:08	17:58	0:50	33	48	16	BKN32 to BKN43	10
01/07/06	9:13	10:45	1:32	53	30	24	BKN 28	10
03/07/06	10:51	11:19	0:28	29	62	11	SCT060 SCT150	10

Notes:

1. Information obtained from September 12, 2006 SFO Port Authority presentation
2. SOIA approach used only when ceiling minimums are 2100' or greater.
3. Runway 28L and 28R separation = 3000'.

Procedure(s) Development Request:

The implementation of these measures requires the development of an offset RNAV (GPS) approach and an LDA Approach to Runway 17R. It is requested that the development of these procedures be separated into two phases: Phase 1 and Phase 2.

Phase 1 focuses on accommodating GPS approach capable aircraft and includes the development of an RNAV (GPS) approach procedure. This phase is based on the premise that a procedure of this type requires little or no investment in ground based NAVAIDs and can be implemented immediately. Phase 1 represents the starting point of the implementation of NA-7 and could serve as the catalyst to perfecting the operation prior to the implementation of Phase 2. Based on a sample of operations data obtained from the SDF tracking system data, this approach could accommodate up to 45% of the existing UPS fleet at SDF.

Phase 2 focuses on accommodating non-GPS/FMS equipped aircraft and includes the development of an LDA approach and the implementation of Localizer and DME infrastructure. Implementation of Phase 2 will be conducted after the RNAV GPS procedures have been implemented and ground based NAVAID equipment has been installed. Combined with Phase 1, this approach should accommodate all operations at SDF.

Two prototype approach procedures have been developed by ASRC Research and Technology Solutions (ARTS). These procedures have been coordinated with the Louisville Regional Airport Authority (LRAA) and meet the intent of Noise Measure NA-7. As previously mentioned, the RNAV procedure could be implemented immediately. However, the LDA approach requires ground based infrastructure and a final procedure can not be developed or implemented until the equipment is installed.

Phase 1: RNAV (GPS) Runway 17R

The procedure requested is an RNAV (GPS) approach procedure to Runway 17R. The final approach course is 150.75° True and is offset from the runway centerline of 165.41° True by 14.66°. The final approach course crosses runway centerline 5200' from the displaced threshold of Rwy 17R which is the maximum allowed by criteria. The intermediate segment is aligned with the final segment, is 6 NM in length, and has a minimum altitude of 2500' MSL, which is the intercept altitude for the LNAV/VNAV portion of the approach. The glide path angle and the TCH for the LNAV/VNAV are 3.0° and 55' respectively. The missed approach clearance limit is proposed as BETHY intersection (waypoint) or as requested by ATC. Differences in criteria do not allow the use of DAMEN intersection as a missed approach clearance limit.

There are two initial approach fixes, (IAFs) for this procedure. One is at NABB VORTAC and the other is at MAIZE intersection which will have to be modified to include a waypoint. A minimum altitude of 3000' is proposed for each initial segment. A copy of the proposed RNAV (GPS) approach procedure is shown in **Attachment 1**.

Phase 2: LDA Runway 17R

The second procedure requested is an LDA approach to Runway 17R for aircraft not equipped to fly the RNAV approach, including almost every aircraft operating at SDF. Development of Phase 2 is requested to begin after the implementation of the RNAV procedure. The procedure will require the installation of a localizer and DME which will be funded by the Airport Improvement Program as part of the FAA approved FAR Part 150 Noise Study and installed in accordance with FAR Part 171 *Non Federal Navigation Facilities*. It would be the intent of the LRAA to request FAA take over the maintenance of the system upon its commissioning.

The ground track of the LDA is identical to the RNAV 17R approach. The final approach course is 150.75° True and the final approach course crosses the runway centerline 5200' from the displaced threshold for Runway 17R. The glide path angle is 3.0° and will utilize an offset PAPI for 17R. The missed approach is different from the RNAV (GPS) Rwy 17R procedure. The missed approach clearance limit for the LDA is DAMEN intersection as is the current missed approach for the ILS Runway 17R procedure.

The intermediate segment altitude remains at 2500' MSL. The length of the intermediate segment is 6 NM. The initial approach fix (IAF) is at NABB VORTAC and the initial segment altitude is 3000' MSL. DME or RADAR is required to identify the intermediate fix and the final approach fix.

A copy of the proposed LDA approach procedure is shown in **Attachment 2**. A full feasibility study and siting report, estimate for the installation of the PAPI, localizer and DME is contained in **Attachment 3**.

Cost Benefit of the Requested Equipment and Procedures:

Costs of implementing these procedures include procurement of NAVAIDs, engineering and installation, flight check, and maintenance. For budgetary purposes, rough order-of-magnitude costs have been developed for the RNAV (GPS) and the LDA procedures and are detailed in **Tables 2 and 3.**

Table 2
Estimated Cost for Implementation of
RNAV(GPS) Approach to Runway 17R

Facility	Procure Cost	Install Cost	Notes
PAPI	$40,000	$20,000	Assumes an additional PAPI system will be installed. An additional PAPI may not be required.
Totals	**$40,000**	**$20,000**	

Notes:
1. Cost generated for planning purposes only. Upon the approval of the measure, cost estimates will be refined based on specific site requirements and discussions with vendors.
2. PAPI installation may not be required as existing facility may provide coverage or be modified to provide coverage.

Table 3
Estimated Cost for Implementation of
LDA Approach to Runway 17R

Facility	Procure Cost	Install Cost	Notes
Localizer	$250,000	$350,000	Assumes terminal mounted system work, power and access available; ground-mounted antenna array
DME	$100,000	$30,000	Co-sited with LOC
PAPI	$40,000	$20,000	Assumes an additional PAPI system will be installed. An additional PAPI may not be required.
Miscellaneous	---	$50,000 $30,000	Sight Testing Flight inspection
Maintenance Fee LOC/GS		$15,000	Cost per year routine conditions/flight inspections
Totals	**$540,000**	**$570,000**	

Notes:
1. Cost generated for planning purposes only. Upon the approval of the measure cost estimates will be refined based on specific site requirements and discussions with vendors.
2. PAPI installation may not be required as existing facility may provide coverage or be modified to provide coverage.
3. PAPI costs are duplicated from RNAV costs.

As previously mentioned, the implementation of these approaches is anticipated to save up to $36 million in sound insulation for houses north of the airport, representing a significant benefit based on the investment dollars required for the RNAV or LDA approaches.

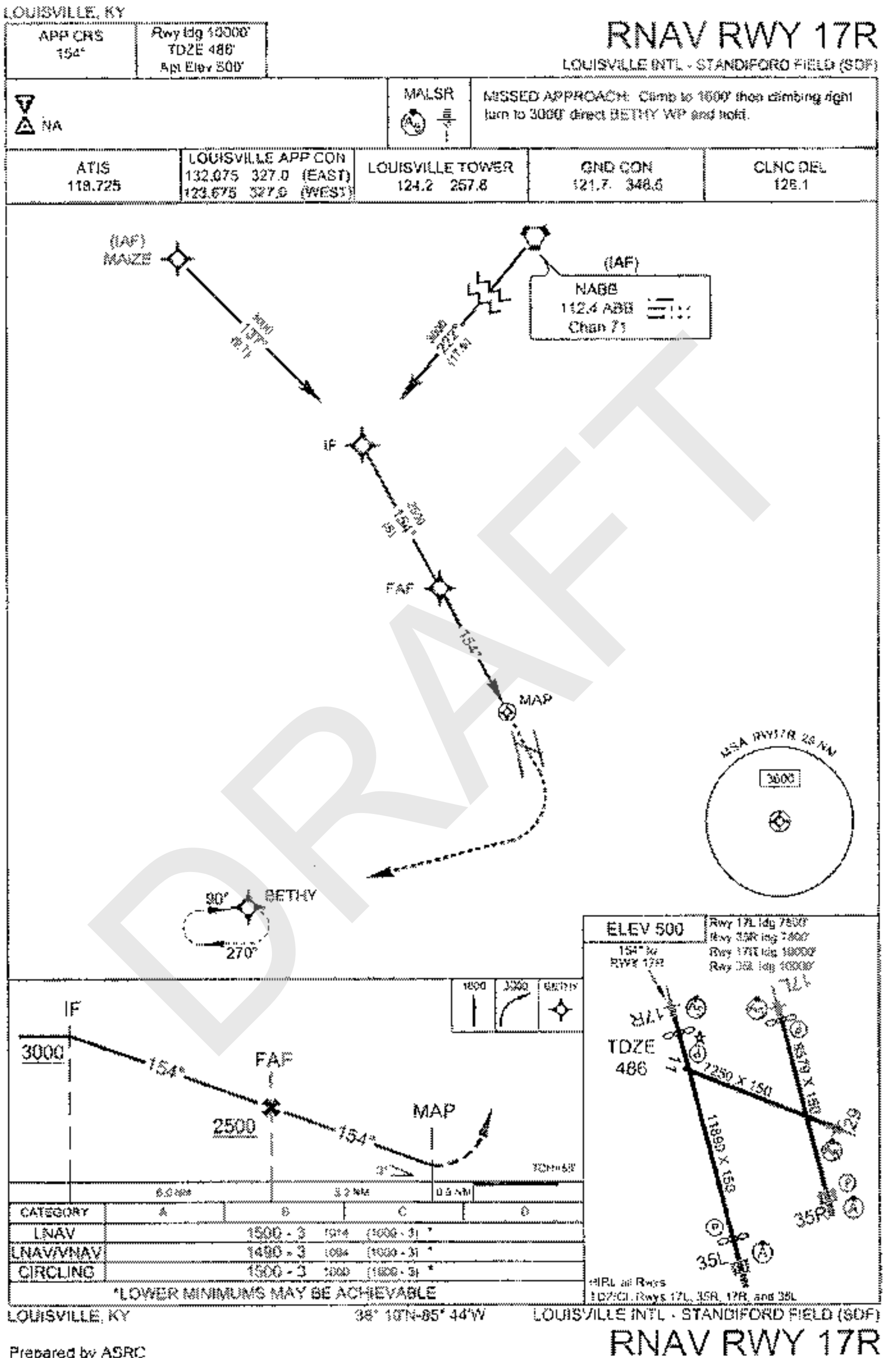
We understand the implementation of the NA-7 approach procedures will require coordination from other FAA departments including: Airports, Airway Facilities, Flight Procedures Office, and Flight Standards. We have copied key FAA personnel on our request in an effort to move forward quickly and in a coordinated manner.

We look forward to working with you on this project and thank you for your assistance. If you have any questions, please contact me at 502-368-6524.

Sincerely,

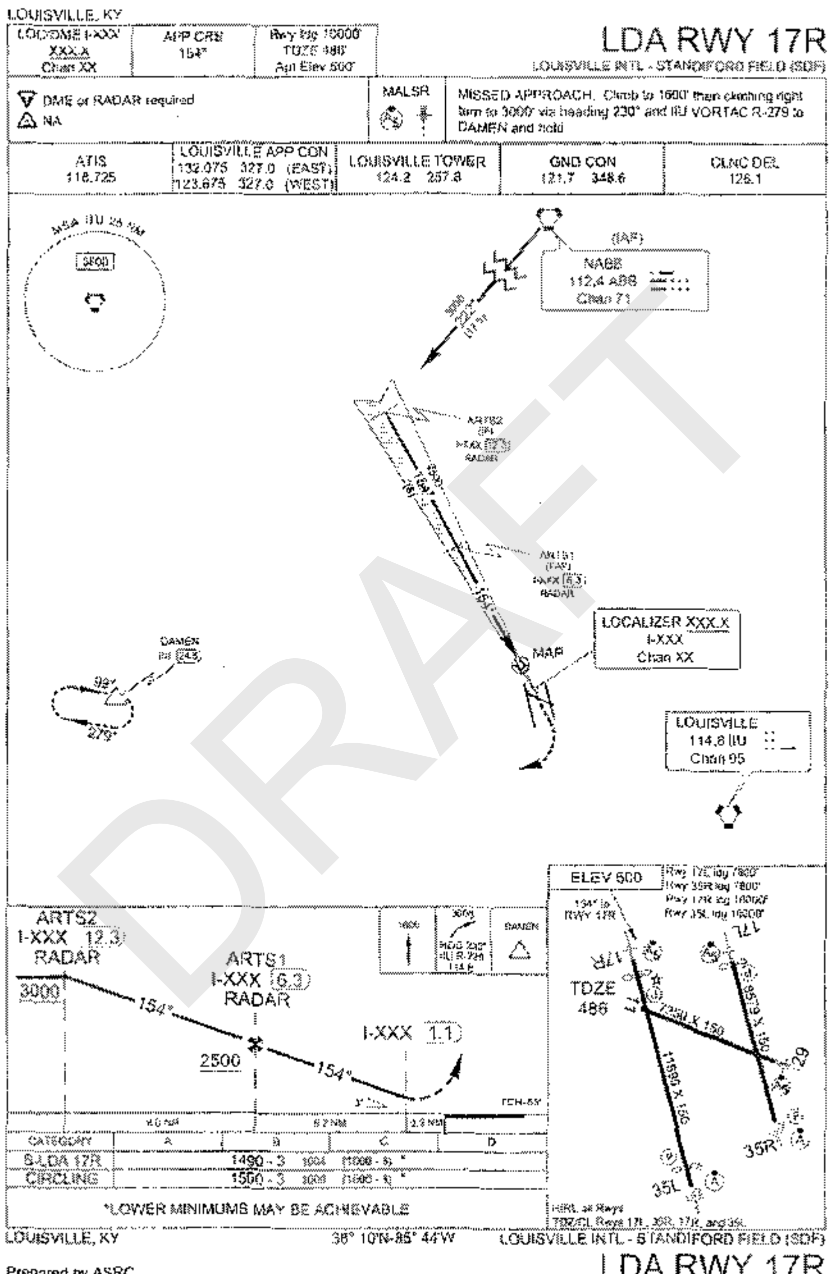
C.T. "Skip" Miller, A.A.E.
Executive Director
Louisville Regional Airport Authority

Cc: Philip Braden, FAA Airports District Office
Rusty Chapman, FAA Southern Region Airports Office
Gerald Lynch, FAA Eastern Region Flight Procedures Office
Douglas Murphy, FAA Southern Region Administrator
Karen Scott, LRAA Deputy Executive Director
Bob Slattery, LRAA Noise Abatement Manager



Prepared by ASRC
4255 Pheasant Ridge Drive
Suite 402
Minneapolis, MN 55449
763.786.9582

DRAFT ONLY - NOT FOR COCKPIT USE



Prepared by ASRC

DRAFT ONLY - NOT FOR COCKPIT USE

Attachment 2

U.S. Department of Transportation
Federal Aviation Administration

1701 Columbia Avenue
College Park, GA 30337-2748

APR 0 3 2009

Mr. C. T. "Skip" Miller, A.A.E.
Executive Director
Louisville Regional Airport Authority (LRAA)
P.O. Box 9129
Louisville, KY 40209

Dear Mr. Miller: Skip

This is in response to your October 29, 2008 letter requesting implementation of the Louisville-Standiford International Airport (SDF) 14 Code of Federal Regulations (CFR), Part 150 Update, *Noise Abatement Measure 7 Offset Approach.*

In the Federal Aviation Administration (FAA) Record of Approval (ROA), dated May 14, 2004 a determination of "No action required at this time" was given for Noise Compatibility Program (NCP) Measure NA-7, which included the proposed offset approach procedure. The determination additionally stated "a technical analysis of this measure…and an environmental analysis are required to determine its feasibility and environmental impacts." The determination also highlighted operational and capacity concerns that were not addressed adequately in the Louisville Regional Airport Authority (LRAA) NCP. Finally, NA-7 speaks specifically to a Global Positioning System (GPS) or Localizer-Type Directional Aid (LDA) offset instrument approach to runway 17R. We started a formal analysis when we received the additional approach information in your October 29, 2008 request.

FAA's approval or disapproval of 14 CFR, Part 150 NCP recommendations is measured according to standards in Part 150 and the Aviation Safety and Noise Abatement Act of 1979. Part 150, Section 150.35 includes language stating that programs will be approved under this part if program measures relating to the use of flight procedures for noise control can be implemented within the period covered by the program and without reducing the level of aviation safety provided or adversely affecting the efficient use and management of the navigable airspace and air traffic control systems.

While not considering the absence of an environmental analysis nor a subsequent Safety Risk Management evaluation, FAA evaluated potential safety issues, technical feasibility, and operational efficiencies of your proposed offset approach procedure. As a result, the proposed instrument offset approach procedure to Runway 17R at Louisville-Standiford

International Airport (SDF), and the corresponding components of measure NA-7, are both deemed unacceptable and are disapproved for implementation.

FAA's decision includes these comments:

- The Flight Standards Division does not consider this procedure to be a safe operation. The stabilized approach would be compromised, and the missed approach (particularly with loss of engine power) would be under less than ideal conditions and would place the aircraft over a populated area close to the surface, as well as the parallel runway, while maneuvering in a non-favorable environment.

- The Quality Oversight and Technical Advisory, National Flight Procedures Office does not support development of the offset approach due to runway alignment and stabilization criteria, as well as an excessive required missed approach climb gradient.

The Air traffic Organization (ATO) has serious concerns about safety, efficiency, and incompatibility with existing and proposed arrival routes. ATO specifics include:

- The flight path of the proposed offset procedure would place the published missed approach procedure in conflict with arrivals and departures operating from RWY 17L/35R. This would create a significant safety risk. In addition, IFR arrivals from the east, destined for the offset approach, would be required to cross the straight-in final approach course for both Runways 17L and 17R before entering the pattern for the offset approach, which would result in an increased safety risk, along with an increased risk of separation errors.

- Use of an offset approach would eliminate Air Traffic control (ATC) ability to run simultaneous approaches to Runways 17L and 17R. This existing ability is key to an expeditious arrival traffic flow, and was one of the criteria used when designing the airport layout. Simultaneous approaches require that the approaches be parallel precision approaches. An offset approach to RWY 17R is neither parallel nor precise, and does not meet this criterion.

- An offset approach would require the use of increased separation standards, and result in substantial delays for arriving aircraft. It is estimate that an "offset" instrument approach procedure would restrict arrival capacity by approximately 1/3 during instrument (non-visual) weather conditions. Further reductions in capacity would result from the necessity to move the downwind leg of the Runway 17R approach approximately 5-7 miles beyond its normal location in order to accommodate this approach. This inefficiency would be exacerbated if Runway 17R were the preferred runway for all instrument arrivals, as proposed in NA-7.

- Normally, during visual conditions, and light-to-moderate traffic levels, arriving aircraft fly a "visual approach," which is generally the most direct and efficient route to the airport. Mandating the use of an instrument procedure during visual conditions, for non-operational reasons, would result in extended flying miles, added time, and increased costs for our users.

- UPS and FAA are, at this time, collaboratively working to develop RNAV STARS for all runways at SDF. When complete, these STARS (Standard Terminal Arrival Routes) are expected to standardize arrival procedures into SDF, and provide significant cost and efficiency benefits to UPS and other airport users. The offset approach procedure proposed by LRAA is not compatible with these RNAV STARS.

- The proposed offset approach, as specified in the Part 150 Update, would be used in conjunction with NA-2, which reverses the current runway use program to prefer the west runway (RWY 17R). This would imply a significant use of this offset procedure, which would exacerbate the concerns highlighted above.

Based on your request and the aforementioned comments resulting from our technical analysis, the noise abatement measure NA-7, Use an Offset Departure from Runway 35L and Offset Approach to Runway 17R, is disapproved, from a procedural standpoint. In addition, the other noise abatement measures dependent on the Offset Approach, NA-2, Reverse East-West Preference and NA-3, Morning North Flow Preference are also disapproved. This proposal cannot be implemented without reducing the level of aviation safety provided and adversely affecting the efficient use and management of the navigable airspace and air traffic control systems. This disapproval does not constitute a determination under Part 150 which will be completed by the Memphis Airports District Office. They will be contacting you to revise the Record of Approval to reflect these disapprovals in accordance with Part 150.

Finally, according to 14 CFR Part 150, Subpart B, 150.21(d)(4), if your forecast Noise Exposure Map (NEM) is based on assumptions involving recommendations in the Noise Compatibility Program that are subsequently disapproved by FAA and that would change the future NEM such that a substantial, non-compatible land use is either excluded or included, contrary to the forecast NEM, a revised map must be submitted. Revised NEMs are subject to the same requirements and procedures as initial submissions of NEMs under Part 150. Please contact the Memphis Airports District Office at 901-322-8181 for further guidance on Part 150 issues.

If you need more information, please contact me at 404-305-5000.

Sincerely,

Doug Murphy

Douglas R. Murphy
Regional Administrator, Southern Region

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Appendix C: Noise Modeling Supporting Information

Table of Contents

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Operational Forecast Documents

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TECHNICAL MEMO

Date: June 25, 2024

Project: Louisville Muhammad Ali International Airport (SDF)
Summary of Forecast Data for SDF NEM Update

From: Joni Steigerwald, ENV SP - C&S Engineers, Inc.

File: F87.023.200

This Technical Memo provides the recommended aviation activity levels for use in the development of the aircraft noise exposure contours representing the 2024 Existing Condition and 2029 Forecast Condition for the Louisville Muhammad Ali International Airport (SDF) Noise Exposure Map (NEM) Update in accordance with Title 14 of the Code of Federal Regulations Part 150 (Part 150). As a result of the analysis reported below, we recommend using the Federal Aviation Administration (FAA) Terminal Area Forecast (TAF)[1] as the basis for aircraft operations in 2024 and 2029 for the NEM Update.

I. Master Plan Forecast: Approved Baseline Forecast

The latest approved Master Plan at SDF was developed by Kimley-Horn and Associates, Inc. (KHA) and was provided for use in this technical memo. **Table 1** details the FAA-approved operations forecast presented in the Master Plan for the baseline forecast. For the purpose of this memo and the SDF NEM Update, the forecasted operations for 2024 and 2029 have been extrapolated per the Master Plan published growth rates[2].

Table 1 – 2021 SDF Master Plan Approved Forecast

Operations	MP Baseline 2018	MP Forecast 2023	Extrapolation 2024	MP Forecast 2028	Extrapolation 2029
Commercial Operations	53,530	54,264	54,335	54,630	54,701
Air Cargo Operations	88,486	100,533	101,689	104,134	105,332
General Aviation Operations	25,316	27,330	27,724	29,285	29,707
Military Operations	2,367	2,878	2,878	2,878	2,878
TOTAL OPERATIONS	**169,699**	**185,005**	**186,625**	**190,927**	**192,617**

Source: 2021 SDF Master Plan completed by KHA; C&S Engineers, Inc.

[1] FAA TAF January 2024[2] *Table 2.26 Baseline Forecast Summary (Master Plan 2021)*: AAGR Commercial Operations 0.13%, AAGR Air Cargo Operations 1.15%, AAGR GA Operations 1.44%, AAGR Military operations 0.0%.

[2] *Table 2.26 Baseline Forecast Summary (Master Plan 2021)*: AAGR Commercial Operations 0.13%, AAGR Air Cargo Operations 1.15%, AAGR GA Operations 1.44%, AAGR Military operations 0.0%.

II. Operations Forecast from Most Recent FAA TAF (February 2023 / January 2024)

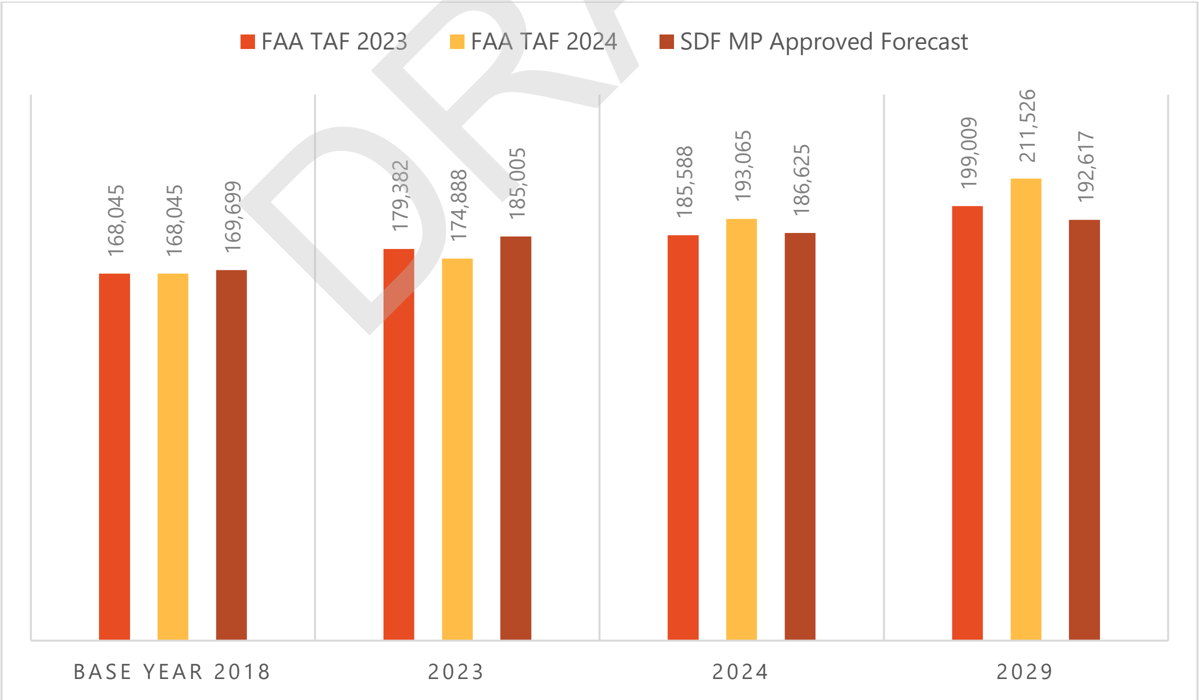
A review of the published FAA TAF (February 2023) information as well as the latest FAA TAF (January 2024) data is provided below in **Table 2**. The latest FAA TAF data includes higher operations than the approved 2021 Master Plan forecast for the projected years beyond 2023. **Figure 1** depicts the same data graphically.

Table 2 – FAA TAF Operations

Operations Forecast Source	2023	2024	2029
FAA TAF (Published February 2023)	179,382	185,588	199,009
FAA TAF (Published January 2024)	174,888	193,065	211,526
SDF Master Plan Approved Forecast 2021	*185,005*	*186,625*	*192,617*

Source: FAA TAF February 2023; FAA TAF January 2024; SDF Master Plan 2021

Figure 1 – SDF Operations FAA TAF v. SDF MP Approved Forecast



Source: FAA TAF February 2023; FAA TAF January 2024; SDF Master Plan 2021

III. Operations from Recent 12 Months of Activity

LRAA provided a recent 12 months (September 1, 2022, through August 30, 2023) of flight track and aircraft identification data from the SDF noise and operations monitoring system (NOMS)[3] to serve as the basis for the NEM derivative forecasts and other data required for noise modeling purposes, e.g., fleet mix, day-night split, runway use, and flight path use. **Table 3** summarizes the 12 months of aircraft operations from the SDF NOMS data and scales those operations by category to match the FAA's Operations Network (OPSNET)[4] counts for the same time period.

Table 3 – SDF Radar Operations / OPSNET Operations

Operations	NOMS Operations	Scaled to OPSNET Totals
Air Carrier Cargo Operations	100,158	100,592
Air Carrier Passenger Operations	47,275	47,511
Air Taxi Operations	13,689	15,265
General Aviation Operations	8,303	9,877
Military Operations	70	1,889
TOTAL OPERATIONS	**169,495**	**175,134***

*Does not include 372 local operations
Source: Symphony EnvironmentalVue Airport Operations Management Systems, September 2022 through August 2023; OPSNET, September 2022 through August 2023

IV. Additional Input from SDF Stakeholders/Tenants

Through conversations with key stakeholders at the Airport, an indication of what can be expected at SDF over the next five years of forecasted activity is noted below by category.

Cargo

Reports from both LRAA staff and cargo operators have noted there has been a 10 percent decrease in cargo operations activity over the past year as compared to the prior year. Published operations data corroborate this information in tower data (OPSNET). The following list includes key findings from these conversations:

- It's been noted that the Master Plan forecast was developed prior to the rise in cargo during COVID-19.

[3] Aircraft Flight Tracking and Noise Management System (NOMS)
[4] The Operations Network (OPSNET) is the official source of FAA air traffic operations and delay data. Daily Operations Data is available from FY 1990 through yesterday. Daily Delay Data is available from FY 2000 through yesterday. Although operations and delay data are available through yesterday, they are not publicly accessible until after the 20th of the next month.

- The MD-11 aircraft are in the process of being phased out at SDF, with Boeing 767-300 aircraft increasing in operations as a result.
- Projections for cargo aircraft operations are expected to increase over the planning period due to a current tenant securing a new contract for cargo operations.

Airlines

Conversations with LRAA staff concurred that SDF is trending ahead of the 2021 Master Plan approved forecast in enplanements. It is important to understand the correlation of those enplanements to the aircraft being utilized and the operations associated with that growth. The conversations included the following commentary:

- Aircraft operations are not increasing at the rate of increased enplanements as air carriers have been up-gauging to larger aircraft to accommodate the growth in passengers with fewer pilots and aircraft available as compared to 2019.
- Since 2019, enplanements have increased 15 percent while operations have decreased 8 percent.
- In 2023, enplanements increased 25 percent from 2022 but flights have only increased 13 percent.
- The airlines are tracking leisure travel trends, showing growth in the number of leisure enplanements.
- There is currently more leisure travel than compared to pre-COVID-19 numbers, with increased capacity to BOS, DEN, DFW, LAS, PHX and other destinations.
- LRAA expects continued growth in enplanements (8 to 10 percent per year) associated with 1 to 2 percent growth in operations. SDF is seeing more activity with the Boeing 737 MAX aircraft (MAX 8, MAX 9) and the Airbus A321neo aircraft types.
- There has been a change in frequency of flights associated with up-gauging. Whereas the SDF previously had six to seven flights with smaller regional jets per day to Chicago, there are now four to five flights per day with two to three of the larger jet types. LRAA believes the increase is due to the Airport being previously underserved, in addition to the increase in leisure activities in the area (bourbon tours, etc.). The Airport will continue to pursue additional airlines (Air Canada, Alaska Airlines, Jet Blue, etc.) with hopes to increase growth at SDF. These airlines currently operate with a fleet mix similar to SDF's current fleet.

Military

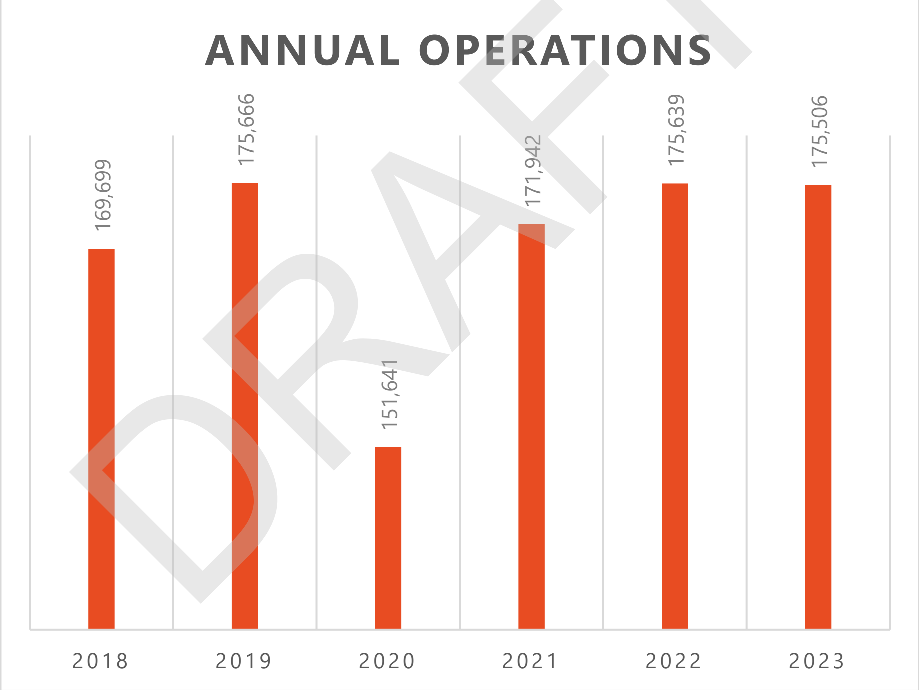
The Airport is home to the 123rd Kentucky Air National Guard, which operates the majority of the military activity at SDF. While this activity can change depending on national military initiatives, there is no known plan for a change in military operations. The Airport has noted that the Guard is in the process of changing their fleet from C-130H to C-130J aircraft.

V. Forecast Comparison/Recommendation

While SDF has seen continual growth in operations since the published/approved forecast from the 2021 Master Plan, the post-COVID-19 activity in cargo operations has not grown at the published growth rates beyond 2023. With this in mind, it's important to evaluate the trend in actual annual tower operations over the years since the Master Plan's baseline of 2018.

A historical review of the OPSNET annual operations between the years of 2018 (the Master Plan baseline year) and 2022, shows the average annual growth rate (AAGR) of total operations to be 1.34 percent. Incorporating 2023 totals in the calculation from 2018 results in an AAGR of 1.06 percent. **Figure 2** presents the six years of OPSNET data graphically.

Figure 2 – SDF OPSNET Operations



Source: OPSNET

During the course of the development of this Technical Memo and forecast analysis, cargo operators at SDF have acquired a new contract for additional cargo activity. Conversations with the Airport indicate that cargo activity at SDF is expected to increase over the course of 2024 by an additional average daily 52 operations or approximately 19,000 annual operations. With this knowledge, it is important to include the growth in this five-year forecast. Projections in other categories of activity are for similar growth rates as seen over the past five years.

Table 4 summarizes the forecast information for the years 2023 (baseline), 2024 (existing), and 2029 (forecast). Included for comparison are the extrapolated projections from the approved Master Plan forecast, the most recent published FAA TAF annual operations forecast, and the projected growth based on the five-year trend (2018 – 2022) in the OPSNET operations. The bottom line identifies the projected annual operations recommended for the SDF NEM Forecast.

The recommendation for the SDF NEM Forecast follows the growth realized at the Airport over the past five years and includes the new activity in cargo operations, which parallels the FAA TAF projections. Based on this evaluation, the FAA TAF published operations forecast for the years 2024 and 2029 are the proposed operations levels for the SDF NEM Update.

Table 4 –Operations Forecast

Operations Forecast Source	2023 (Base Year)	2024 (Existing Conditions)	2029 (5-Year Forecast)
Master Plan[1]	N/A	N/A	192,617
FAA TAF[2]	174,888	193,065	211,526
OPSNET Operations Trend[3]	175,506*	177,858**	190,436**
Proposed SDF NEM Update Operations	**N/A**	**193,065**	**211,526**

1. 2021 Master Plan approved forecast 2023
2. FAA TAF January 2024
3. SDF NOMS Operations scaled to OPSNET (September 1, 2022 through August 31, 2023)
   *Includes local operations (372)
   **OPSNET extrapolated based on AAGR from 2018 annual operations through 2022 (1.34% AAGR)

VI. Operations Fleet Mix Forecast Summary

Table 5 provides the aircraft fleet mix forecast data for 2024 and 2029.

Table 5 – Operations Fleet Mix Forecast

2024	**Category**	**Type**	**Operations**	**% Annual Operations**
	Air Carrier	Jets	163,424	85%
	Air Taxi	Jets	10,447	5%
		Non-Jets	6,381	3%
	GA	Helicopters	213	Less than 1%
		Jets	8,750	5%
		Non-Jets	1,927	1%
	Military	KYANG C-130s	1,194	1%
		Transient	729	Less than 1%
		TOTAL	**193,065**	**100.00%**
2029	**Category**	**Type**	**Operations**	**% Annual Operations**
	Air Carrier	Jets	179,613	85%
	Air Taxi	Jets	11,296	5%
		Non-Jets	6,900	3%
	GA	Helicopters	228	Less than 1%
		Jets	9,462	5%
		Non-Jets	2,082	1%
	Military	KYANG C-130s	1,208	1%
		Transient	737	Less than 1%
		TOTAL	**211,526**	**100.00%**

ATTACHMENTS:

1. FAA TAF January 2024
2. OPSNET 2018-2023

APO TERMINAL AREA FORECAST DETAIL REPORT
Forecast Issued January 2024

SDF

	Enplanements			AIRCRAFT OPERATIONS Itinerant Operations					Local Operations					
Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	Total Ops	Total Tracon Ops	Based Aircraft

REGION:ASO **STATE:**KY **LOCID:**SDF
CITY:LOUISVILLE **AIRPORT:**LOUISVILLE MUHAMMAD ALI INTL

Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	Total Ops	Total Tracon Ops	Based Aircraft
2013	897,738	763,595	1,661,333	92,930	42,505	10,213	2,840	148,488	252	119	371	148,859	206,050	26
2014	942,957	711,232	1,654,189	96,633	36,755	11,619	2,799	147,806	431	242	673	148,479	205,003	27
2015	855,274	776,478	1,631,752	102,860	30,108	11,560	2,953	147,481	458	131	589	148,070	203,499	23
2016	860,498	768,257	1,628,755	110,487	27,948	11,340	2,706	152,481	637	213	850	153,331	208,772	35
2017	854,451	800,153	1,654,604	123,002	24,404	10,573	2,887	160,866	711	213	924	161,790	219,719	27
2018	967,375	849,750	1,817,125	127,716	25,750	11,574	2,327	167,367	573	105	678	168,045	224,892	36
2019	1,115,241	903,961	2,019,202	136,394	24,002	10,311	2,121	172,828	510	176	686	173,514	232,853	29
2020	597,391	519,893	1,117,284	132,437	16,925	7,025	1,547	157,934	369	137	506	158,440	211,389	29
2021	658,891	581,490	1,240,381	138,351	16,102	8,383	2,119	164,955	558	117	675	165,630	226,816	29
2022	1,134,071	754,463	1,888,534	148,668	16,701	10,287	1,730	177,386	475	86	561	177,947	248,277	31
2023*	1,486,301	681,129	2,167,430	147,817	15,019	9,808	1,917	174,561	186	141	327	174,888	245,596	31
2024*	1,961,352	652,354	2,613,706	169,281	11,378	10,108	1,917	192,684	240	141	381	193,065	262,582	31
2025*	1,996,020	663,838	2,659,858	172,839	13,425	11,222	1,917	199,403	527	141	668	200,071	273,248	31
2026*	2,018,757	671,385	2,690,142	176,704	12,456	11,235	1,917	202,312	532	141	673	202,985	275,842	31
2027*	2,042,896	679,397	2,722,293	179,680	12,327	11,248	1,917	205,172	537	141	678	205,850	278,973	31
2028*	2,067,202	687,459	2,754,661	182,383	12,455	11,261	1,917	208,016	543	141	684	208,700	282,265	31
2029*	2,089,820	694,972	2,784,792	185,063	12,584	11,273	1,917	210,837	548	141	689	211,526	285,521	31
2030*	2,111,966	702,330	2,814,296	187,755	12,713	11,286	1,917	213,671	554	141	695	214,366	288,788	31
2031*	2,133,915	709,622	2,843,537	190,468	12,843	11,299	1,917	216,527	559	141	700	217,227	292,078	31
2032*	2,156,060	716,979	2,873,039	193,214	12,974	11,312	1,917	219,417	565	141	706	220,123	295,406	31
2033*	2,178,088	724,298	2,902,386	195,984	13,107	11,325	1,917	222,333	570	141	711	223,044	298,762	31
2034*	2,200,037	731,588	2,931,625	198,779	13,241	11,338	1,917	225,275	576	141	717	225,992	302,145	31
2035*	2,222,510	739,056	2,961,566	201,619	13,376	11,351	1,917	228,263	582	141	723	228,986	305,584	31
2036*	2,245,619	746,737	2,992,356	204,507	13,512	11,364	1,917	231,300	588	141	729	232,029	309,081	31
2037*	2,269,172	754,559	3,023,731	207,436	13,650	11,377	1,917	234,380	593	141	734	235,114	312,624	31
2038*	2,292,647	762,359	3,055,006	210,393	13,789	11,390	1,917	237,489	599	141	740	238,229	316,196	31
2039*	2,316,594	770,316	3,086,910	213,393	13,929	11,403	1,917	240,642	605	141	746	241,388	319,817	31
2040*	2,341,162	778,482	3,119,644	216,442	14,071	11,416	1,917	243,846	611	141	752	244,598	323,499	31
2041*	2,365,223	786,472	3,151,695	219,506	14,214	11,429	1,917	247,066	618	141	759	247,825	327,194	31
2042*	2,390,181	794,767	3,184,948	222,628	14,358	11,442	1,917	250,345	624	141	765	251,110	330,960	31

APO TERMINAL AREA FORECAST DETAIL REPORT
Forecast Issued January 2024

SDF

AIRCRAFT OPERATIONS

	Enplanements			Itinerant Operations					Local Operations					
Fiscal Year	**Air Carrier**	**Commuter**	**Total**	**Air Carrier**	**Air Taxi & Commuter**	**GA**	**Military**	**Total**	**Civil**	**Military**	**Total**	**Total Ops**	**Total Tracon Ops**	**Based Aircraft**
2043*	2,415,418	803,149	3,218,567	225,789	14,504	11,455	1,917	253,665	630	141	771	254,436	334,772	31
2044*	2,440,600	811,515	3,252,115	228,980	14,651	11,469	1,917	257,017	636	141	777	257,794	338,618	31
2045*	2,465,820	819,891	3,285,711	232,204	14,800	11,482	1,917	260,403	643	141	784	261,187	342,499	31
2046*	2,491,151	828,307	3,319,458	235,464	14,950	11,495	1,917	263,826	649	141	790	264,616	346,422	31
2047*	2,516,533	836,738	3,353,271	238,758	15,101	11,508	1,917	267,284	656	141	797	268,081	350,385	31
2048*	2,541,846	845,147	3,386,993	242,084	15,254	11,521	1,917	270,776	662	141	803	271,579	354,387	31
2049*	2,567,460	853,656	3,421,116	245,452	15,408	11,534	1,917	274,311	669	141	810	275,121	358,440	31
2050*	2,593,455	862,295	3,455,750	248,866	15,564	11,547	1,917	277,894	675	141	816	278,710	362,549	31

OPSNET : Airport Operations : Standard Report

From 01/2018 To 09/2023 | Facility=SDF

Calendar Year	Facility	State	Region	DDSO Service Area	Class	Itinerant Air Carrier	Itinerant Air Taxi	Itinerant General Aviation	Itinerant Military	Itinerant Total	Local Civil	Local Military	Local Total	Total Operations
2018	SDF	KY	ASO	CE	Combined TRACON & Tower with I	129,765	25,423	11,553	2,247	168,988	591	120	711	169,699
2019	SDF	KY	ASO	CE	Combined TRACON & Tower with I	138,987	24,018	9,959	2,083	175,047	470	149	619	175,666
2020	SDF	KY	ASO	CE	Combined TRACON & Tower with I	129,078	13,982	6,391	1,611	151,062	411	168	579	151,641
2021	SDF	KY	ASO	CE	Combined TRACON & Tower with I	142,917	17,261	9,143	1,958	171,279	584	79	663	171,942
2022	SDF	KY	ASO	CE	Combined TRACON & Tower with I	146,560	16,169	10,352	1,921	175,002	435	202	637	175,639
2023	SDF	KY	ASO	CE	Combined TRACON & Tower with I	108,878	11,214	7,370	1,448	128,910	122	25	147	129,057
Total:						**796,185**	**108,067**	**54,768**	**11,268**	**970,288**	**2,613**	**743**	**3,356**	**973,644**

Report created on Mon Oct 30 14:37:48 EDT 2023

Sources: The Operations Network (OPSNET)

Show data notices.

CAT_TOWER	MARKET	AIRLINE	AIRCRAFTTYPE	AEDT EQUIP_ID	TOTAL_2024_OPS	Arrivals			Departures																		
						Day	Night		Day									Night									
						SL_1	SL_1	Total Arrivals	SL_1	SL_2	SL_3	SL_4	SL_5	SL_6	SL_7	SL_8	SL_9	SL_1	SL_2	SL_3	SL_4	SL_5	SL_6	SL_7	SL_8	SL_9	Total Departures
Air Carrier/Cargo	Cargo	UPS	A306	704	22,906	3,339	8,115	11,453	1,052	1,751	210	584	-	-	-	-	-	4,030	2,753	499	574	-	-	-	-	-	11,453
Air Carrier/Cargo	Cargo	UPS	B744	4085	4,782	1,120	1,271	2,391	72	263	18	237	261	217	-	-	-	91	199	-	336	310	240	-	148	-	2,391
Air Carrier/Cargo	Cargo	UPS	B748	6630	4,214	784	1,324	2,107	20	91	-	43	267	213	-	-	-	43	67	-	44	459	592	-	268	-	2,107
Air Carrier/Cargo	Cargo	UPS	B752	3917	8,556	1,271	3,007	4,278	391	591	232	281	-	-	-	-	-	850	1,334	243	356	-	-	-	-	-	4,278
Air Carrier/Cargo	Cargo	UPS	B752	4089	5,547	859	1,914	2,773	262	396	155	188	-	-	-	-	-	541	849	155	226	-	-	-	-	-	2,773
Air Carrier/Cargo	Cargo	UPS	B763	4087	39,525	6,986	12,776	19,763	913	2,154	1,779	2,844	25	102	-	-	-	3,089	4,141	1,948	2,354	379	34	-	-	-	19,763
Air Carrier/Cargo	Cargo	UPS	MD11	5269	8,363	1,311	2,871	4,182	110	784	105	429	-	59	-	-	-	1,538	891	32	233	-	-	-	-	-	4,182
Air Carrier/Cargo	Cargo	UPS	MD11	3969	5,860	999	1,932	2,930	84	598	80	327	-	45	-	-	-	1,025	594	21	155	-	-	-	-	-	2,930
Air Carrier/Cargo	Cargo	UPS	MD11	5270	4,256	645	1,483	2,128	56	397	53	217	-	30	-	-	-	784	455	16	119	-	-	-	-	-	2,128
Air Carrier/Cargo	Cargo	FDX	A306	710	1,209	331	274	605	94	156	19	52	-	-	-	-	-	145	99	18	21	-	-	-	-	-	605
Air Carrier/Cargo	Cargo	Other	B744	4085	1,999	486	514	1,000	42	154	10	139	153	127	-	-	-	26	56	-	94	87	68	-	42	-	1,000
Air Carrier	Passenger	RPA	E170	2559	2,646	1,046	276	1,323	564	432	-	-	-	-	-	-	-	198	128	-	-	-	-	-	-	-	1,323
Air Carrier	Passenger	RPA	E75L	3071	5,276	2,108	530	2,638	589	1,252	-	-	-	-	-	-	-	388	409	-	-	-	-	-	-	-	2,638
Air Carrier	Passenger	RPA	E75S	3816	5,802	2,509	392	2,901	849	1,307	-	-	-	-	-	-	-	349	396	-	-	-	-	-	-	-	2,901
Air Carrier	Passenger	SWA	B38M	6472	1,337	555	114	668	270	190	39	12	-	-	-	-	-	116	41	-	-	-	-	-	-	-	668
Air Carrier	Passenger	SWA	B737	176	3,341	1,324	347	1,671	575	676	65	-	-	-	-	-	-	315	39	-	-	-	-	-	-	-	1,671
Air Carrier	Passenger	SWA	B737	178	2,492	984	262	1,246	427	502	48	-	-	-	-	-	-	239	30	-	-	-	-	-	-	-	1,246
Air Carrier	Passenger	SWA	B738	203	3,353	1,460	217	1,677	575	697	43	18	-	-	-	-	-	172	170	-	-	-	-	-	-	-	1,677
Air Carrier	Passenger	DAL	B712	83	2,912	1,388	68	1,456	1,418	-	-	-	-	-	-	-	-	38	-	-	-	-	-	-	-	-	1,456
Air Carrier	Passenger	DAL	B738	2499	602	237	64	301	109	132	8	3	-	-	-	-	-	25	24	-	-	-	-	-	-	-	301
Air Carrier	Passenger	DAL	B739	4357	2,431	648	568	1,216	657	64	-	-	-	-	-	-	-	495	-	-	-	-	-	-	-	-	1,216
Air Carrier	Passenger	AAL	A319	967	1,906	603	350	953	356	284	10	-	-	-	-	-	-	49	254	-	-	-	-	-	-	-	953
Air Carrier	Passenger	AAL	A319	957	872	338	98	436	192	153	5	-	-	-	-	-	-	14	71	-	-	-	-	-	-	-	436
Air Carrier	Passenger	AAL	A320	1019	1,028	291	223	514	105	210	10	44	-	-	-	-	-	63	56	26	-	-	-	-	-	-	514
Air Carrier	Passenger	AAL	B738	203	1,593	405	391	797	221	267	16	7	-	-	-	-	-	144	142	-	-	-	-	-	-	-	797
Air Carrier	Passenger	SKW	CRJ9	2547	1,599	548	251	799	473	293	-	-	-	-	-	-	-	19	15	-	-	-	-	-	-	-	799
Air Carrier	Passenger	SKW	E75L	3071	2,602	915	386	1,301	277	589	-	-	-	-	-	-	-	212	223	-	-	-	-	-	-	-	1,301
Air Carrier	Passenger	ASH	CRJ9	2547	2,270	733	402	1,135	618	384	-	-	-	-	-	-	-	75	58	-	-	-	-	-	-	-	1,135
Air Carrier	Passenger	ASH	E75L	3071	1,611	628	178	806	219	465	-	-	-	-	-	-	-	59	62	-	-	-	-	-	-	-	806
Air Carrier	Passenger	JIA	CRJ7	2546	544	263	9	272	253	13	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	272
Air Carrier	Passenger	JIA	CRJ7	1253	526	254	9	263	244	12	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	263
Air Carrier	Passenger	JIA	CRJ9	2547	2,137	798	271	1,068	555	344	-	-	-	-	-	-	-	95	74	-	-	-	-	-	-	-	1,068
Air Carrier	Passenger	NKS	A20N	5975	462	193	38	231	-	169	30	26	-	-	-	-	-	-	5	1	1	-	-	-	-	-	231
Air Carrier	Passenger	NKS	A320	4632	726	276	87	363	78	155	7	33	-	-	-	-	-	39	34	16	-	-	-	-	-	-	363
Air Carrier	Passenger	NKS	A321	1039	1,505	372	380	752	19	327	9	96	-	-	-	-	-	-	56	245	-	-	-	-	-	-	752
Air Carrier	Passenger	UAL	A319	957	1,225	401	212	612	334	266	9	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	612
Air Carrier	Passenger	UAL	A320	1019	997	267	232	498	135	269	12	56	-	-	-	-	-	12	10	5	-	-	-	-	-	-	498
Air Carrier	Passenger	AAY	A320	4631	905	441	12	453	122	244	11	51	-	-	-	-	-	11	9	4	-	-	-	-	-	-	453
Air Carrier	Passenger	AAY	A320	1003	865	426	7	433	120	238	11	50	-	-	-	-	-	6	5	3	-	-	-	-	-	-	433
Air Carrier	Passenger	MXY	BCS3	6634	898	420	29	449	130	133	-	153	-	-	-	-	-	22	12	-	-	-	-	-	-	-	449
Air Carrier	Passenger	MXY	BCS3	6633	184	83	9	92	26	26	-	30	-	-	-	-	-	6	3	-	-	-	-	-	-	-	92
Air Carrier	Passenger	Other	CRJ7	1253	504	247	5	252	237	12	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	252
Air Carrier	Passenger	Other	E75L	3071	3,392	1,481	215	1,696	516	1,095	-	-	-	-	-	-	-	41	44	-	-	-	-	-	-	-	1,696
Air Taxi	Cargo	SNC	SH36	798	1,915	-	958	958	18	-	-	-	-	-	-	-	-	939	-	-	-	-	-	-	-	-	958
Air Taxi	Cargo	SNC	SH36	796	873	-	436	436	1	-	-	-	-	-	-	-	-	435	-	-	-	-	-	-	-	-	436
Air Taxi	Passenger	AWI	CRJ2	1250	1,123	534	28	562	493	27	39	-	-	-	-	-	-	0	2	-	-	-	-	-	-	-	562
Air Taxi	Passenger	SKW	CRJ2	1250	592	259	37	296	259	14	21	-	-	-	-	-	-	0	2	-	-	-	-	-	-	-	296
Air Taxi	Passenger	Other	E145	1754	1,048	519	4	524	524	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	524
Air Taxi	Other/Miscellaneous	Other	E55P	4917	1,622	787	24	811	461	293	-	-	-	-	-	-	-	26	30	-	-	-	-	-	-	-	811
Air Taxi	Other/Miscellaneous	Other	C68A	6386	1,224	574	38	612	383	187	-	-	-	-	-	-	-	42	-	-	-	-	-	-	-	-	612
Air Taxi	Other/Miscellaneous	Other	CRJ2	1250	970	-	485	485	67	4	5	-	-	-	-	-	-	24	385	-	-	-	-	-	-	-	485
Air Taxi	Other/Miscellaneous	Other	SW4	1458	810	336	69	405	199	139	39	-	-	-	-	-	-	23	4	-	-	-	-	-	-	-	405
Air Taxi	Other/Miscellaneous	Other	SW4	1449	809	217	188	404	144	101	29	-	-	-	-	-	-	112	19	-	-	-	-	-	-	-	404
Air Taxi	Other/Miscellaneous	Other	BE40	2024	782	385	6	391	251	132	-	-	-	-	-	-	-	6	3	-	-	-	-	-	-	-	391
Air Taxi	Other/Miscellaneous	Other	B190	36	747	8	366	373	27	2	-	-	-	-	-	-	-	329	16	-	-	-	-	-	-	-	373
Air Taxi	Other/Miscellaneous	Other	PC12	3122	724	-	362	362	7	2	-	-	-	-	-	-	-	353	-	-	-	-	-	-	-	-	362
Air Taxi	Other/Miscellaneous	Other	CL35	5345	603	291	11	302	177	112	-	-	-	-	-	-	-	8	5	-	-	-	-	-	-	-	302
Air Taxi	Other/Miscellaneous	Other	C56X	6070	475	227	11	238	147	78	-	-	-	-	-	-	-	9	5	-	-	-	-	-	-	-	238
Air Taxi	Other/Miscellaneous	Other	C56X	6065	439	214	5	220	139	74	-	-	-	-	-	-	-	4	2	-	-	-	-	-	-	-	220
Air Taxi	Other/Miscellaneous	Other	C25B	6067	219	104	5	110	65	40	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	110
Air Taxi	Other/Miscellaneous	Other	CL30	4856	197	93	5	98	41	41	-	13	-	-	-	-	-	2	2	-	1	-	-	-	-	-	98
Air Taxi	Other/Miscellaneous	Other	C680	5184	178	71	18	89	53	19	-	-	-	-	-	-	-	14	4	-	-	-	-	-	-	-	89
Air Taxi	Other/Miscellaneous	Other	C680	3047	151	73	3	76	56	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76
General Aviation	--	--	F2TH	4804	1,956	902	76	978	418	433	38	30	-	-	-	-	-	-	60	-	-	-	-	-	-	-	978
General Aviation	--	--	C550	6343	1,584	739	53	792	525	187	-	-	-	-	-	-	-	80	-	-	-	-	-	-	-	-	792
General Aviation	--	--	C172	1267	1,136	530	38	568	517	-	-	-	-	-	-	-	-	51	-	-	-	-	-	-	-	-	568
General Aviation	--	--	C25B	6067	963	454	27	481	324	127	-	-	-	-	-	-	-	31	-	-	-	-	-	-	-	-	481
General Aviation	--	--	C56X	6070	731	366	-	366	235	115	-	-	-	-	-	-	-	11	5	-	-	-	-	-	-	-	366
General Aviation	--	--	H25B	3105	696	329	19	348	224	96	-	-	-	-	-	-	-	18	8	2	-	-	-	-	-	-	348
General Aviation	--	--	BE40	2024	550	244	31	275	164	87	-	-	-	-	-	-	-	15	8	-	-	-	-	-	-	-	275
General Aviation	--	--	C680	5184	549	246	28	275	194	79	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	275
General Aviation	--	--	CL30	4856	509	239	15	255	150	92	-	-	-	-	-	-	-	8	5	-	-	-	-	-	-	-	255
General Aviation	--	--	PC12	3122	357	163	16	179	126	29	-	-	-	-	-	-	-	19	4	-	-	-	-	-	-	-	179
General Aviation	--	--	BE20	1481	281	126	14	140	104	21	-	-	-	-	-	-	-	13	3	-	-	-	-	-	-	-	140
General Aviation	--	--	B350	5996	266	131	2	133	129	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	133
General Aviation	--	--	CL35	5345	257	126	3	129	73	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	129
General Aviation	--	--	EC35	4097	195	41	57	97	46	-	-	-	-	-	-	-	-	52	-	-	-	-	-	-	-	-	97
Military	--	--	T38	1862	101	51	-	51	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51
Military			BE20		141	71		71	71																		71
Military			TEX2		93	47		47	47																		47
Military			F18		58	29		29	29																		29
Military			C560		45	23		23	23																		23
Military			C17		31	16		16	16																		16
Military			BE40		25	13		13	13																		13
Military			B762		8	4		4	4																		4
Military			LJ35		6	3		3	3																		3
Military			PA23		4	2		2	2																		2
Military	--	--	C30J	3192	1,100	550	-	550	550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	550
Military	--	--	H60	21	159	80	-	80	41	-	-	-	-	-	-	-	-	39	-	-	-	-	-	-	-	-	80

TOTAL OPS 193,065   **TOTAL arrivals** 96,533   **TOTAL departures** 96,533

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						Arrivals			Departures																		
						Day	Night		Day									Night									
CAT_TOWER	MARKET	AIRLINE	AIRCRAFTTYPE	AEDT EQUIP_ID	TOTAL_2029_OPS	SL_1	SL_1	Total Arrivals	SL_1	SL_2	SL_3	SL_4	SL_5	SL_6	SL_7	SL_8	SL_9	SL_1	SL_2	SL_3	SL_4	SL_5	SL_6	SL_7	SL_8	SL_9	Total Departures
Air Carrier/Cargo	Cargo	UPS	A306	704	21,839	3,183	7,737	10,920	1,003	1,670	200	557	-	-	-	-	-	3,843	2,625	476	547	-	-	-	-	-	10,920
Air Carrier/Cargo	Cargo	UPS	B744	4085	5,703	1,335	1,516	2,851	86	314	21	283	311	259	-	-	-	108	237	-	400	370	286	-	176	-	2,851
Air Carrier/Cargo	Cargo	UPS	B748	6630	4,169	775	1,309	2,084	20	90	-	43	264	211	-	-	-	43	66	-	44	454	586	-	265	-	2,084
Air Carrier/Cargo	Cargo	UPS	B752	3917	9,937	1,476	3,492	4,969	454	686	269	326	-	-	-	-	-	987	1,550	283	413	-	-	-	-	-	4,969
Air Carrier/Cargo	Cargo	UPS	B752	4089	6,442	998	2,223	3,221	305	460	180	219	-	-	-	-	-	628	986	180	263	-	-	-	-	-	3,221
Air Carrier/Cargo	Cargo	UPS	B763	4087	56,561	9,998	18,283	28,281	1,306	3,083	2,545	4,070	36	145	-	-	-	4,420	5,925	2,788	3,369	543	49	-	-	-	28,281
Air Carrier/Cargo	Cargo	UPS	MD11	5269	3,842	602	1,319	1,921	51	360	48	197	-	27	-	-	-	707	410	15	107	-	-	-	-	-	1,921
Air Carrier/Cargo	Cargo	UPS	MD11	3969	2,693	459	888	1,346	39	275	37	150	-	21	-	-	-	471	273	10	71	-	-	-	-	-	1,346
Air Carrier/Cargo	Cargo	UPS	MD11	5270	1,955	296	681	978	26	183	24	100	-	14	-	-	-	360	209	7	55	-	-	-	-	-	978
Air Carrier/Cargo	Cargo	FDX	A306	710	1,292	354	293	646	100	167	20	56	-	-	-	-	-	155	106	19	22	-	-	-	-	-	646
Air Carrier/Cargo	Cargo	Other	B744	4085	2,137	519	549	1,068	45	165	11	149	164	136	-	-	-	27	60	-	101	93	72	-	45	-	1,068
Air Carrier	Passenger	RPA	E170	2559	2,975	1,177	311	1,488	635	486	-	-	-	-	-	-	-	223	144	-	-	-	-	-	-	-	1,488
Air Carrier	Passenger	RPA	E75L	3071	5,939	2,373	596	2,969	664	1,409	-	-	-	-	-	-	-	437	460	-	-	-	-	-	-	-	2,969
Air Carrier	Passenger	RPA	E75S	3816	6,531	2,824	441	3,266	956	1,472	-	-	-	-	-	-	-	392	445	-	-	-	-	-	-	-	3,266
Air Carrier	Passenger	SWA	B38M	6472	1,505	624	128	752	304	214	44	13	-	-	-	-	-	131	47	-	-	-	-	-	-	-	752
Air Carrier	Passenger	SWA	B737	176	3,762	1,490	390	1,881	648	761	73	-	-	-	-	-	-	355	44	-	-	-	-	-	-	-	1,881
Air Carrier	Passenger	SWA	B737	178	2,805	1,108	295	1,403	481	565	54	-	-	-	-	-	-	269	34	-	-	-	-	-	-	-	1,403
Air Carrier	Passenger	SWA	B738	203	3,775	1,644	244	1,888	648	785	48	20	-	-	-	-	-	194	192	-	-	-	-	-	-	-	1,888
Air Carrier	Passenger	DAL	B712	83	3,278	1,563	76	1,639	1,597	-	-	-	-	-	-	-	-	42	-	-	-	-	-	-	-	-	1,639
Air Carrier	Passenger	DAL	B738	2499	677	266	72	338	122	148	9	4	-	-	-	-	-	28	27	-	-	-	-	-	-	-	338
Air Carrier	Passenger	DAL	B739	4357	2,737	730	639	1,369	739	72	-	-	-	-	-	-	-	558	-	-	-	-	-	-	-	-	1,369
Air Carrier	Passenger	AAL	A319	967	2,145	678	394	1,072	401	320	11	-	-	-	-	-	-	55	286	-	-	-	-	-	-	-	1,072
Air Carrier	Passenger	AAL	A319	957	981	381	110	491	216	173	6	-	-	-	-	-	-	15	80	-	-	-	-	-	-	-	491
Air Carrier	Passenger	AAL	A320	1019	1,158	328	251	579	119	236	11	49	-	-	-	-	-	71	63	30	-	-	-	-	-	-	579
Air Carrier	Passenger	AAL	B738	203	1,794	456	441	897	248	301	19	8	-	-	-	-	-	162	160	-	-	-	-	-	-	-	897
Air Carrier	Passenger	SKW	CRJ9	2547	1,800	617	283	900	532	330	-	-	-	-	-	-	-	21	16	-	-	-	-	-	-	-	900
Air Carrier	Passenger	SKW	E75L	3071	2,929	1,030	435	1,465	312	663	-	-	-	-	-	-	-	238	251	-	-	-	-	-	-	-	1,465
Air Carrier	Passenger	ASH	CRJ9	2547	2,554	824	453	1,277	696	432	-	-	-	-	-	-	-	84	66	-	-	-	-	-	-	-	1,277
Air Carrier	Passenger	ASH	E75L	3071	1,813	707	200	907	246	523	-	-	-	-	-	-	-	67	70	-	-	-	-	-	-	-	907
Air Carrier	Passenger	JIA	CRJ7	2546	612	296	10	306	284	14	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	306
Air Carrier	Passenger	JIA	CRJ7	1253	592	286	10	296	275	14	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	296
Air Carrier	Passenger	JIA	CRJ9	2547	2,405	898	305	1,203	624	388	-	-	-	-	-	-	-	107	84	-	-	-	-	-	-	-	1,203
Air Carrier	Passenger	NKS	A20N	5975	521	217	43	260	-	190	34	29	-	-	-	-	-	-	5	1	1	-	-	-	-	-	260
Air Carrier	Passenger	NKS	A320	4632	817	311	98	409	88	175	8	37	-	-	-	-	-	44	39	18	-	-	-	-	-	-	409
Air Carrier	Passenger	NKS	A321	1039	1,693	419	428	847	21	368	11	108	-	-	-	-	-	-	63	276	-	-	-	-	-	-	847
Air Carrier	Passenger	UAL	A319	957	1,379	451	238	690	376	300	10	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	690
Air Carrier	Passenger	UAL	A320	1019	1,122	300	261	561	152	302	14	63	-	-	-	-	-	13	11	5	-	-	-	-	-	-	561
Air Carrier	Passenger	AAY	A320	4631	1,020	496	13	510	138	274	13	57	-	-	-	-	-	12	11	5	-	-	-	-	-	-	510
Air Carrier	Passenger	AAY	A320	1003	974	480	8	487	135	268	12	56	-	-	-	-	-	7	6	3	-	-	-	-	-	-	487
Air Carrier	Passenger	MXY	BCS3	6634	1,011	472	33	505	146	149	-	172	-	-	-	-	-	25	14	-	-	-	-	-	-	-	505
Air Carrier	Passenger	MXY	BCS3	6633	207	94	10	104	29	30	-	34	-	-	-	-	-	7	4	-	-	-	-	-	-	-	104
Air Carrier	Passenger	Other	CRJ7	1253	567	278	6	283	267	14	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	283
Air Carrier	Passenger	Other	E75L	3071	3,815	1,666	242	1,908	580	1,232	-	-	-	-	-	-	-	47	49	-	-	-	-	-	-	-	1,908
Air Taxi	Cargo	SNC	SH36	798	2,047	-	1,023	1,023	20	-	-	-	-	-	-	-	-	1,004	-	-	-	-	-	-	-	-	1,023
Air Taxi	Cargo	SNC	SH36	796	933	-	466	466	2	-	-	-	-	-	-	-	-	465	-	-	-	-	-	-	-	-	466
Air Taxi	Passenger	AWI	CRJ2	1250	1,201	570	30	600	527	29	42	-	-	-	-	-	-	0	2	-	-	-	-	-	-	-	600
Air Taxi	Passenger	SKW	CRJ2	1250	632	277	39	316	277	15	22	-	-	-	-	-	-	0	2	-	-	-	-	-	-	-	316
Air Taxi	Passenger	Other	E145	1754	1,120	555	5	560	560	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	560
Air Taxi	Other/Miscell	Other	E55P	4917	1,733	841	26	867	493	314	-	-	-	-	-	-	-	28	32	-	-	-	-	-	-	-	867
Air Taxi	Other/Miscell	Other	C68A	6386	1,308	614	40	654	409	200	-	-	-	-	-	-	-	45	-	-	-	-	-	-	-	-	654
Air Taxi	Other/Miscell	Other	CRJ2	1250	1,037	-	519	519	72	4	6	-	-	-	-	-	-	26	412	-	-	-	-	-	-	-	519
Air Taxi	Other/Miscell	Other	SW4	1458	865	359	73	433	213	149	42	-	-	-	-	-	-	25	4	-	-	-	-	-	-	-	433
Air Taxi	Other/Miscell	Other	SW4	1449	864	232	201	432	154	108	30	-	-	-	-	-	-	119	21	-	-	-	-	-	-	-	432
Air Taxi	Other/Miscell	Other	BE40	2024	836	412	6	418	268	141	-	-	-	-	-	-	-	6	3	-	-	-	-	-	-	-	418
Air Taxi	Other/Miscell	Other	B190	36	798	8	391	399	29	2	-	-	-	-	-	-	-	351	17	-	-	-	-	-	-	-	399
Air Taxi	Other/Miscell	Other	PC12	3122	774	-	387	387	8	2	-	-	-	-	-	-	-	377	-	-	-	-	-	-	-	-	387
Air Taxi	Other/Miscell	Other	CL35	5345	645	311	11	323	189	119	-	-	-	-	-	-	-	9	6	-	-	-	-	-	-	-	323
Air Taxi	Other/Miscell	Other	C56X	6070	508	243	11	254	157	83	-	-	-	-	-	-	-	9	5	-	-	-	-	-	-	-	254
Air Taxi	Other/Miscell	Other	C56X	6065	469	229	6	235	149	79	-	-	-	-	-	-	-	5	3	-	-	-	-	-	-	-	235
Air Taxi	Other/Miscell	Other	C25B	6067	235	112	6	117	69	43	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	117
Air Taxi	Other/Miscell	Other	CL30	4856	210	99	6	105	43	43	-	14	-	-	-	-	-	2	2	-	1	-	-	-	-	-	105
Air Taxi	Other/Miscell	Other	C680	5184	191	76	20	95	56	20	-	-	-	-	-	-	-	15	4	-	-	-	-	-	-	-	95
Air Taxi	Other/Miscell	Other	C680	3047	161	78	3	81	60	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81
General Aviation	--	--	F2TH	4804	2,090	964	81	1,045	446	462	40	32	-	-	-	-	-	-	64	-	-	-	-	-	-	-	1,045
General Aviation	--	--	C550	6343	1,694	790	57	847	561	200	-	-	-	-	-	-	-	86	-	-	-	-	-	-	-	-	847
General Aviation	--	--	C172	1267	1,214	566	41	607	552	-	-	-	-	-	-	-	-	55	-	-	-	-	-	-	-	-	607
General Aviation	--	--	C25B	6067	1,029	485	29	515	346	135	-	-	-	-	-	-	-	33	-	-	-	-	-	-	-	-	515
General Aviation	--	--	C56X	6070	782	391	-	391	252	123	-	-	-	-	-	-	-	11	5	-	-	-	-	-	-	-	391
General Aviation	--	--	H25B	3105	744	352	20	372	239	102	-	-	-	-	-	-	-	20	9	2	-	-	-	-	-	-	372
General Aviation	--	--	BE40	2024	588	261	33	294	176	93	-	-	-	-	-	-	-	17	8	-	-	-	-	-	-	-	294
General Aviation	--	--	C680	5184	587	263	30	294	207	84	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	294
General Aviation	--	--	CL30	4856	544	256	17	272	160	98	-	-	-	-	-	-	-	9	5	-	-	-	-	-	-	-	272
General Aviation	--	--	PC12	3122	382	174	17	191	135	31	-	-	-	-	-	-	-	20	5	-	-	-	-	-	-	-	191
General Aviation	--	--	BE20	1481	300	135	15	150	111	23	-	-	-	-	-	-	-	14	3	-	-	-	-	-	-	-	150
General Aviation	--	--	B350	5996	284	140	2	142	138	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	142
General Aviation	--	--	CL35	5345	275	134	3	137	78	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	137
General Aviation	--	--	EC35	4097	208	43	61	104	49	-	-	-	-	-	-	-	-	55	-	-	-	-	-	-	-	-	104
Military	--	--	T38	1862	101	51	-	51	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51
Military			BE20		141	71		71	71																		71
Military			TEX2		93	47		47	47																		47
Military			F18		58	29		29	29																		29
Military			C560		45	23		23	23																		23
Military			C17		31	16		16	16																		16
Military			BE40		25	13		13	13																		13
Military			B762		8	4		4	4																		4
Military			LJ35		6	3		3	3																		3
Military			PA23		4	2		2	2																		2
Military	--	--	C30J	3192	1,100	550	-	550	550	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	550
Military	--	--	H60	21	159	79	-	79	41	-	-	-	-	-	-	-	-	39	-	-	-	-	-	-	-	-	79

TOTAL OPS 211,526 **TOTAL arrivals** 105,763 **TOTAL departures** 105,763

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U.S. Department of Transportation
Federal Aviation Administration

Memphis Airports District Office
2600 Thousand Oaks Blvd, Suite 2250
Memphis, Tennessee 38118

Phone: 901-322-8180

July 30, 2024

Mr. Brian J. Sinnwell, C.M.
Vice President, Planning & Facilities
Louisville Regional Airport Authority
4320 Park Blvd
Louisville, Kentucky 40209

Summary of Forecast Data for Noise Exposure Map Update
Louisville Muhammad Ali International Airport (SDF)

Dear Mr. Sinnwell:

We have reviewed the technical memo, titled "Summary of Forecast Data for SDF NEM Update," dated June 25, 2024. As a result of our review, we concur with and approve the use of 2024 Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) as the baseline forecast for use in the Noise Exposure Map Update. Should you have any questions, please feel free to contact me at Kabrina.d.webb@faa.gov.

Sincerely,

Kabrina Webb, Community Planner
Memphis Airports District Office

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Noise Model Inputs, Supplemental Information

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Table C-1. Modeled 2024 and 2029 Aircraft Types and AEDT Aircraft Type Assignment

Source: SDF NOMS radar data, AEDT 3f database, and HMMH, 2023

Category	Engine Type	ICAO Type Designator	AEDT Airframe	AEDT Aircraft Type
Air Carrier	**Jet**	A20N	Airbus A320-NEO	A320-270N
		A21N	Airbus A321-NEO	A321-232
		A306	Airbus A300F4-600 Series	A300-622R
		A319	Airbus A319-100 Series	A319-131
		A320	Airbus A320-200 Series	A320-211
		A320	Airbus A320-200 Series	A320-232
		A321	Airbus A321-100 Series	A321-232
		B38M	Boeing 737-8	7378MAX
		B39M	Boeing 737-9	7378MAX
		B712	Boeing 717-200 Series	717200
		B722	Boeing 727-200 Series Freighter	727EM2
		B732	Boeing 737-200 Series	737N17
		B733	Boeing 737-300 Series Freighter	737300
		B734	Boeing 737-400 Series	737400
		B737	Boeing 737-700 Series	737700
		B738	Boeing 737-800 Series	737800
		B739	Boeing 737-900 Series	737800
		B739	Boeing 737-900-ER	737800
		B744	Boeing 747-400 Series Freighter	747400
		B744	Boeing 747-400 Series Freighter	747400RN
		B748	Boeing 747-8F	7478
		B752	Boeing 757-200 Series Freighter	757RR
		B752	Boeing 757-200 Series	757PW
		B762	Boeing 767-200 Series Freighter	767CF6
		B763	Boeing 767-300 Series	767300
		B763	Boeing 767-300 ER Freighter	7673ER
		BCS3	Airbus A220-300	737700
		CRJ7	Bombardier CRJ-700	CRJ9-ER
		CRJ9	Bombardier CRJ-900	CRJ9-ER
		DC91	Boeing DC-9-10 Series Freighter	DC93LW
		DC93	Boeing DC-9-30 Series Freighter	DC93LW
		E170	Embraer ERJ170	EMB170
		E190	Embraer ERJ190	EMB190
		E195	Embraer ERJ195	EMB195
		E75L	Embraer ERJ175-LR	EMB175
		E75S	Embraer ERJ175	EMB175
		MD11	Boeing MD-11 Freighter	MD11GE
		MD11	Boeing MD-11 Freighter	MD11PW
		MD82	Boeing MD-82	MD82
		MD83	Boeing MD-83	MD83
		MD88	Boeing MD-88	MD83
	Turboprop	CVLT	Convair CV-640	CVR580

Category	Engine Type	ICAO Type Designator	AEDT Airframe	AEDT Aircraft Type
Air Taxi/ Commuter	**Jet**	BE40	Raytheon Beechjet 400	MU3001
		C25A	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C25B	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C25C	Cessna CitationJet CJ4 (Cessna 525C)	CNA525C
		C25M	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C525	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C550	Cessna S550 Citation S/II	CNA55B
		C560	Cessna 560 Citation V	CNA560U
		C56X	Cessna 560 Citation XLS	CNA560XL
		C680	Cessna 680 Citation Sovereign	CNA680
		C68A	Cessna 680-A Citation Latitude	CNA680
		C700	Cessna 700 Citation Longitude	CNA680
		C750	Cessna 750 Citation X	CNA750
		CL30	Bombardier Challenger 300	CL600
		CL35	Bombardier Challenger 350	CL600
		CL60	Bombardier Challenger 601	CL601
		CL60	Bombardier Challenger 604	CL600
		CL60	Bombardier Challenger 605	CL600
		CL60	Bombardier Challenger 600	CL601
		CRJ2	Bombardier CRJ-200	CL600
		CRJ2	Bombardier (Canadair) CRJ200 ExecLiner	CL601
		CRJ2	Bombardier (Canadair) CRJ200PF Bulk Freighter	CL600
		E135	Embraer ERJ140	EMB145
		E135	Embraer ERJ135 Legacy Business	EMB145
		E145	Embraer ERJ145-LR	EMB14L
		E45X	Embraer ERJ145-XR	EMB145
		E50P	Embraer Phenom 100 (EMB-500)	CNA510
		E545	Embraer Praetor 500	CNA750
		E550	Embraer Praetor 600	CL601
		E55P	Embraer Phenom 300 (EMB-505)	CNA55B
		F2TH	Dassault Falcon 2000	CNA750
		F900	Dassault Falcon 900-EX	FAL900EX
		FA20	Dassault Falcon 20-C	FAL20
		FA20	Dassault Falcon 20-D	FAL20
		FA20	Dassault Falcon 20-F	FAL20
		FA20	Dassault Falcon 200	FAL20
		FA50	Dassault Falcon 50	FAL900EX
		FA7X	Falcon 7X	GIV
		G150	Gulfstream G150	IA1125
		GALX	Gulfstream G200	CL600
		GL5T	Bombardier Global 5000	BD-700-1A11
		GLEX	Bombardier Global Express	BD-700-1A10
		GLEX	Bombardier Global 6000	BD-700-1A10
		GLF4	Gulfstream IV-SP	GIV
		GLF4	Gulfstream G450	GIV
		GLF5	Gulfstream G-5 / Gulfstream G500	GV
		GLF6	Gulfstream G650ER	G650ER

Category	Engine Type	ICAO Type Designator	AEDT Airframe	AEDT Aircraft Type
Air Taxi/ Commuter continued	**Jet**	H25B	Raytheon Hawker 800	LEAR35
		HA4T	Raytheon Hawker 4000 Horizon	CNA750
		HDJT	Honda HA-420 Hondajet	CNA510
		LJ35	Bombardier Learjet 35	LEAR35
		LJ35	Bombardier Learjet 36	LEAR35
		LJ40	Bombardier Learjet 40	LEAR35
		LJ45	Bombardier Learjet 45	LEAR35
		LJ55	Bombardier Learjet 55	LEAR35
		LJ60	Bombardier Learjet 60	LEAR35
		LJ70	Bombardier Learjet 70	LEAR35
		LJ75	Bombardier Learjet 75	LEAR35
		PC24	Pilatus PC-24	CNA55B
		PRM1	Raytheon Premier I	CNA55B
		SF50	Cirrus SF-50 Vision	ECLIPSE500
	Turboprop	B190	Raytheon Beech 1900-C	1900D
		B350	Raytheon Super King Air 300	DHC6
		BE20	Raytheon Super King Air 200	DHC6
		BE30	Raytheon Super King Air 300	DHC6
		BE99	Raytheon Beech 99	DHC6
		C208	Cessna 208 Caravan	CNA208
		E110	Embraer EMB110 Bandeirante	DHC6
		E120	Embraer EMB120 Brasilia	EMB120
		MU2	Mitsubishi MU-2	DHC6
		PC12	Pilatus PC-12	CNA208
		SB20	Saab 2000	HS748A
		SF34	Saab 340-A	SF340
		SH36	Shorts 360-100	SD330
		SH36	Shorts 360-200	SD330
		SW4	Fairchild SA-227-AC Metro III	DHC6
		SW4	Fairchild Metro IVC	DHC6
	Piston	DA40	Diamond DA40	GASEPV
		DV20	Diamond DA20	CNA172
		P28R	Piper PA-28 Cherokee Series	GASEPF
General Aviation	**Jet**	ASTR	Gulfstream G100	IA1125
		BE40	Raytheon Beechjet 400	MU3001
		C25A	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C25B	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C25C	Cessna CitationJet CJ4 (Cessna 525C)	CNA525C
		C25M	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C500	Cessna 500 Citation I	CNA500
		C501	Cessna 501 Citation ISP	CNA500
		C510	CESSNA CITATION 510	CNA510
		C525	Cessna CitationJet CJ/CJ1 (Cessna 525)	CNA525C
		C550	Cessna S550 Citation S/II	CNA55B
		C560	Cessna 560 Citation V	CNA560U
		C560	Cessna 560 Citation Encore	CNA560E
		C56X	Cessna 560 Citation XLS	CNA560XL
		C650	Cessna 650 Citation III	CIT3

Category	Engine Type	ICAO Type Designator	AEDT Airframe	AEDT Aircraft Type
General Aviation continued	**Jet**	C680	Cessna 680 Citation Sovereign	CNA680
		C68A	Cessna 680-A Citation Latitude	CNA680
		C700	Cessna 700 Citation Longitude	CNA680
		C750	Cessna 750 Citation X	CNA750
		CL30	Bombardier Challenger 300	CL600
		CL35	Bombardier Challenger 350	CL600
		CL60	Bombardier Challenger 604	CL600
		CL60	Bombardier Challenger 600	CL601
		CRJ2	Bombardier CRJ-200	CL600
		CRJ2	Bombardier (Canadair) CRJ200 ExecLiner	CL601
		E135	Embraer ERJ135-LR	EMB145
		E135	Embraer ERJ140	EMB145
		E135	Embraer ERJ135 Legacy Business	EMB145
		E145	Embraer ERJ145-EP	EMB145
		E50P	Embraer Phenom 100 (EMB-500)	CNA510
		E545	Embraer Praetor 500	CNA750
		E550	Embraer Praetor 600	CL601
		E55P	Embraer Phenom 300 (EMB-505)	CNA55B
		EA50	Eclipse 500 / PW610F	ECLIPSE500
		F2TH	Dassault Falcon 2000	CNA750
		F900	Dassault Falcon 900-EX	FAL900EX
		FA10	Dassault Falcon 100	LEAR35
		FA20	Dassault Falcon 200	FAL20
		FA50	Dassault Falcon 50	FAL900EX
		FA7X	Falcon 7X	GIV
		G150	Gulfstream G150	IA1125
		G280	Gulfstream G280	CL601
		GA5C	Gulfstream Aerospace Gulfstream G500 (G-7)	GV
		GA6C	Gulfstream G600	GV
		GALX	Gulfstream G200	CL600
		GL5T	Bombardier Global 5000	BD-700-1A11
		GLEX	Bombardier Global Express	BD-700-1A10
		GLF4	Gulfstream G450	GIV
		GLF4	Gulfstream IV-SP	GIV
		GLF5	Gulfstream G550	GV
		GLF5	Gulfstream G-5 / Gulfstream G500	GV
		GLF6	Gulfstream G650ER	G650ER
		H25B	Raytheon Hawker 800	LEAR35
		HDJT	Honda HA-420 Hondajet	CNA510
		LJ31	Bombardier Learjet 31	LEAR35
		LJ35	Bombardier Learjet 35	LEAR35
		LJ40	Bombardier Learjet 40	LEAR35
		LJ45	Bombardier Learjet 45	LEAR35
		LJ55	Bombardier Learjet 55	LEAR35
		LJ60	Bombardier Learjet 60	LEAR35
		LJ75	Bombardier Learjet 75	LEAR35
		PC24	Pilatus PC-24	CNA55B
		PRM1	Raytheon Premier I	CNA55B

Category	Engine Type	ICAO Type Designator	AEDT Airframe	AEDT Aircraft Type
General Aviation continued		SF50	Cirrus SF-50 Vision	ECLIPSE500
	Turboprop	B190	Raytheon Beech 1900-C	1900D
		B350	Raytheon Super King Air 300	DHC6
		BE10	Raytheon King Air 100	DHC6
		BE20	Raytheon Super King Air 200	DHC6
		BE9L	Raytheon Beech 99	DHC6
		C208	Cessna 208 Caravan	CNA208
		C441	Cessna 441 Conquest II	CNA441
		M600	Piper PA46-TP Meridian	CNA208
		MU2	Mitsubishi MU-2	DHC6
		P180	Piaggio P.180 Avanti	DHC6
		P46T	Piper PA46-TP Meridian	CNA208
		PAY2	Piper PA-31T Cheyenne	CNA441
		PC12	Pilatus PC-12	CNA208
		SW4	Fairchild SA-227-AC Metro III	DHC6
		TBM7	EADS Socata TBM-700	CNA208
		TBM8	SOCATA TBM 850	CNA208
		TBM9	Daher TBM 900 Series	CNA208
	Piston Piston	BE33	Raytheon Beech Bonanza 36	GASEPV
		BE55	Raytheon Beech 55 Baron	BEC58P
		BE58	Raytheon Beech Baron 58	BEC58P
		C150	Cessna 150 Series	GASEPF
		C172	Cessna 172 Skyhawk	CNA172
		C182	Cessna 182	CNA182
		C195	Cessna 195 (FAS)	GASEPV
		C206	Cessna 206	CNA206
		C210	Cessna 210 Centurion	GASEPV
		C310	Cessna 310	BEC58P
		C340	Cessna 340	BEC58P
		C414	Cessna 414	BEC58P
		C421	Cessna 421 Piston	BEC58P
		CORS	Piper PA-32 Cherokee Six	GASEPV
		DA40	Diamond DA40	GASEPV
		DA42	Diamond DA42 Twin Star	PA30
		DV20	Diamond DA20	CNA172
		G44	Raytheon Beech Baron 58	BEC58P
		M20P	Mooney M20-K	GASEPV
		P28A	Piper PA-28 Cherokee Series	GASEPF
		P32R	Piper PA-32 Cherokee Six	GASEPV
		PA24	Piper PA-24 Comanche	GASEPV
		PA30	Piper PA-30 Twin Comanche	PA30
		PA31	Piper PA-31 Navajo	BEC58P
		PA32	Piper PA-32 Cherokee Six	GASEPV
		PA34	Piper PA-34 Seneca	BEC58P
		PA44	Piper PA-44-180T (FAS)	PA30
		PA46	Piper PA46 Malibu (FAS)	GASEPV
		RV12	Vans RV12 (FAS)	GASEPF
		RV7	Vans RV-7	GASEPV

Category	Engine Type	ICAO Type Designator	AEDT Airframe	AEDT Aircraft Type
General Aviation continued	**Piston**	SR20	Cirrus SR20	COMSEP
		SR22	Cirrus SR22 (FAS)	COMSEP
	Helicopter	B06	Bell 206B-3	B206B3
		B407	Bell 407	B407
		B430	Bell 430	B430
		EC30	Eurocopter EC-130	EC130
		EC35	Eurocopter EC-T2 (CPDS)	EC130
Military	**Jet**	T38	T-38 Talon	T-38A
		F18	Boeing F/A-18 Hornet	F18EF
		C560	Cessna 560 Citation XLS	CNA560XL
		C17	Boeing C-17A	C17
		BE40	Raytheon Beechjet 400	MU3001
		B762	Boeing 767-200 ER	767300
		LJ35	Bombardier Learjet 35	LEAR35
	Turboprop	C30J	Lockheed C-130 Hercules ANP:C130AD	C130AD
		BE20	Raytheon Super King Air 200	DHC6
		TEX2	Beechcraft T-6 Texan 2	CNA208
	Piston	PA23	Piper PA-23 Apache	BEC58P
	Helicopter	H60	Sikorsky UH-60 Black Hawk	S70

Table C-2. Modeled Average Daily Detailed Air Taxi Aircraft Operations for 2024

Source: HMMH, C&S, LRAA, 2024

Category	Propulsion	AEDT Type	Arrivals		Departures		Total
			Day	Night	Day	Night	
Air Taxi	Jet	BD-700-1A10	0.04	0.00	0.04	0.00	0.08
		BD-700-1A11	0.04	0.00	0.04	0.00	0.08
		CL600	3.18	1.01	3.36	0.83	8.38
		CL601	0.30	0.28	0.50	0.09	1.17
		CNA510	0.20	0.01	0.20	0.00	0.41
		CNA525C	0.39	0.03	0.37	0.04	0.84
		CNA55B	1.41	0.04	1.35	0.09	2.89
		CNA560U	0.12	0.01	0.11	0.02	0.26
		CNA560XL	0.72	0.02	0.71	0.03	1.48
		CNA680	1.22	0.07	1.21	0.09	2.59
		CNA750	0.53	0.02	0.55	0.01	1.11
		ECLIPSE500	0.03	0.00	0.03	0.00	0.05
		EMB145	0.13	0.00	0.13	0.00	0.25
		EMB14L	1.19	0.01	1.20	0.00	2.40
		FAL20	0.20	0.24	0.22	0.22	0.88
		FAL900EX	0.05	0.00	0.05	0.00	0.11
		G650ER	0.01	0.00	0.02	0.00	0.03
		GIV	0.18	0.00	0.17	0.00	0.35
		GV	0.04	0.00	0.04	0.00	0.09
		IA1125	0.01	0.00	0.00	0.00	0.01
		LEAR35	0.66	0.09	0.63	0.12	1.50
		MU3001	0.60	0.01	0.59	0.03	1.23
	Turboprop	1900D	0.02	0.85	0.05	0.82	1.74
		CNA208	0.18	0.83	0.18	0.83	2.02
		DHC6	0.94	0.68	1.20	0.42	3.23
		EMB120	0.20	0.27	0.25	0.22	0.93
		HS748A	0.05	0.00	0.04	0.01	0.10
		SD330	0.01	3.84	0.09	3.76	7.70
		SF340	0.04	0.08	0.07	0.05	0.24
	Piston	CNA172	0.01	0.00	0.01	0.00	0.02
		GASEPF	0.03	0.02	0.04	0.01	0.10
		GASEPV	0.08	0.01	0.07	0.02	0.17
Air Taxi Total			**12.81**	**8.43**	**13.51**	**7.73**	**42.47**

Table C-3. Modeled Average Daily Detailed General Aviation Aircraft Operations for 2024

Source: HMMH, C&S, LRAA, 2024

Category	Propulsion	AEDT Type	Arrivals		Departures		Total
			Day	Night	Day	Night	
General Aviation	Jet	BD-700-1A10	0.24	0.02	0.24	0.01	0.51
		BD-700-1A11	0.12	0.00	0.11	0.01	0.24
		CIT3	0.28	0.03	0.27	0.04	0.61
		CL600	0.51	0.03	0.52	0.02	1.07
		CL601	0.30	0.01	0.31	0.01	0.63
		CNA500	0.03	0.00	0.03	0.00	0.08
		CNA510	0.10	0.00	0.10	0.00	0.21
		CNA525C	1.29	0.09	1.29	0.08	2.75
		CNA55B	1.30	0.09	1.25	0.15	2.78
		CNA560E	0.02	0.00	0.02	0.00	0.04
		CNA560U	0.27	0.01	0.27	0.01	0.55
		CNA560XL	0.61	0.02	0.61	0.03	1.27
		CNA680	0.56	0.04	0.60	0.01	1.21
		CNA750	1.36	0.13	1.40	0.09	2.98
		ECLIPSE500	0.10	0.01	0.10	0.00	0.21
		EMB145	0.13	0.00	0.12	0.02	0.27
		FAL20	0.01	0.01	0.01	0.01	0.04
		FAL900EX	0.35	0.02	0.35	0.02	0.73
		G650ER	0.03	0.00	0.03	0.00	0.06
		GIV	0.33	0.01	0.32	0.02	0.67
		GV	0.22	0.01	0.21	0.02	0.46
		IA1125	0.04	0.00	0.04	0.00	0.08
		LEAR35	1.20	0.09	1.18	0.11	2.58
		MU3001	0.30	0.04	0.31	0.03	0.68
	Turboprop	1900D	0.04	0.00	0.04	0.00	0.08
		CNA208	0.43	0.03	0.41	0.06	0.92
		CNA441	0.03	0.00	0.03	0.00	0.05
		DHC6	0.63	0.05	0.62	0.06	1.36
	Piston	BEC58P	0.32	0.02	0.32	0.02	0.68
		CNA172	0.31	0.01	0.29	0.04	0.65
		CNA182	0.06	0.00	0.06	0.00	0.11
		CNA206	0.02	0.00	0.02	0.00	0.04
		COMSEP	0.20	0.02	0.20	0.02	0.45
		GASEPF	0.13	0.01	0.13	0.02	0.29
		GASEPV	0.33	0.02	0.32	0.03	0.70
		PA30	0.04	0.01	0.04	0.01	0.10
	Helicopter	B206B3	0.07	0.15	0.08	0.15	0.44
		B407	0.04	0.01	0.02	0.03	0.10
		B430	0.08	0.01	0.07	0.02	0.18
		EC130	0.06	0.23	0.07	0.23	0.59
General Aviation Total			**12.47**	**1.27**	**12.40**	**1.34**	**27.48**

Table C-4. Modeled Average Daily Detailed Air Taxi Aircraft Operations for 2029

Source: HMMH, C&S, LRAA, 2024

Category	Propulsion	AEDT Type	Arrivals		Departures		Total
			Day	Night	Day	Night	
Air Taxi	Jet	BD-700-1A10	0.04	0.00	0.04	0.00	0.09
		BD-700-1A11	0.04	0.00	0.04	0.00	0.09
		CL600	3.40	1.08	3.60	0.88	8.96
		CL601	0.33	0.30	0.53	0.10	1.26
		CNA510	0.21	0.01	0.22	0.00	0.44
		CNA525C	0.42	0.03	0.40	0.05	0.89
		CNA55B	1.50	0.04	1.45	0.10	3.09
		CNA560U	0.13	0.01	0.12	0.02	0.28
		CNA560XL	0.77	0.02	0.75	0.04	1.58
		CNA680	1.31	0.08	1.29	0.09	2.77
		CNA750	0.57	0.03	0.59	0.01	1.19
		ECLIPSE500	0.03	0.00	0.03	0.00	0.05
		EMB145	0.14	0.00	0.14	0.00	0.27
		EMB14L	1.27	0.01	1.28	0.00	2.56
		FAL20	0.21	0.26	0.23	0.24	0.94
		FAL900EX	0.06	0.00	0.06	0.00	0.11
		G650ER	0.01	0.00	0.02	0.00	0.03
		GIV	0.19	0.00	0.19	0.00	0.38
		GV	0.05	0.00	0.04	0.00	0.09
		IA1125	0.01	0.00	0.00	0.00	0.01
		LEAR35	0.71	0.10	0.67	0.13	1.61
		MU3001	0.65	0.01	0.63	0.03	1.32
	Turboprop	1900D	0.02	0.91	0.05	0.88	1.86
		CNA208	0.19	0.88	0.19	0.89	2.16
		DHC6	1.00	0.72	1.28	0.44	3.45
		EMB120	0.21	0.29	0.27	0.23	0.99
		HS748A	0.05	0.00	0.04	0.01	0.11
		SD330	0.01	4.10	0.09	4.02	8.23
		SF340	0.05	0.08	0.08	0.05	0.26
	Piston	CNA172	0.01	0.00	0.01	0.00	0.02
		GASEPF	0.04	0.02	0.05	0.01	0.11
		GASEPV	0.09	0.01	0.08	0.02	0.19
Air Taxi Total			**13.69**	**9.01**	**14.44**	**8.26**	**45.40**

Table C-5. Modeled Average Daily Detailed General Aviation Aircraft Operations for 2029

Source: HMMH, C&S, LRAA, 2024

Category	Propulsion	AEDT Type	Arrivals		Departures		Total
			Day	Night	Day	Night	
General Aviation	Jet	BD-700-1A10	0.25	0.02	0.26	0.01	0.54
		BD-700-1A11	0.12	0.00	0.12	0.01	0.25
		CIT3	0.29	0.03	0.29	0.04	0.65
		CL600	0.54	0.03	0.56	0.02	1.15
		CL601	0.32	0.01	0.33	0.01	0.68
		CNA500	0.04	0.00	0.04	0.00	0.08
		CNA510	0.11	0.00	0.11	0.00	0.23
		CNA525C	1.38	0.09	1.38	0.09	2.94
		CNA55B	1.39	0.10	1.33	0.16	2.97
		CNA560E	0.02	0.00	0.02	0.00	0.05
		CNA560U	0.29	0.01	0.29	0.01	0.59
		CNA560XL	0.66	0.02	0.65	0.03	1.36
		CNA680	0.60	0.04	0.64	0.01	1.29
		CNA750	1.45	0.14	1.50	0.09	3.18
		ECLIPSE500	0.10	0.01	0.11	0.00	0.23
		EMB145	0.14	0.00	0.12	0.02	0.29
		FAL20	0.01	0.01	0.01	0.01	0.04
		FAL900EX	0.37	0.02	0.38	0.02	0.79
		G650ER	0.03	0.00	0.03	0.00	0.07
		GIV	0.35	0.01	0.34	0.02	0.72
		GV	0.23	0.01	0.23	0.02	0.49
		IA1125	0.04	0.00	0.04	0.00	0.08
		LEAR35	1.28	0.10	1.26	0.12	2.76
		MU3001	0.32	0.04	0.34	0.03	0.73
	Turboprop	1900D	0.04	0.00	0.04	0.00	0.09
		CNA208	0.46	0.03	0.43	0.06	0.99
		CNA441	0.03	0.00	0.03	0.00	0.05
		DHC6	0.67	0.06	0.67	0.06	1.45
	Piston	BEC58P	0.34	0.02	0.34	0.02	0.73
		CNA172	0.33	0.01	0.31	0.04	0.69
		CNA182	0.06	0.00	0.06	0.00	0.12
		CNA206	0.02	0.00	0.02	0.00	0.04
		COMSEP	0.22	0.03	0.22	0.02	0.48
		GASEPF	0.14	0.01	0.14	0.02	0.31
		GASEPV	0.35	0.02	0.34	0.03	0.75
		PA30	0.04	0.01	0.04	0.01	0.11
	Helicopter	B206B3	0.07	0.16	0.08	0.16	0.47
		B407	0.04	0.01	0.02	0.03	0.10
		B430	0.08	0.01	0.08	0.02	0.19
		EC130	0.07	0.25	0.07	0.25	0.63
General Aviation Total			**13.33**	**1.36**	**13.25**	**1.43**	**29.37**

Table C-6. Modeled Average Daily Detailed Military Aircraft Operations for 2024 and 2029

Source: HMMH, C&S, LRAA, 2024

Category	Propulsion	AEDT Type	Arrivals		Departures		Total
			Day	Night	Day	Night	
General Aviation	Jet	T-38A	0.14	0.00	0.14	0.00	0.28
		F18EF	0.08	0.00	0.08	0.00	0.16
		CNA560XL	0.06	0.00	0.06	0.00	0.12
		C17	0.04	0.00	0.04	0.00	0.08
		MU3001	0.03	0.00	0.03	0.00	0.07
		767300	0.01	0.00	0.01	0.00	0.02
		LEAR35	0.01	0.00	0.01	0.00	0.02
	Turboprop	DHC6	0.19	0.00	0.19	0.00	0.39
		CNA208	0.13	0.00	0.13	0.00	0.25
		C130AD	1.42	0.08	1.51	0.00	3.01
	Piston	BEC58P	0.01	0.00	0.01	0.00	0.01
	Helicopter	S70	0.22	0.00	0.11	0.11	0.43
Military Total			**2.34**	**0.08**	**2.32**	**0.11**	**4.85**

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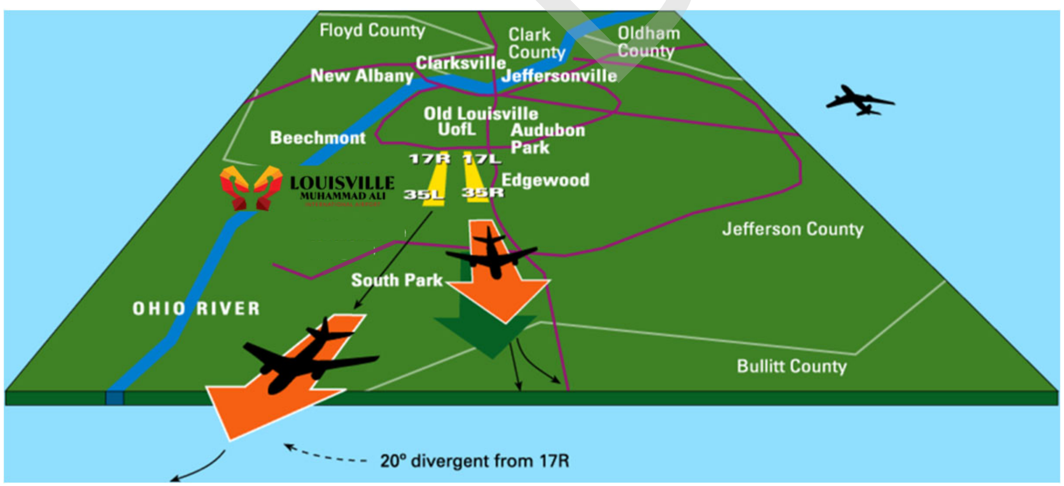
LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT

CONTRAFLOW (10:00 p.m. - 7:00 a.m.)
OPERATIONS REPORT
January 2024

CONTRAFLOW

Between the hours of 10:00 p.m. and 7:00 a.m., the Airport operates from the south and to the south (contraflow) whenever wind, weather, and demand allow. Contraflow procedures require aircraft to arrive on Runways 35R and 35L and depart on Runways 17R and 17L in order to direct aircraft operations south of the Airport over areas which are less densely populated than areas north of the Airport.

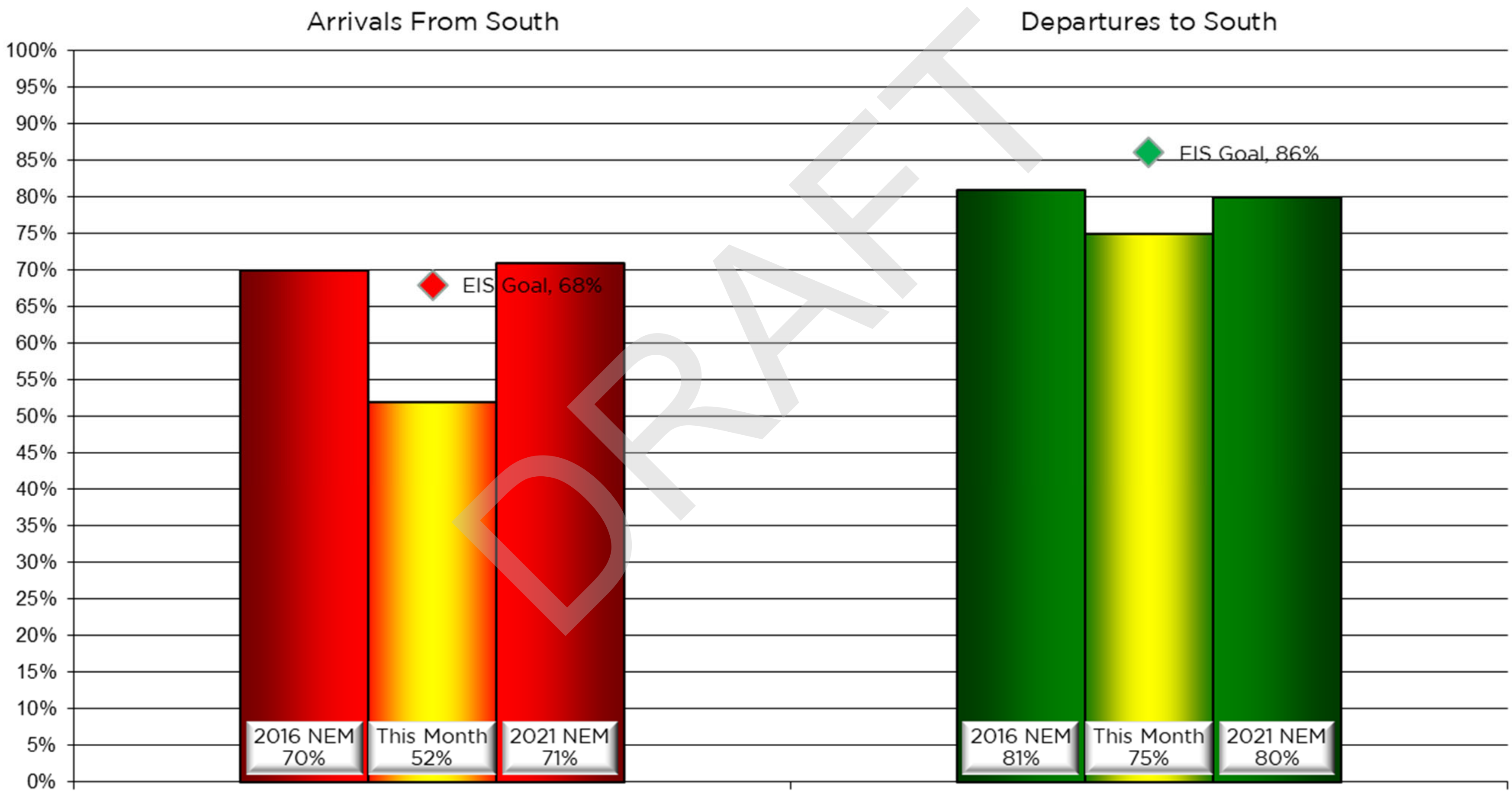
Inbound



Outbound

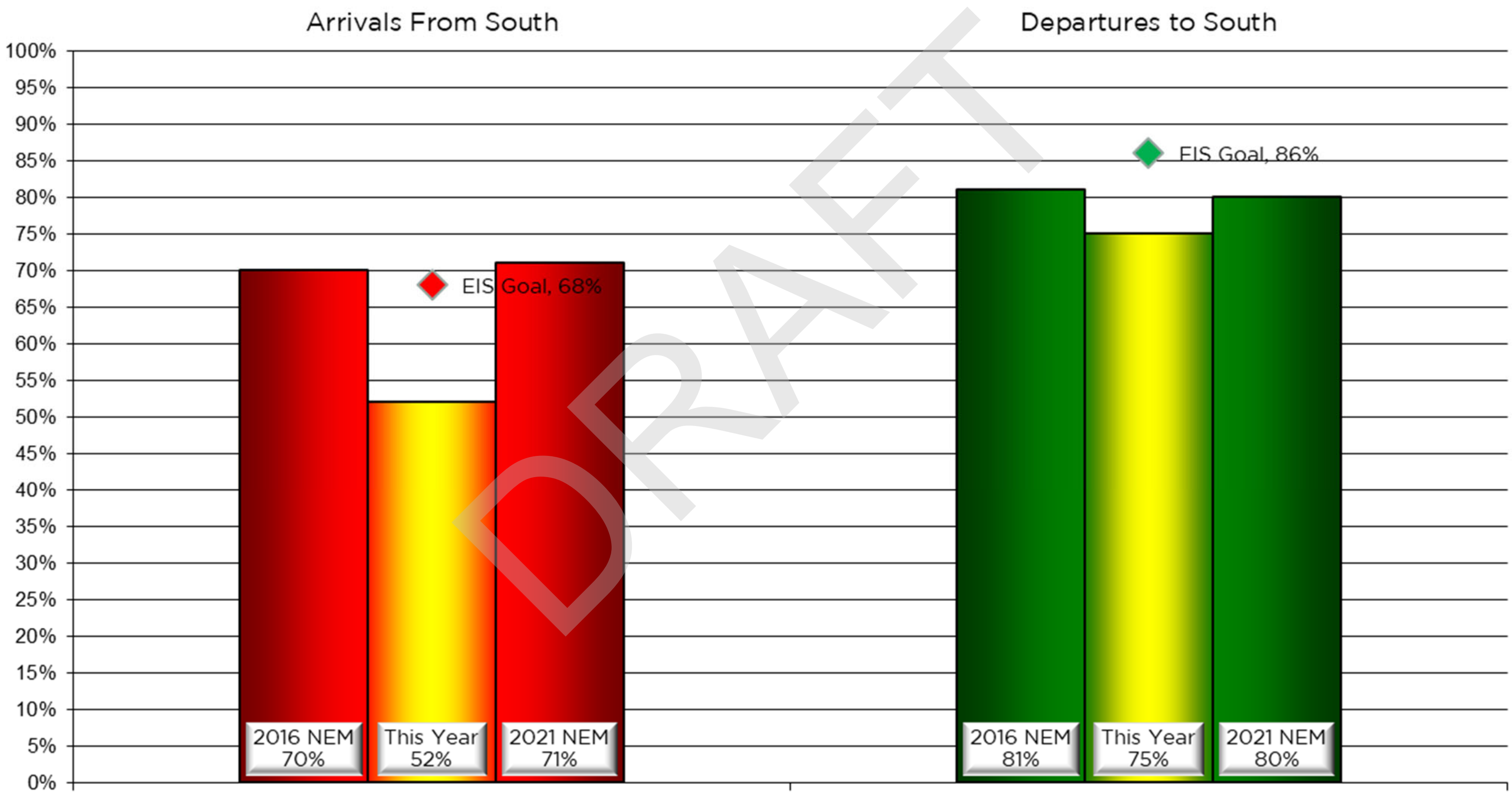
LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT

Monthly Contraflow
January 1-31, 2024

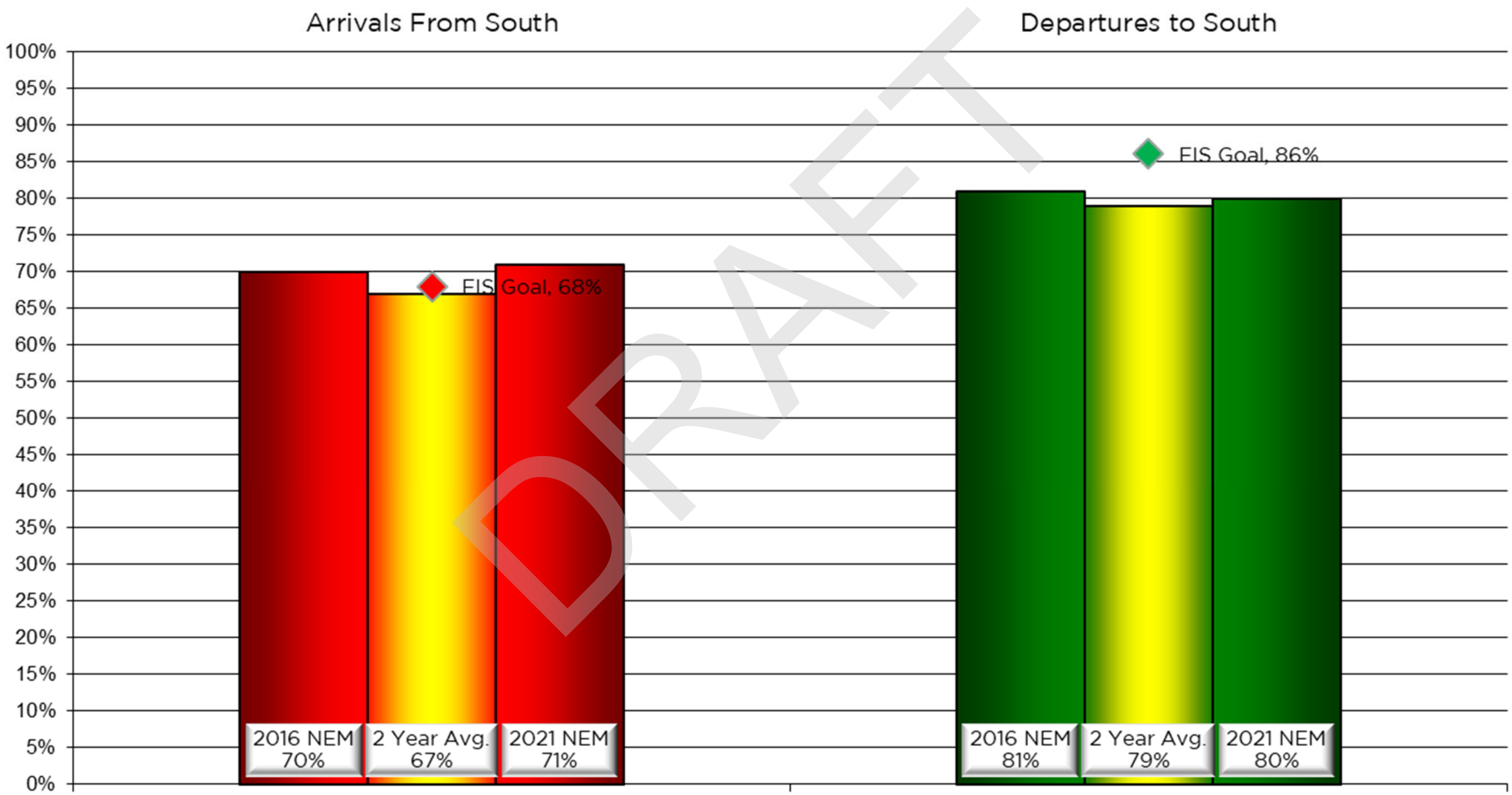


LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT

Contraflow This Year
As of January 31, 2024

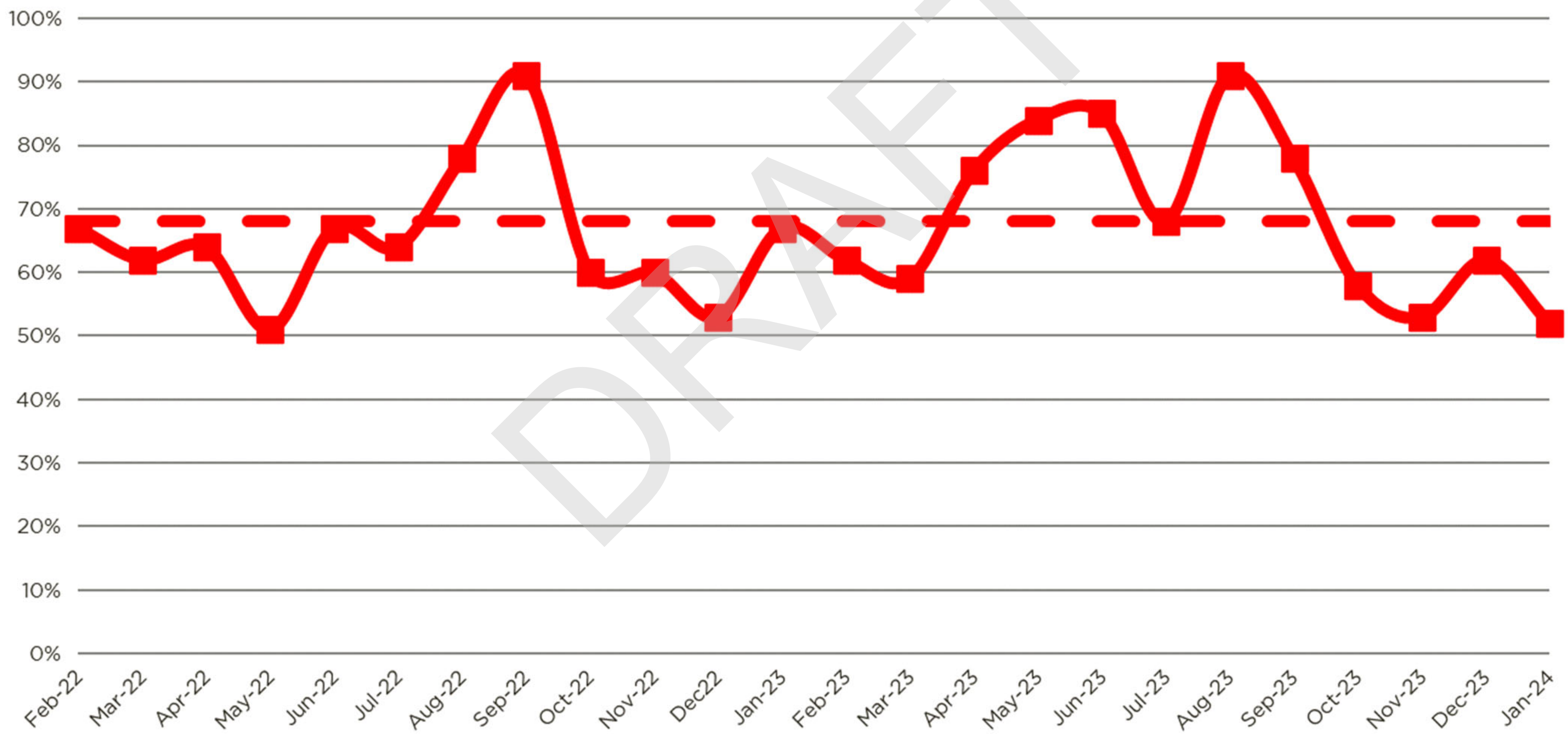


Contraflow 2 Year Average
February 2022 - January 2024



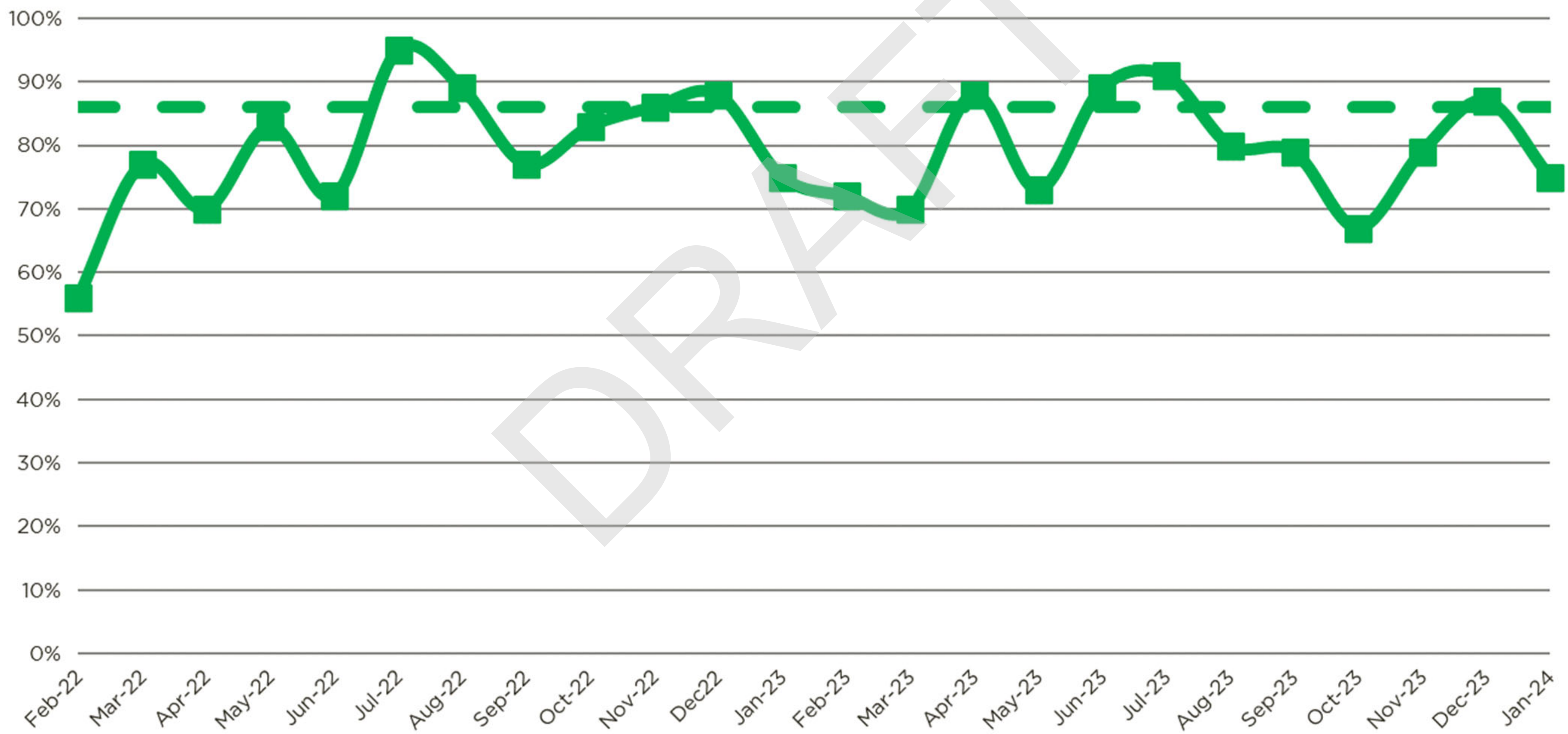
LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT

Arrivals From The South
February 2022 through January 2024
(10:00 pm to 7:00 am)
(68% is Goal)



LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT

Departures To The South
February 2022 through January 2024
(10:00 pm to 7:00 am)
(86% is Goal)



LOUISVILLE
MUHAMMAD ALI
INTERNATIONAL AIRPORT

Year-to-Year by Month Percent*

Contraflow

	Arrivals From the South (Goal 68%)										Departures to the South (Goal 86%)								
	2017	2018	2019	2020	2021	2022	2023	2024	Avg		2017	2018	2019	2020	2021	2022	2023	2024	Avg
Jan	65%	60%	75%	56%	71%	78%	67%	52%	66%		61%	72%	69%	82%	71%	65%	75%	79%	72%
Feb	58%	67%	78%	78%	87%	67%	62%		72%		77%	70%	57%	43%	45%	56%	72%		61%
Mar	79%	84%	82%	65%	51%	62%	59%		68%		62%	61%	89%	64%	77%	77%	70%		72%
Apr	56%	73%	65%	71%	62%	64%	76%		69%		80%	72%	82%	69%	75%	82%	88%		78%
May	75%	43%	65%	71%	71%	51%	84%		65%		80%	89%	90%	90%	63%	83%	73%		81%
Jun	74%	74%	50%	69%	65%	67%	85%		70%		93%	91%	91%	88%	84%	70%	89%		86%
Jul	85%	90%	75%	72%	70%	55%	68%		72%		85%	77%	87%	91%	76%	95%	91%		87%
Aug	79%	72%	88%	82%	74%	78%	91%		80%		90%	88%	89%	87%	88%	89%	82%		88%
Sep	85%	80%	83%	83%	63%	91%	78%		81%		31%	87%	77%	85%	90%	75%	79%		77%
Oct	81%	77%	79%	71%	69%	68%	58%		73%		82%	76%	78%	72%	76%	78%	67%		76%
Nov	69%	76%	70%	51%	61%	60%	53%		64%		75%	54%	72%	78%	81%	86%	79%		75%
Dec	74%	72%	76%	67%	56%	53%	62%		67%		74%	61%	72%	69%	80%	88%	87%		74%
Avg	73%	72%	74%	70%	67%	66%	70%	52%			74%	75%	79%	77%	76%	79%	79%	79%	

Nightly Runway Use Summary – January 2024
(from 10:00 PM date list in first column to 7:00 AM the following morning)

		% of all arrivals from the south									% of all departures to the south								
			Runway #						Unknown			Runway #						Unknown	
Date	Day	* in compliance	11	17L	17R	29	35L	35R	Runway Use	Notes / Comments	** in compliance	11	17L	17R	29	35L	35R	Runway Use	Notes / Comments
01-01-24	Mon	93%		7			62	31	0		100%		23	77				0	
01-02-24	Tue	97%		1	2		59	38	0		90%		36	54		8	2	0	
01-03-24	Wed	100%					57	43	0		0%					58	42	0	300-101@7-17
01-04-24	Thu	96%		1	3		59	37	0		92%		36	56		5	3	0	
01-05-24	Fri	4%		38	58		3	1	0	040-070@7-11, ra,	4%		1	3		52	44	0	020-060@7-13,ra
01-06-24	Sat																		
01-07-24	Sun																		
01-08-24	Mon	0%		44	56				0	080-120@15-31, ra	100%		40	60				0	
01-09-24	Tue	0%		38	62				0	220-250@27-42,g60,sn	93%		38	55	7			0	
01-10-24	Wed	0%		43	57				0	130-220@9-21,g29	100%		41	59				0	
01-11-24	Thu	42%		23	35		26	16	0	090-150@7-21	97%		43	54		2	1	0	
01-12-24	Fri	0%		2	6	92			0	250-260@29-44,g64,sn	92%		40	52	8			0	
01-13-24	Sat																		
01-14-24	Sun																		
01-15-24	Mon	100%					61	39	0		0%					55	45	0	290-310@15-23
01-16-24	Tue	94%			5	1	59	35	0		92%		35	57		4	4	0	
01-17-24	Wed	0%		46	54				0	180-210@11-19	100%		42	58				0	
01-18-24	Thu	100%					62	38	0		0%					60	40	0	270-320@7-17,sn
01-19-24	Fri	100%					65	35	0		0%					54	46	0	280-300@15-23
01-20-24	Sat																		
01-21-24	Sun																		
01-22-24	Mon	0%		43	57				0	100-120@5-9	100%		43	57				0	
01-23-24	Tue	0%		41	59				0	080-120@5-7,ra	100%		43	57				0	
01-24-24	Wed	0%		43	57				0	060-200@3-11,ra	100%		40	60				0	
01-25-24	Thu	0%		41	59				0	220-280@17-31,ra	97%		44	53		1	2	0	
01-26-24	Fri	97%			3		66	31	0		97%		36	61		1	2	0	
01-27-24	Sat																		
01-28-24	Sun																		
01-29-24	Mon	81%		4	15		47	34	0		98%		40	58		1	1	0	
01-30-24	Tue	98%			2		60	38	0		84%		31	53		6	10	0	
01-31-24	Wed	99%			1		58	41	0		93%		39	54		6	1	0	

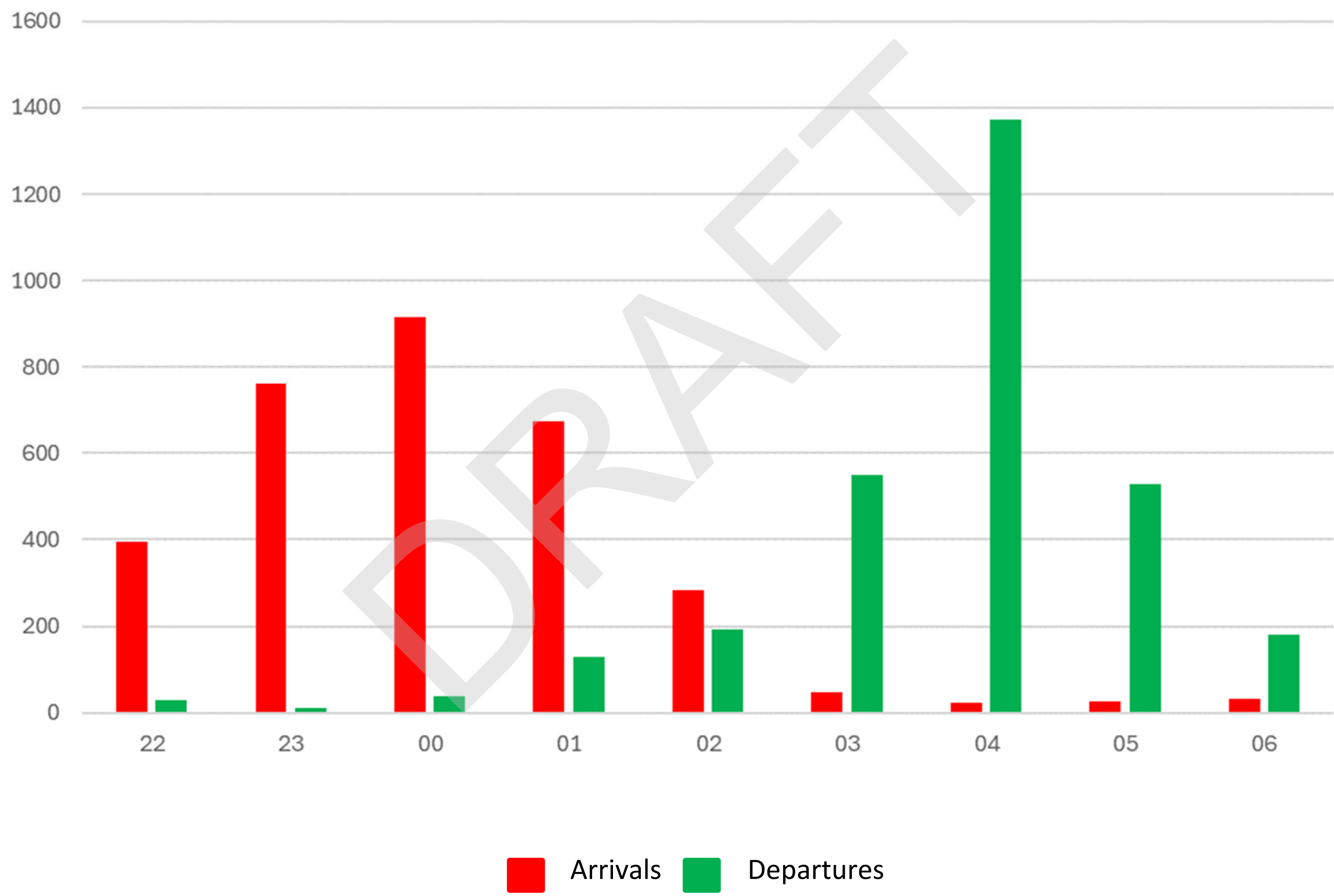
Preferred Flow

DATIS Reported Conditions Indicate Support for Non-Preferred Flow

DATIS Reported Conditions Do Not Indicate Support for Non-Preferred Flow

LOUISVILLE MUHAMMAD ALI INTERNATIONAL AIRPORT

Arrivals/Departures by Hour
January 2024



Non-Standard Modeling Documents

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HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
781.229.0707

TECHNICAL MEMORANDUM

To:	Kabrina Webb Peggy Kelley Memphis Airports District Office Federal Aviation Administration 2600 Thousand Oaks Blvd., Suite 2250 Memphis, TN 38118
CC:	Bob Slattery, LRAA
From:	David Crandall, Aofei Li, and Kate Larson HMMH
Date:	8/14/2024
Subject:	Request for Approval: AEDT 3f User-Defined Profiles for SDF NEM Update
Reference:	HMMH Project Number 22-0185A

Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority (LRAA) to prepare a Noise Exposure Map (NEM) update for Louisville International Airport (SDF). For the noise modeling with AEDT version 3f, we are requesting approval of user-defined profiles for several aircraft. The profiles presented here have been developed in coordination with the respective aircraft types' primary operator at SDF. This follows similar collaboration efforts for the data development of the prior two SDF NEMs (in 2011 and in 2016) which were approved by Federal Aviation Administration (FAA).

Activity by the cargo aircraft in this submittal represents a very important segment of operations at SDF; they constitute approximately half of the operations at SDF and, importantly from a noise perspective, their activity is more heavily weighted toward the nighttime hours than other aircraft. Approximately two-thirds of departures by these aircraft occur during the nighttime period.

HMMH has prepared this technical memorandum in accordance with Section 5 of FAA's document titled "Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA" dated October 27, 2017.[1] This particular request falls under this Section 5.2.2 "Analysis methods/data that require AEE review and approval," which includes:

- "User-defined aircraft profiles (including modifications to standard profiles) developed by methods other than AEDT's FAA-accepted methodology."

HMMH believes that this request should be routed in accordance with Section 5.1 of that AEDT guidance document, which states that the project consultant must submit the review package to the appropriate FAA headquarters office after coordinating with the FAA project manager in the district office.

We ask that you route this memo appropriately within FAA. After review at FAA headquarters, we would expect a document from the Office of Environment and Energy (AEE) responding to the methods presented in this memorandum. That AEE response will be included in the NEM's technical documentation supporting the noise analysis.

This user-defined profile submission has been prepared in accordance with FAA guidance. The profile information, with supporting documentation, is included in the following sections of this review package, grouped by the operators' pilot ratings and respective procedures. The data includes six

[1] https://aedt.faa.gov/Documents/guidance_aedt_nepa.pdf

representative AEDT Aircraft Noise and Performance (ANP) aircraft types, organized into three main sections:

A. Airbus 300, modeled by AEDT ANP type **A300-622R**
B. Boeing 747-400 series and 747-800series, modeled by AEDT ANP types **747400** and **7478**
C. Boeing 757-200 series and 767-300ER aircraft, modeled by AEDT ANP types **757PW**, **757RR** and **7673ER**

This package is a compilation of two earlier submissions, the first dated April 18, 2024, and the subsequent dated June 19, 2024. The initial submission provided a complete description of the proposed departure flight profiles and included an original concurrence page dated May 15, 2024. The subsequent document, prepared after HMMH receipt of FAA feedback, consisted of replacement pages where corrections were needed and additional pages for each aircraft section supplying altitude vs distance and speed vs distance graphics for each aircraft, by stage length designation.

Each of the supporting documentation sections combines the pages from the separate submissions; this compiled package includes all non-standard noise model input for which we are requesting approval. The refreshed operators' concurrence page indicates the corresponding header dates; the full package has been reviewed in its entirety. The operators' concurrence is provided as page 3 of this memo.

As outlined by Section 5.3 of the aforementioned AEDT guidance document, each section provides:

1. Statement of Benefit
2. Analysis Demonstrating Benefit in the form of sound exposure level results at 0.5 nmi increments under the flight path from the user-defined departure procedures compared to the AEDT standard profiles.
3. Verification of New Parameters in the form of procedure step profiles using modification of standard AEDT 3f profiles. An AEDT study containing the user-defined profiles will be included as an appendix to the memorandum.
4. Graphical and Tabular Comparison: a series of graphs depicting AEDT standard climb and speed profiles and the proposed modified climb and speed profiles to actual SDF climb and speed profiles.

The AEDT 3f study is available in electronic file format upon request, as are the spreadsheets which generated the graphs in the packet.

UPS Global Operations Center
825 Lotus Avenue
Louisville, KY 40213

UPS Concurrence Certification

UPS certifies review and concurrence with the below-listed proposed departure flight profiles for use in preparation of the Noise Exposure Map update for Louisville International Airport. The profiles fall within reasonable bounds of actual aircraft performance for UPS operations at SDF.

UPS acknowledges that the profiles were developed from AEDT's reduced thrust departure profiles, as described in the Statement of Benefit section of the documentation for each aircraft type.

Aircraft Type	Documentation Section	Dated	Reviewer's Signature
Airbus A300-600	A	April 18, 2024 June 19, 2024	
Boeing 747-400	B	April 18, 2024	
Boeing 747-8		June 19, 2024	
Boeing 757-200 PW	C	April 18, 2024	
Boeing 757-200 RR			
Boeing 767-300		June 19, 2024	

Concurrence provided by:

Michael Ausley
Name

8/7/24
Date

UPS AIRLINES
DIRECTOR OF OPERATIONS
Position/ Title

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
781.229.0707

Section A:

Airbus A300-600

This section describes the user-defined inputs for Airbus A300-600. This aircraft makes up a notable portion of SDF existing operations, both daytime and nighttime. The A300-600 is represented by ANP type A300-622R.

The primary cargo operator of the A300-600 at SDF (UPS) has provided information related to the development of these AEDT profiles and has indicated that these profiles are representative of current (2024) operations and are expected to be continued in the future.

Overall, the proposed user-defined profiles reflect current SDF A300-600 procedures that operators refer to as “NADP 2.” In simple terms, these procedures are described with the following steps:

- Take-off thrust and take-off flaps while climbing at constant airspeed speed to 1,000 ft Above Field Elevation (AFE);
- At 1,000 ft AFE, reduce thrust to climb thrust setting, reduce aircraft pitch, accelerate and retract flaps on the aircraft manufacturer’s recommended speed schedule (i.e., sometimes referred to as "retract flaps on schedule” or "flap retraction schedule");
- Continue accelerating to 250 knots indicated airspeed with flaps fully retracted; and
- Constant speed climb at 250 knots to 10,000 ft AFE.

The closest profiles available with AEDT include an additional climb step between acceleration for the "retract flaps on schedule” step and the “accelerating to 250 knots indicated airspeed with flaps fully retracted” step. Current operators of the A300-600 have indicated that the extra climb segment within the default AEDT profiles is not representative of actual operations at SDF. The proposed user-defined profiles developed are modifications of existing AEDT profiles and continue to use AEDT’s flap retraction schedule for a given weight.

The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Airbus A300-600 operations will be represented with AEDT ANP stage lengths 1 – 4, while stage lengths 5 – 6 will be used much less often.

HMMH has prepared this documentation in accordance with Section 5 of FAA’s document titled “Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA” dated October 27, 2017.[1]

[1] https://aedt.faa.gov/Documents/guidance_aedt_nepa.pdf

Contents

Figures

Tables

A.1. Airbus A300-600 (ANP Type A300-622R) Profile Review with AEDT 3f

A.1.1. Statement of Benefit

Operators at SDF use a version of “Noise Abatement Departures Procedures” (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. The proposed A300-622R climb profiles and thrust settings during the various stages of flight provide a better representation of what is actually being flown by cargo aircraft at SDF. These profiles were developed from the default (i.e. included) reduced thrust profiles in AEDT.

The proposed user-defined profiles were developed with considerations of SDF runway specific length and minimum climb requirements. Correspondence with the operators has indicated a high agreement with their procedures at SDF.

A.1.1.1. Figures Supporting Statement of Benefit

Figure A-1 and **Figure A-3** compare the standard AEDT profiles and proposed profiles to actual aircraft climb performance at SDF. **Figure A-2** and **Figure A-4** compare the standard AEDT profiles and proposed profiles to actual aircraft ground speed profiles at SDF. The standard profiles are identified in the figure legends as “Stage length - Weight”. The proposed profiles are identified in the figure legends as “Name – Stage length - Weight.”

Additional Figures, **A-20** through **A-29**, provide further comparison by stage length representative weight.

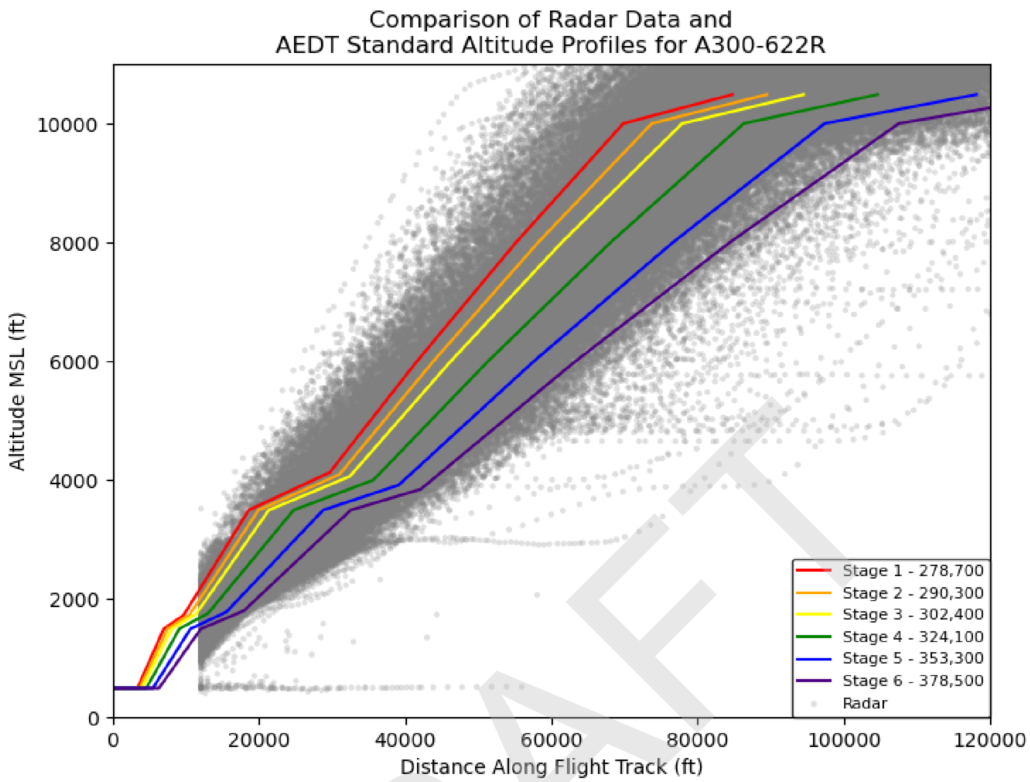

Figure A-1. A300-622R AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

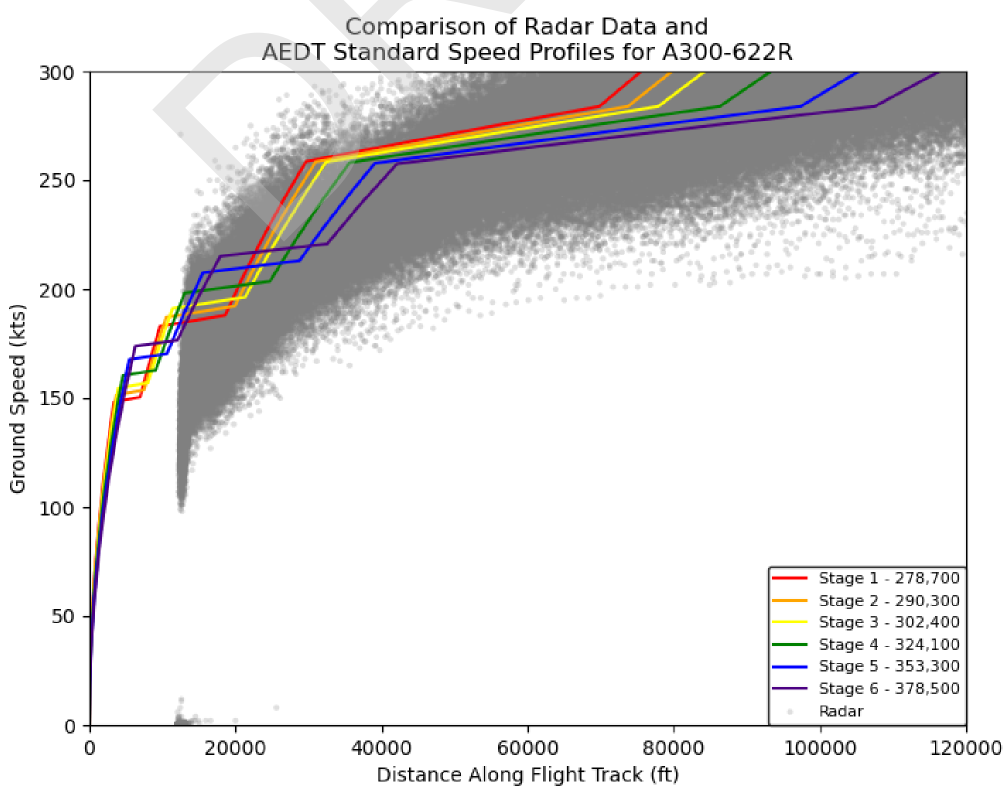

Figure A-2. A300-622R AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

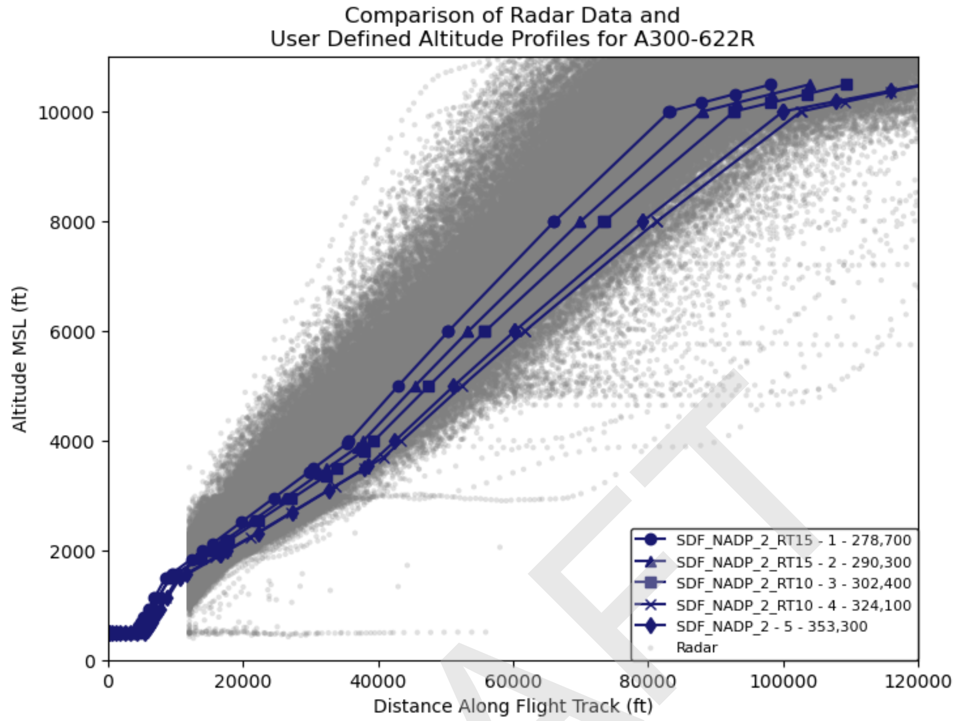

Figure A-3. A300-622R Proposed Altitude Profiles Compared to Actual Aircraft Performance

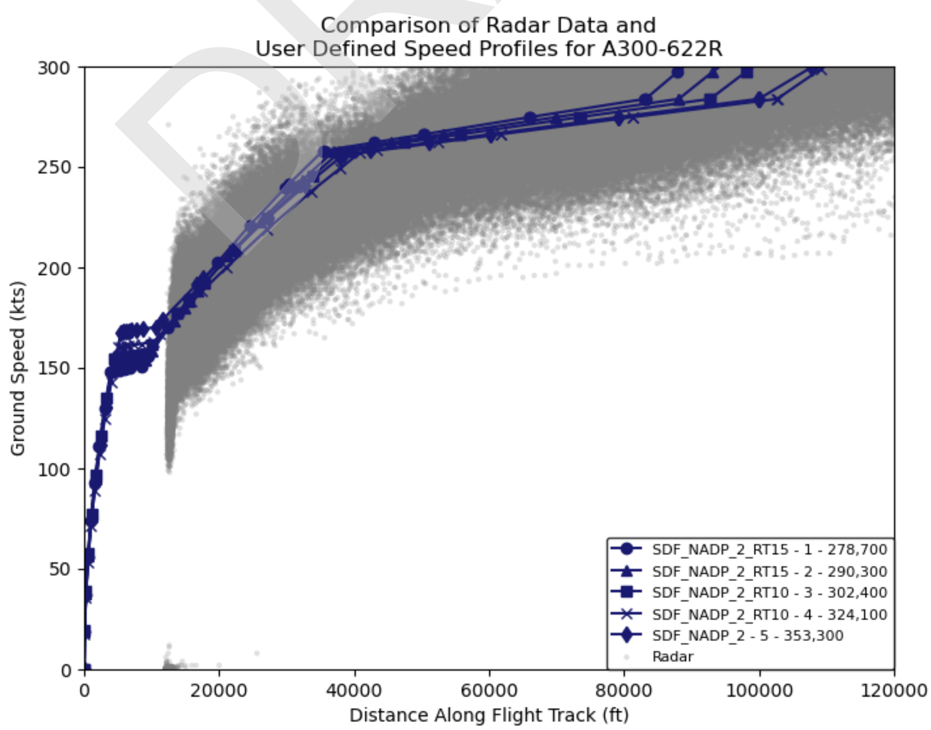

Figure A-4. A300-622R Proposed Speed Profiles Compared to Actual Aircraft Performance

A.1.2. Analysis Demonstrating Benefit

The differences between the existing A300-622R profiles in AEDT 3f and the proposed user-defined profiles are primarily due to the use of reduced thrust, reduced acceleration energy share percentage, and climb altitude on departure. The sound exposure level results under the flight path from the user-defined departure procedures are shown in **Section A.1.5.1**. In general, the proposed user-defined profiles show less noise associated with the take-off roll, a different location where aircraft change from take-off thrust to climb thrust, and additional noise under the flight path miles out because of a slower climb.

A.1.3. Concurrence on Aircraft Performance

Preparation of these profiles for the current project and AEDT 3f was done in cooperation with the relevant airline. Airline concurrence documentation accompanies this memorandum for submission to FAA.

A.1.4. Certification of New Parameters

The profiles developed for this study are procedure step profiles created by modifying profiles already included in AEDT 3f. Screenshots from the AEDT user interface (UI) of starting default profiles and the proposed user-defined profiles are presented for comparison as **Figure A-5** through **Figure A-14**. An AEDT study containing the profiles developed for this project is available in electronic form upon request. Altitudes are listed as feet above airfield elevation. Speeds are true airspeed in knots. Thrust is in units of pounds which matches the units of thrust settings used in the aircraft's associated noise-power-distance curves.

A.1.4.1. A300-622R, Profile Weight 278,700

The “stage length 1” user-defined profile for the A300-622R assumes a weight of 278,700 pounds, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1 This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1 to change the thrust cut back to occur at the end of the initial climb to 1,000 ft AFE (rather than after the first flap retraction) and to remove the climb at 3,000 AFE in step 4. The acceleration energy share percentage was also reduced from 70 percent to 45 percent to provide a better match to flight track samples’ altitude range and speed range shown in Figure 3 and Figure 4, respectively. To assist AEDT, a climb was introduced at 4,500 AFE in step 5.

MODIFIED_RT15	Procedural	278700	1	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	1500	Max Takeoff 15% Reduced		0	
2	Climb	1500	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	1500	Max Takeoff 15% Reduced		185.3	70
4	Climb	0000	Max Climb 10% Reduced	3000		
5	Percent Accelerate	0000	Max Climb 10% Reduced		250	70
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-5. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1

SDF_NADP_2_RT15	Procedural	278700	1	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	1500	Max Takeoff 15% Reduced		0	
2	Climb	1500	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	1500	Max Climb 10% Reduced		185.3	45
4	Percent Accelerate	0000	Max Climb 10% Reduced		250	45
5	Climb	0000	Max Climb 10% Reduced	4500		
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-6. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1

A.1.4.2. A300-622R, Profile Weight 290,300

The "stage length 2" user-defined profile for the A300-622R assumes a weight of 290,300 pounds, and is identified as PROF_ID1: SDF_NADP_2_RT_15; PROF_ID2: 2. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT_15; PROF_ID2: 2 to change the thrust cut back to occur at the end of the initial climb to 1,000 ft AFE (rather than after the first flap retraction) and to remove the climb at 3,000 AFE in step 4. The acceleration energy share percentage was also reduced from 70 percent to 45 percent to provide a better match to flight track samples altitude range and speed range shown in Figure 3 and Figure 4, respectively. To assist AEDT, a climb was introduced at 4,500 AFE in step 5.

MODIFIED_RT15	Procedural	290300	2	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	1500	Max Takeoff 15% Reduced		0	
2	Climb	1500	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	1500	Max Takeoff 15% Reduced		189.3	70
4	Climb	0000	Max Climb 10% Reduced	3000		
5	Percent Accelerate	0000	Max Climb 10% Reduced		250	70
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-7. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT_15; PROF_ID2: 2

SDF_NADP_2_RT15	Procedural	290300	2	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	1500	Max Takeoff 15% Reduced		0	
2	Climb	1500	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	1500	Max Climb 10% Reduced		189.3	45
4	Percent Accelerate	0000	Max Climb 10% Reduced		250	45
5	Climb	0000	Max Climb 10% Reduced	4500		
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-8. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2

A.1.4.3. A300-622R, Profile Weight 302,400

The "stage length 3" user-defined profile for the A300-622R assumes a weight of 302,400 pounds, and is identified as PROF_ID1: SDF_NADP_2_RT_10; PROF_ID2: 3. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 3 to change the thrust cut back to occur at the end of the initial climb to 1,000 ft AFE (rather than after the first flap retraction) and to remove the climb at 3,000 AFE in step 4. The acceleration energy share percentage was also reduced from 70 percent to 45 percent to provide a better match to flight track samples altitude range and speed range shown in Figure 3 and Figure 4, respectively. To assist AEDT, a climb was introduced at 4,500 AFE in step 5.

MODIFIED_RT10 | Procedural | 302400 | 3 | Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	1500	Max Takeoff 10% Reduced		0	
2	Climb	1500	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	1500	Max Takeoff 10% Reduced		193.2	70
4	Climb	0000	Max Climb 10% Reduced	3000		
5	Percent Accelerate	0000	Max Climb 10% Reduced		250	70
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-9. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 3

SDF_NADP_2_RT10 | Procedural | 302400 | 3 | Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	1500	Max Takeoff 10% Reduced		0	
2	Climb	1500	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	1500	Max Climb 10% Reduced		193.2	45
4	Percent Accelerate	0000	Max Climb 10% Reduced		250	45
5	Climb	0000	Max Climb 10% Reduced	4500		
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-10. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 3

A.1.4.4. A300-622R, Profile Weight 324,100

The "stage length 4" user-defined profile for the A300-622R assumes a weight of 324,100 pounds, and is identified as PROF_ID1: SDF_NADP_2_RT_10; PROF_ID2: 4. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 4 to change the thrust cut back to occur at the end of the initial climb to 1,000 ft AFE (rather than after the first flap retraction) and to remove the climb at 3,000 AFE in step 4. The acceleration energy share percentage was also reduced from 70 percent to 45 percent to provide a better match to flight track samples altitude range and speed range shown in Figure A-3 and Figure A-4, respectively. To assist AEDT, a climb was introduced at 4,500 AFE in step 5.

MODIFIED_RT10	Procedural	324100	4	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	1500	Max Takeoff 10% Reduced		0	
2	Climb	1500	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	1500	Max Takeoff 10% Reduced		200.1	70
4	Climb	0000	Max Climb 10% Reduced	3000		
5	Percent Accelerate	0000	Max Climb 10% Reduced		250	70
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-11. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 4

SDF_NADP_2_RT10	Procedural	324100	4	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	1500	Max Takeoff 10% Reduced		0	
2	Climb	1500	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	1500	Max Climb 10% Reduced		200.1	45
4	Percent Accelerate	0000	Max Climb 10% Reduced		250	45
5	Climb	0000	Max Climb 10% Reduced	4500		
6	Climb	0000	Max Climb 10% Reduced	5500		
7	Climb	0000	Max Climb 10% Reduced	7500		
8	Climb	0000	Max Climb 10% Reduced	10000		

Figure A-12. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 4

A.1.4.5. A300-622R, Profile Weight 353,300

The “stage length 5” user-defined profile for the A300-622R assumes a weight of 353,300 pounds, and is identified as PROF_ID1: SDF_NADP_2_RT00; PROF_ID2: 5. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT_05; PROF_ID2: 5 to change the thrust cut back to occur at the end of the initial climb to 1,000 ft AFE (rather than after the first flap retraction) and to remove the climb at 3,000 AFE in step 4 and modified to set thrust level to maximum at step 1 and step 2. The acceleration energy share percentage was also reduced from 70 percent to 45 percent to provide a better match to flight track samples altitude range and speed range shown in Figure A-3 and Figure A-4, respectively. To assist AEDT, a climb was introduced at 4,500 AFE in step 5.

MODIFIED_RT05	Procedural	353300	5	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	1500	Max Takeoff 5% Reduced		0	
2	Climb	1500	Max Takeoff 5% Reduced	1000		
3	Percent Accelerate	1500	Max Takeoff 5% Reduced		209.1	70
4	Climb	0000	Max Climb	3000		
5	Percent Accelerate	0000	Max Climb		250	70
6	Climb	0000	Max Climb	5500		
7	Climb	0000	Max Climb	7500		
8	Climb	0000	Max Climb	10000		

Figure A-13. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 5

SDF_NADP_2_RT00	Procedural	353300	5	Departure

Procedure Profile

Click here to add new item

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	1500	Max Takeoff		0	
2	Climb	1500	Max Takeoff	1000		
3	Percent Accelerate	1500	Max Climb		209.1	45
4	Percent Accelerate	0000	Max Climb		250	45
5	Climb	0000	Max Climb	4500		
6	Climb	0000	Max Climb	5500		
7	Climb	0000	Max Climb	7500		
8	Climb	0000	Max Climb	10000		

Figure A-14. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT00; PROF_ID2: 5

A.1.5 Graphical and Tabular Comparison

An MS Excel file containing the profile points as found in the AEDT XML Performance Report Export file is available in electronic form upon request. It was developed for comparison of performance data to the AEDT Standard profiles and was used to generate the following tables and line graphs.

A.1.5.1. Tables and Figures Supporting Analysis Demonstrating Benefit

Table A-1 through **Table A-5** show the Sound Exposure Level (SEL) results under the flight path from the user-defined departure profiles; SEL values resulting from the standard AEDT departure profiles are presented for comparison. **Figure A-5** through **Figure A-19** show the same SEL computations in the form of SEL contours.

Table A-1. SELs for A300-622R Departures at 278,700 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: A300-622R Profile Weight: 278,700 lbs. (PROF_ID2 = 1) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	133.3	130.2	-3.1
0.5	121.8	119.3	-2.5
1.0	103.0	103.1	0.1
1.5	98.4	96.4	-2.1
2.0	91.7	92.9	1.2
2.5	89.3	90.9	1.6
3.0	87.7	89.3	1.6
3.5	86.3	87.8	1.5
4.0	85.1	86.4	1.3
4.5	84.0	85.1	1.2
5.0	82.9	84.0	1.1
5.5	81.9	83.0	1.0
6.0	81.0	81.9	0.9
6.5	80.2	81.0	0.8
7.0	79.4	80.1	0.7
7.5	78.8	79.4	0.6
8.0	78.1	78.6	0.5
8.5	77.5	77.9	0.4
9.0	76.9	77.3	0.4
9.5	76.4	76.7	0.3
10.0	75.9	76.2	0.3

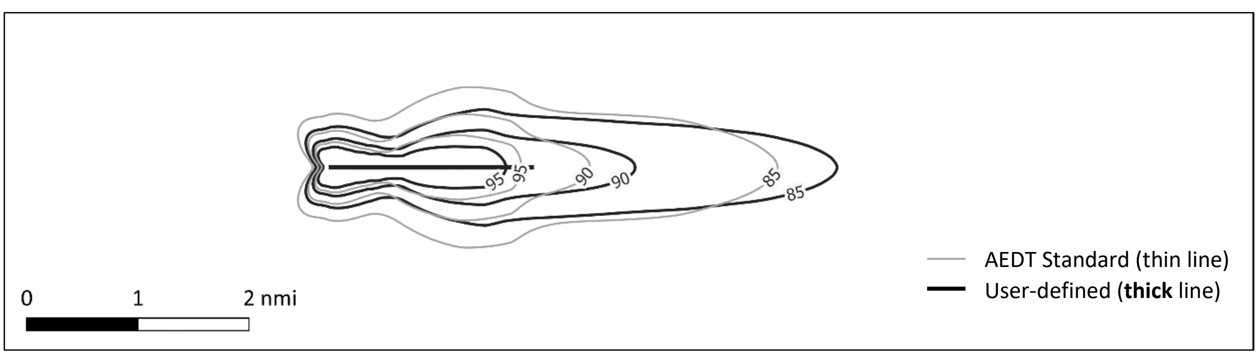

Figure A-15. SEL Contours for A300-622R Departures at Take-Off Weight 278,700 Pounds

Table A-2. SELs for A300-622R Departures at 290,300 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: A300-622R Profile Weight: 290,300 lbs. (PROF_ID2 = 2) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	133.2	130.1	-3.1
0.5	121.8	119.9	-1.9
1.0	103.8	104.5	0.6
1.5	99.0	97.9	-1.1
2.0	92.5	93.4	0.8
2.5	89.9	91.4	1.5
3.0	88.1	89.7	1.6
3.5	86.8	88.4	1.6
4.0	85.5	87.0	1.5
4.5	84.5	85.8	1.3
5.0	83.4	84.7	1.2
5.5	82.5	83.6	1.2
6.0	81.5	82.6	1.0
6.5	80.8	81.7	1.0
7.0	80.0	80.8	0.8
7.5	79.3	79.9	0.7
8.0	78.7	79.3	0.6
8.5	78.0	78.5	0.5
9.0	77.5	77.9	0.4
9.5	76.9	77.3	0.5
10.0	76.4	76.8	0.4

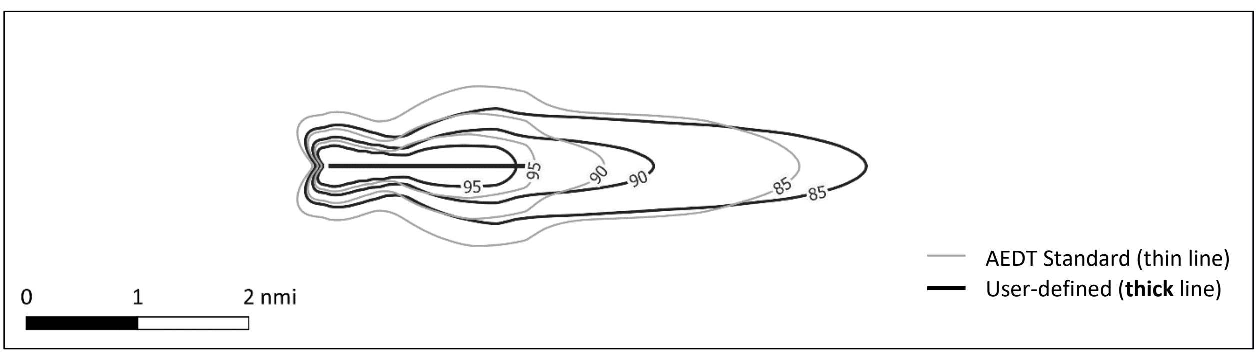

Figure A-16. SEL Contours for A300-622R Departures at Take-Off Weight 290,300 Pounds

Table A-3. SELs for A300-622R Departures at 302,400 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: A300-622R Profile Weight: 302,400 lbs. (PROF_ID2 = 3) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	133.1	131.0	-2.1
0.5	122.1	120.7	-1.4
1.0	105.1	105.6	0.5
1.5	99.6	98.8	-0.8
2.0	94.5	93.4	-1.1
2.5	90.4	91.6	1.1
3.0	88.6	90.0	1.4
3.5	87.2	88.7	1.5
4.0	86.0	87.3	1.3
4.5	84.9	86.1	1.2
5.0	83.9	85.0	1.1
5.5	83.0	84.0	1.1
6.0	82.1	83.1	1.0
6.5	81.3	82.1	0.9
7.0	80.5	81.3	0.8
7.5	79.8	80.5	0.7
8.0	79.2	79.7	0.6
8.5	78.6	79.1	0.5
9.0	78.0	78.4	0.4
9.5	77.4	77.8	0.4
10.0	76.9	77.3	0.4

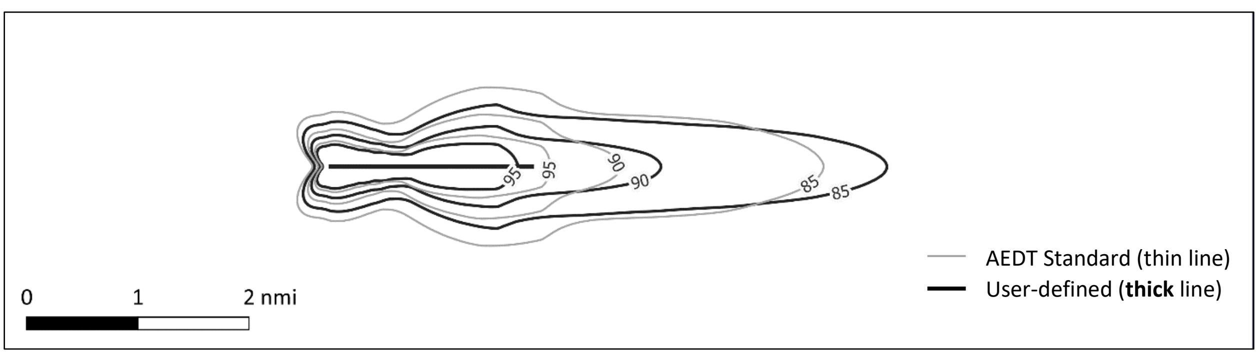

Figure A-17. SEL Contours for A300-622R Departures at Take-Off Weight 302,400 Pounds

Table A-4. SELs for A300-622R Departures at 324,100 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: A300-622R Profile Weight: 324,100 lbs. (PROF_ID2 = 4) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	133.5	131.4	-2.1
0.5	122.2	121.2	-1.0
1.0	107.5	108.8	1.3
1.5	100.6	100.0	-0.6
2.0	97.6	94.1	-3.5
2.5	91.8	92.5	0.7
3.0	89.7	90.9	1.1
3.5	88.2	89.5	1.3
4.0	86.9	88.3	1.4
4.5	85.9	87.2	1.3
5.0	85.0	86.1	1.1
5.5	84.1	85.1	1.0
6.0	83.2	84.2	1.0
6.5	82.4	83.3	1.0
7.0	81.6	82.5	0.9
7.5	80.9	81.6	0.8
8.0	80.3	80.9	0.6
8.5	79.6	80.2	0.6
9.0	79.0	79.6	0.5
9.5	78.4	78.9	0.5
10.0	77.9	78.3	0.4

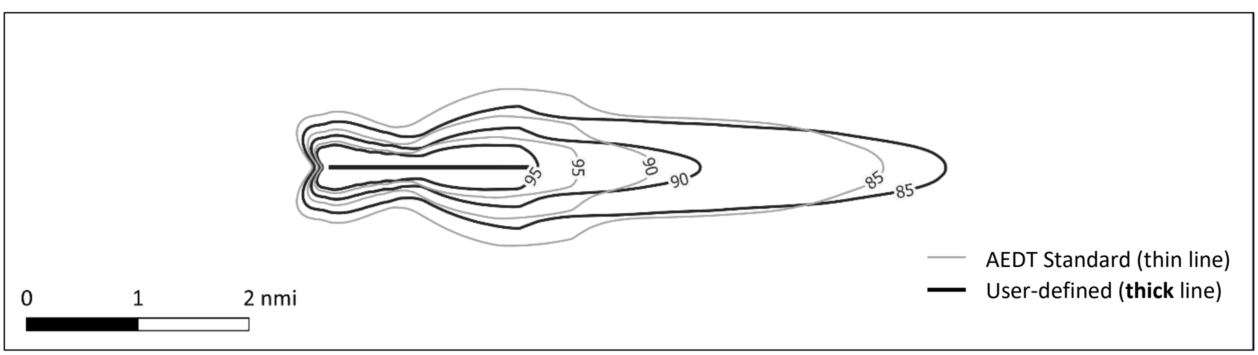

Figure A-18. SEL Contours for A300-622R Departures at Take-Off Weight 324,100 Pounds

Table A-5. SELs for A300-622R Departures at 353,300 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: A300-622R Profile Weight: 353,300 lbs. (PROF_ID2 = 5) User PROF_ID1: SDF_NADP_2_RT00			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	133.3	133.3	0.0
0.5	122.7	122.7	0.0
1.0	112.5	112.5	0.0
1.5	102.3	102.3	0.0
2.0	98.8	95.2	-3.6
2.5	96.6	93.4	-3.2
3.0	91.1	91.8	0.8
3.5	89.4	90.6	1.2
4.0	88.0	89.3	1.4
4.5	86.9	88.2	1.3
5.0	86.0	87.1	1.1
5.5	85.1	86.1	1.0
6.0	84.3	85.2	0.9
6.5	83.5	84.4	0.9
7.0	82.8	83.4	0.7
7.5	82.0	82.7	0.7
8.0	81.4	82.0	0.7
8.5	80.8	81.3	0.5
9.0	80.2	80.7	0.5
9.5	79.6	80.1	0.5
10.0	79.1	79.5	0.3

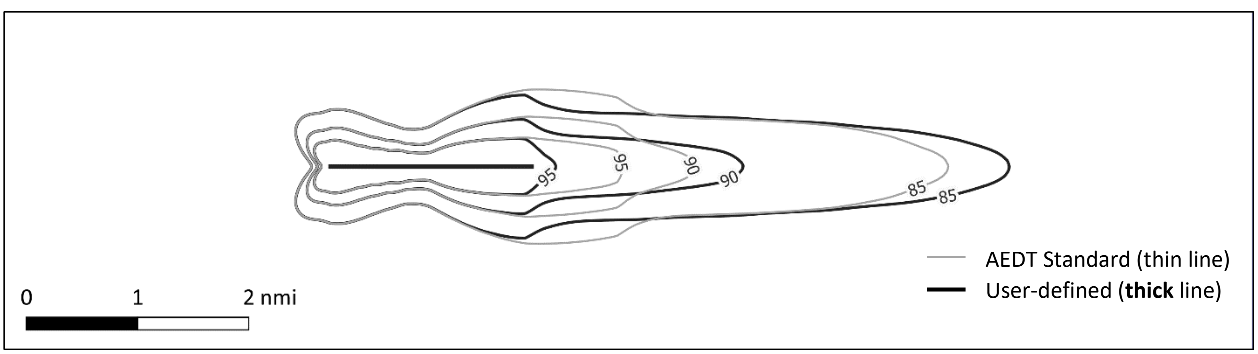

Figure A-19. SEL Contours for A300-622R Departures at Take-Off Weight 353,300 Pounds

A.2. Additional Graphs: Comparison of Altitude and Speed Profiles by Stage Length

The additional graphs of altitude vs. distance and speed vs. distance, organized by stage length, are included in this section in response to FAA's request in the feedback dated May 29, 2024. The following figures are complementary to Figures A-1 through A-4 in the original memorandum (dated April 18, 2024) and show the same data. **Figures A-20** through **A-29** reorganize the data by specific profile weights and respective stage lengths.

The distribution of departures by stage length (as derived by an analysis of the city-pair data in the 12-month NOMS sample) show that 44% of the A300-600 departures are in stage length 1, 39% in stage length 2, 6% in stage length 3, and 10% in stage length 4. The stage length distribution, which will be applied to the cargo aircraft for noise modeling, is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Airbus A300-600 operations will be represented with AEDT ANP stage lengths 1 – 4. Although A300-600 stage length 5 (PROF_ID2 = 5, with representative profile weight of 353,300 pounds) did not appear in the 12-month flight track sample, we include that departure profile in this documentation in case the forecast data indicate that such operations should be included in the forecast NEM.

As noted in the "Statement of Benefit" (Section A.1.1), operators at SDF use a version of "Noise Abatement Departure Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. Operators did not provide the exact reduced thrust. Therefore, we used the thrust-to-weight ratio of the AEDT maximum thrust profile associated with current and historical A300 operations at SDF. The similar thrust-to-weight ratio should maintain a similar acceleration rate during the take-off roll and, combined with the lower rotation speed needed for a lower weight aircraft, should have a shorter take-off roll. Therefore, all of the proposed procedures follow the NADP 2 described on page A-1, although they may use various thrust settings based on weight. This should not be confused with AEDT's definition of a single procedure (PROF_ID1 and PROF_ID2), which combines both the altitude and flap retractation speeds along with the power settings. It also should be noted that our efforts to develop the proposed profiles were limited to the selection of thrust coefficients already available in AEDT. In other words, we did not attempt to define new thrust coefficients to represent power levels not already represented in AEDT. We did not modify the flap retraction speed schedule relative to that in AEDT, and we also kept all clean climbs (i.e., flaps fully retracted) at a speed of 250 knots calibrated airspeed, which matches both the AEDT standard profiles and the indicated airspeed listed in the procedures provided by the operator. In addition, the comparison of the AEDT profiles is done at the SDF annual average day conditions documented in the AEDT database, which will be used in the calculation of the NEM contours. As such, the ground speeds reported by AEDT are not expected to match the flight track data precisely; therefore, we recommend viewing the general speed patterns rather than comparing absolute values.

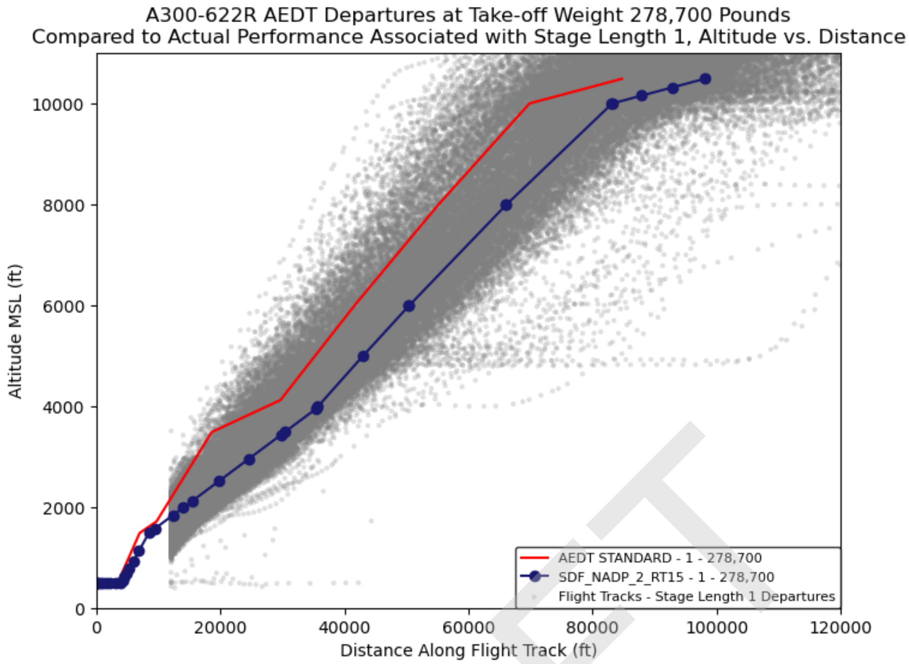

Figure A-20. A300-622R Departures, Stage Length 1, Altitude vs. Distance

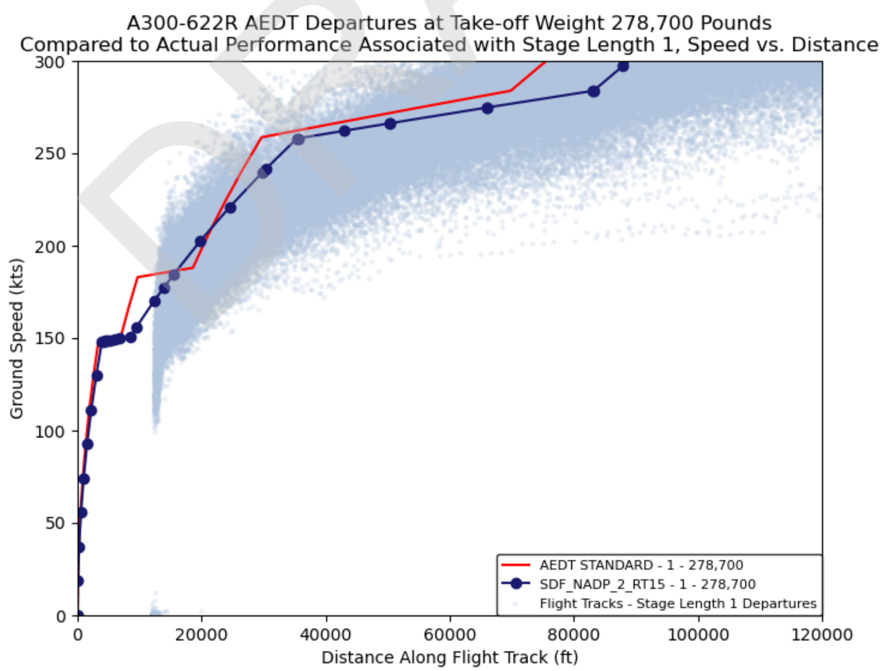

Figure A-21. A300-622R Departures, Stage Length 1, Speed vs. Distance

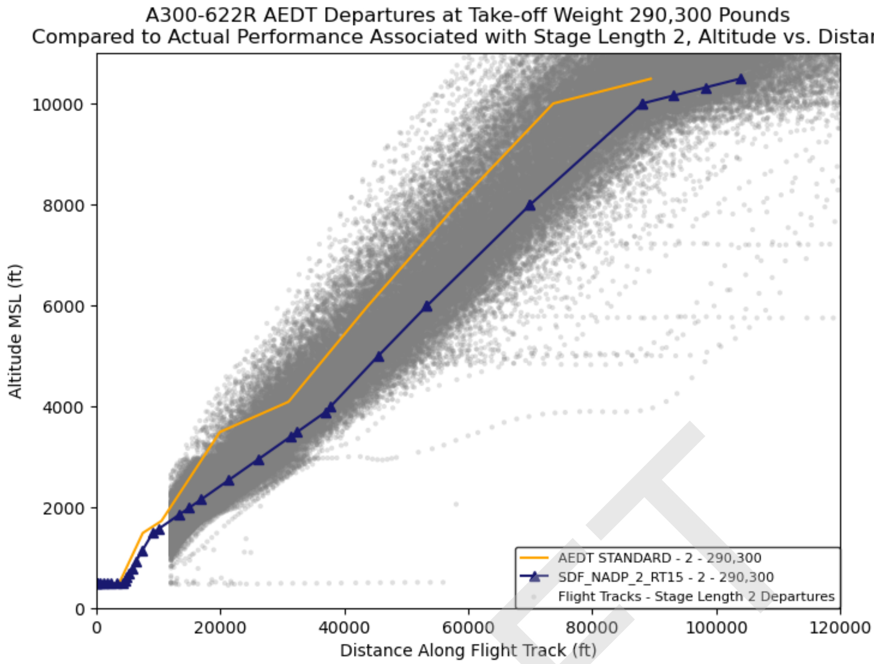

Figure A-22. A300-622R Departures, Stage Length 2, Altitude vs. Distance

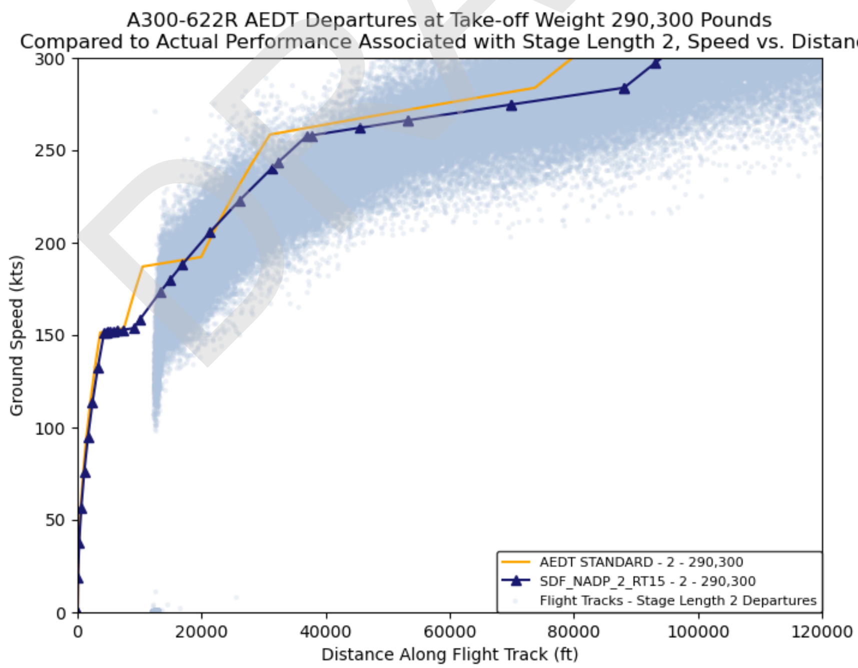

Figure A-23. A300-622R Departures, Stage Length 2, Speed vs. Distance

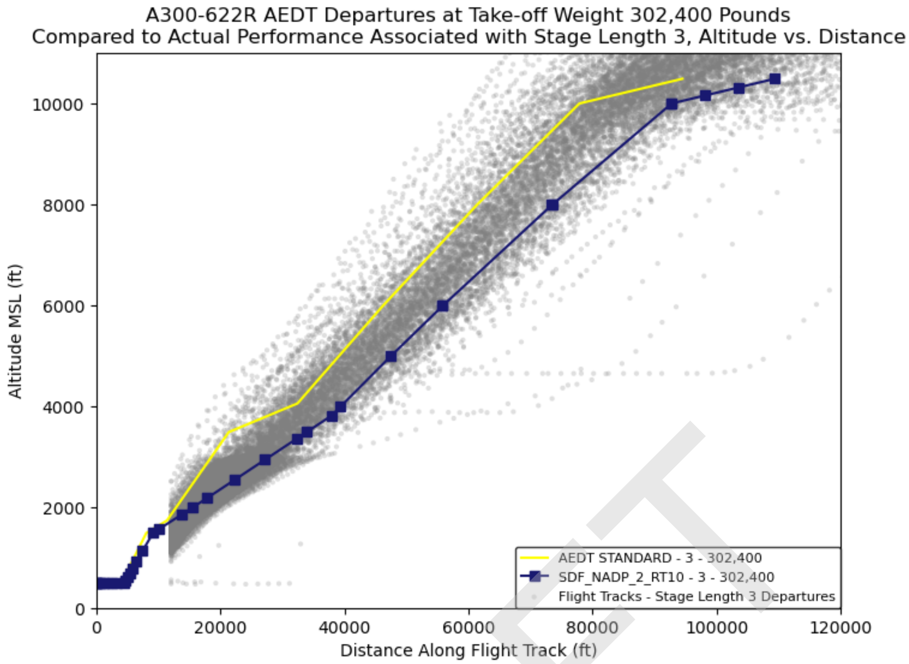

Figure A-24. A300-622R Departures, Stage Length 3, Altitude vs. Distance

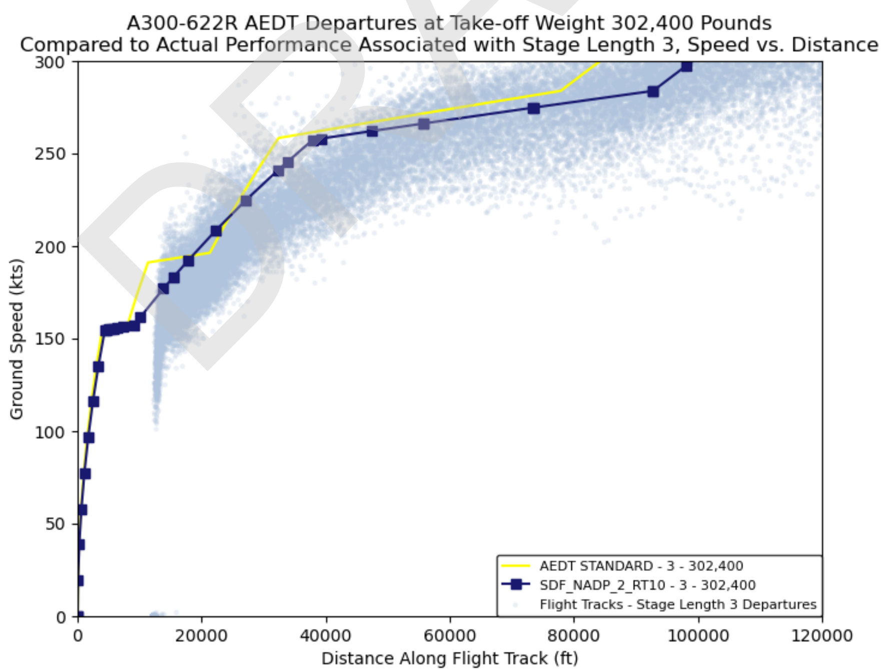

Figure A-25. A300-622R Departures, Stage Length 3, Speed vs. Distance

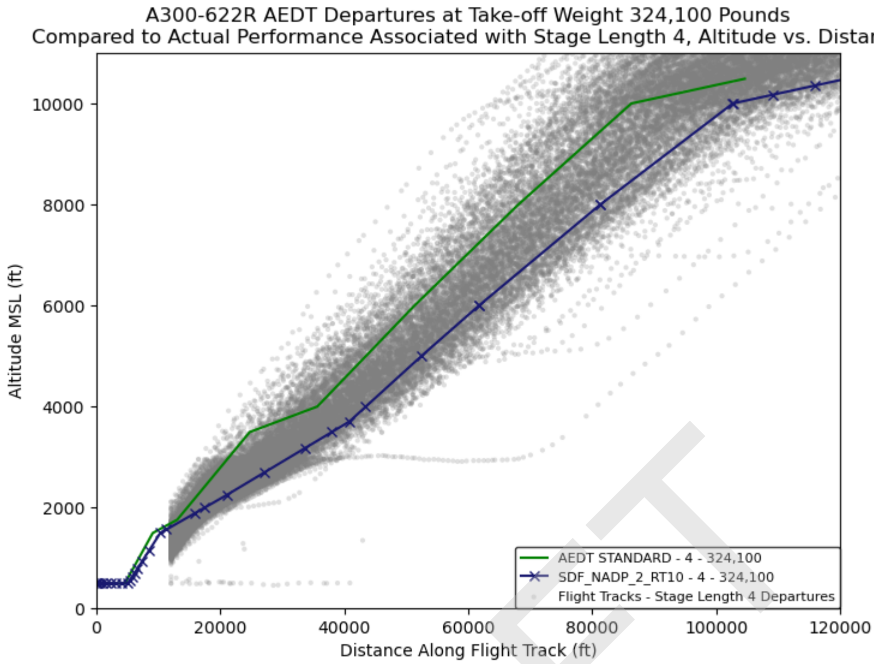

Figure A-26. A300-622R Departures, Stage Length 4, Altitude vs. Distance

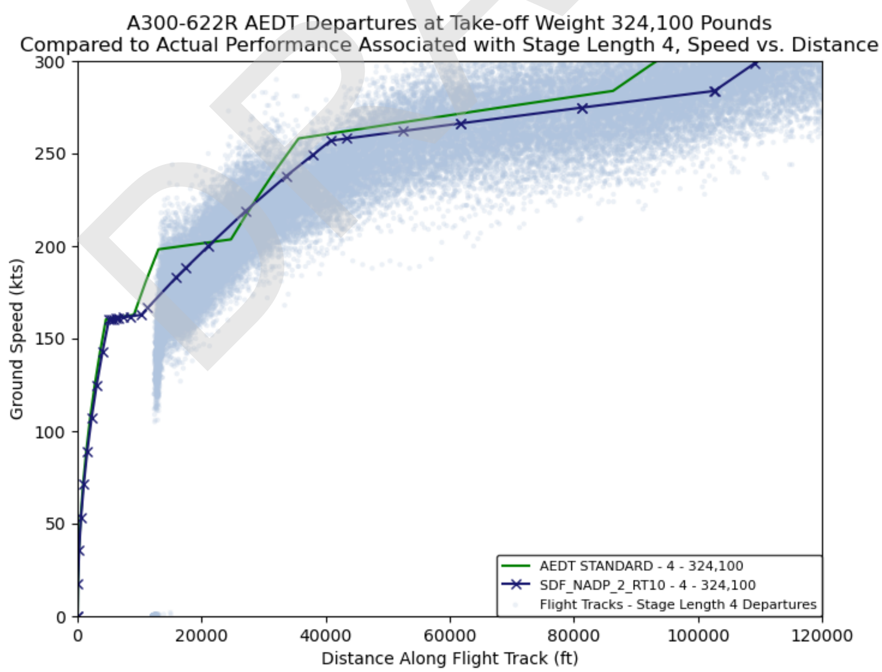

Figure A-27. A300-622R Departures, Stage Length 4, Speed vs. Distance

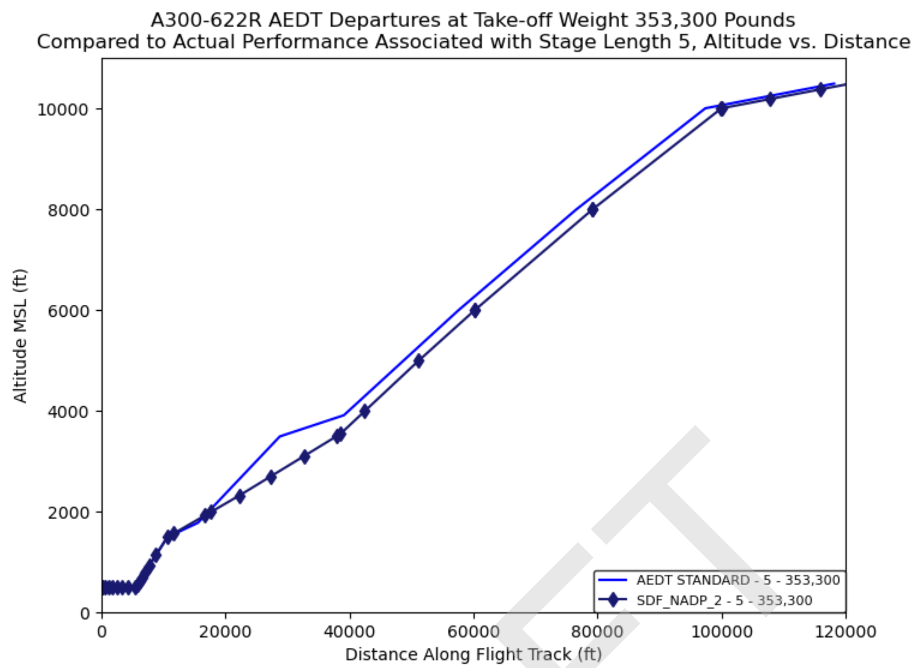

Figure A-28. A300-622R Departures, Stage Length 5, Altitude vs. Distance

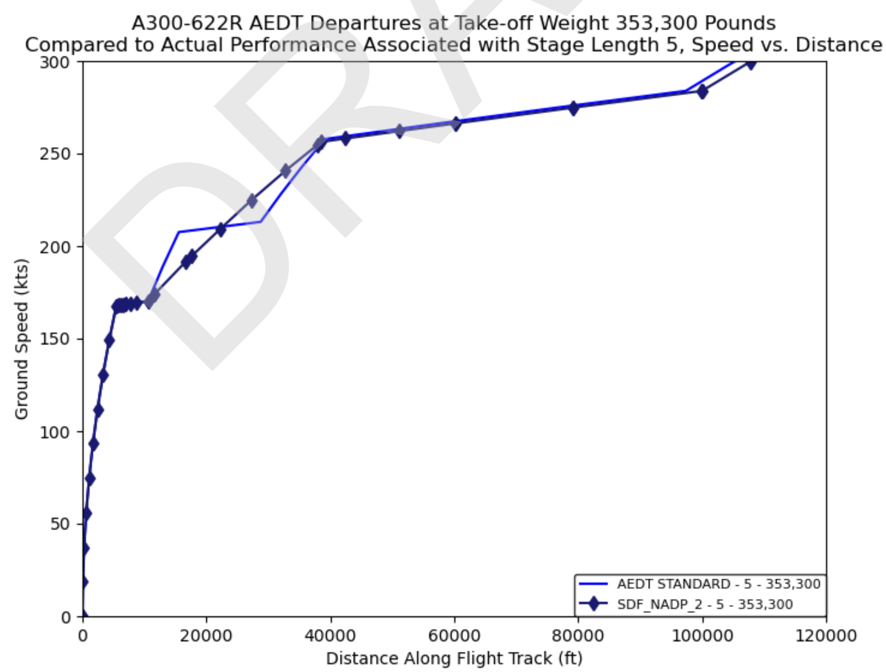

Figure A-29. A300-622R Departures, Stage Length 5, Speed vs. Distance

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Section B:

Boeing 747-400 and 747-8

This section describes the user-defined inputs for Boeing 747-400 and 747-8. These aircraft make up a notable portion of SDF existing operations, both day-time and night-time. The 747-400 is represented by ANP type 747-400 and the 747-8 is represented by ANP type 7478. Our discussion with operators indicates that procedures for both types are the same and that the same pilots operate both variants.

Current operators of the 747-400 and 747-8 at SDF have provided information related to development of these AEDT profiles and have indicated that these profiles are representative of current 2024 operations and are expected to be in place in the future. This user-defined profile submission has been prepared in accordance with FAA guidance. The profile information and supporting documentation is included in the following sections.

Overall, the proposed user-defined profiles reflect current SDF Boeing 747 procedures that operators refer to as "NADP 2." In simple terms, these procedures are described with the following steps:

- Take-off thrust and take-off flaps while climbing at constant airspeed speed to 1,000 ft Above Field Elevation (AFE);
- At 1,000 ft AFE, reduce thrust to climb thrust setting, reduce aircraft pitch, accelerate and retract flaps on the aircraft manufacturer's recommended speed schedule (i.e., sometimes referred to as "retract flaps on schedule" or "flap retraction schedule");
- Continue accelerating to 250 knots indicated airspeed with flaps fully retracted; and
- Constant speed climb at 250 knots to 10,000 ft AFE.

The closest profiles available with AEDT include an additional climb step between acceleration for the "retract flaps on schedule" step and the "accelerating to 250 knots indicated airspeed with flaps fully retracted" step. Current operators of the Boeing 747 have indicated that the extra climb segment within the default AEDT profiles is not representative of actual operations at SDF. The proposed user-defined profiles developed are modifications of existing AEDT profiles and continue to use AEDT's flap retraction schedule for a given weight.

The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Boeing 747s operations will be represented with AEDT ANP stage lengths 1 – 7, while stage lengths 8 – 9 will be used much less often.

HMMH has prepared this documentation in accordance with Section 5 of FAA's document titled "Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA" dated October 27, 2017.[1]

[1] https://aedt.faa.gov/Documents/guidance_aedt_nepa.pdf

Contents

Figures

Tables

B.1. Boeing 747-400 (ANP Type 747400) Profile Review with AEDT 3f

B.1.1. Statement of Benefit

Operators at SDF use a version of "Noise Abatement Departures Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. The proposed 747400 climb profiles and thrust settings during the various stages of flight provide a better representation of what is actually being flown by cargo aircraft at SDF. These profiles were developed from the default (i.e. included) reduced thrust profiles in AEDT.

The proposed user-defined profiles were developed with considerations of SDF runway specific length and minimum climb requirements. Correspondence with the operators has indicated a high agreement with their procedures at SDF.

B.1.1.1. Figures Supporting Statement of Benefit

Figure B-1 and **Figure B-3** compare the standard AEDT profiles and proposed profiles to actual aircraft climb performance at SDF. **Figure B-2** and **Figure B-4** compare the standard AEDT profiles and proposed profiles to actual aircraft ground speed profiles at SDF. The standard profiles are identified in the figure legends as "Stage length - Weight". The proposed profiles are identified in the figure legends as "Name – Stage length - Weight."

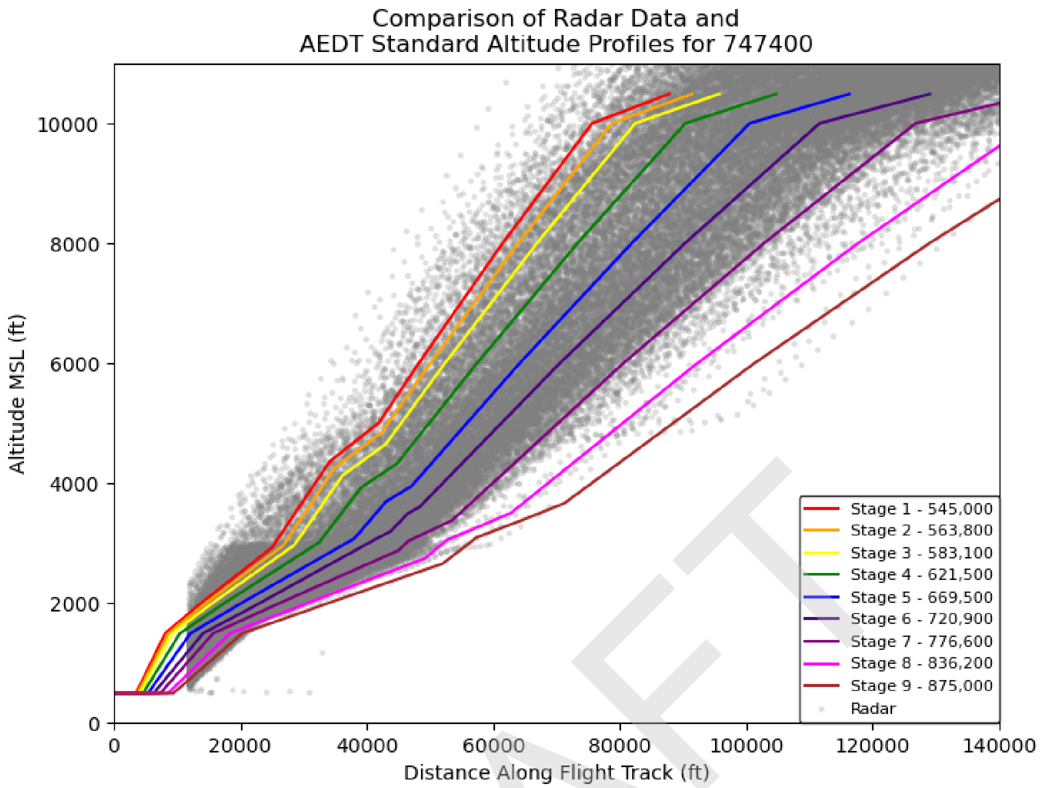

Figure B-1. 747400 AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

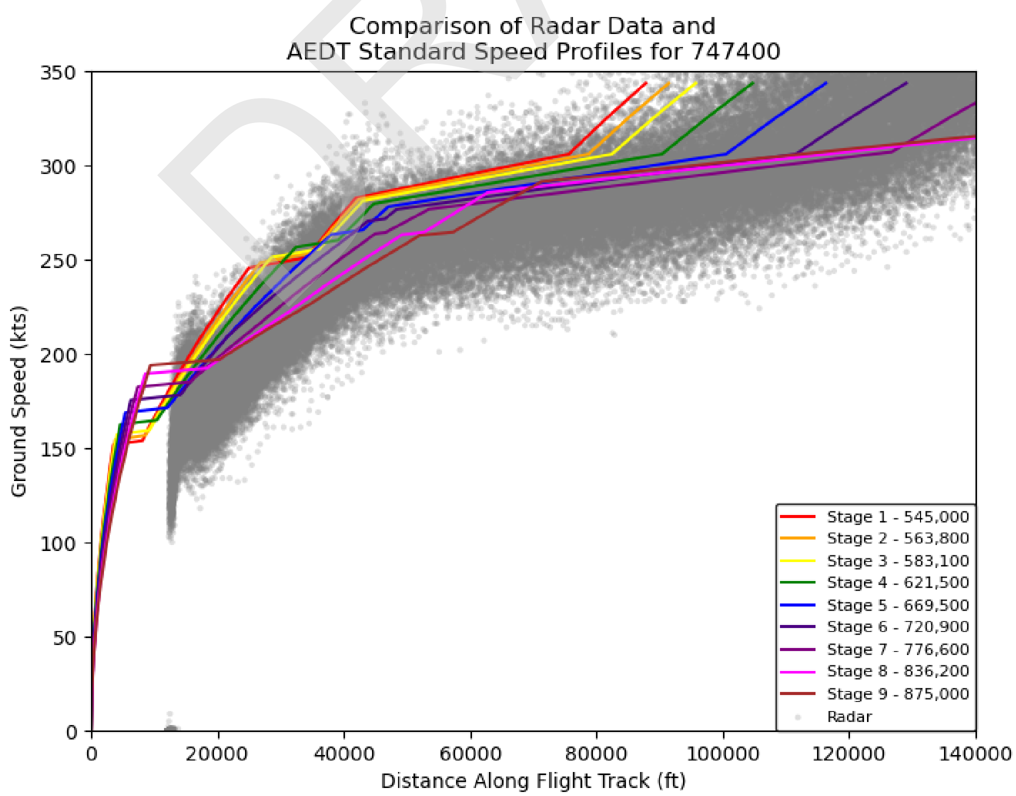

Figure B-2. 747400 AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

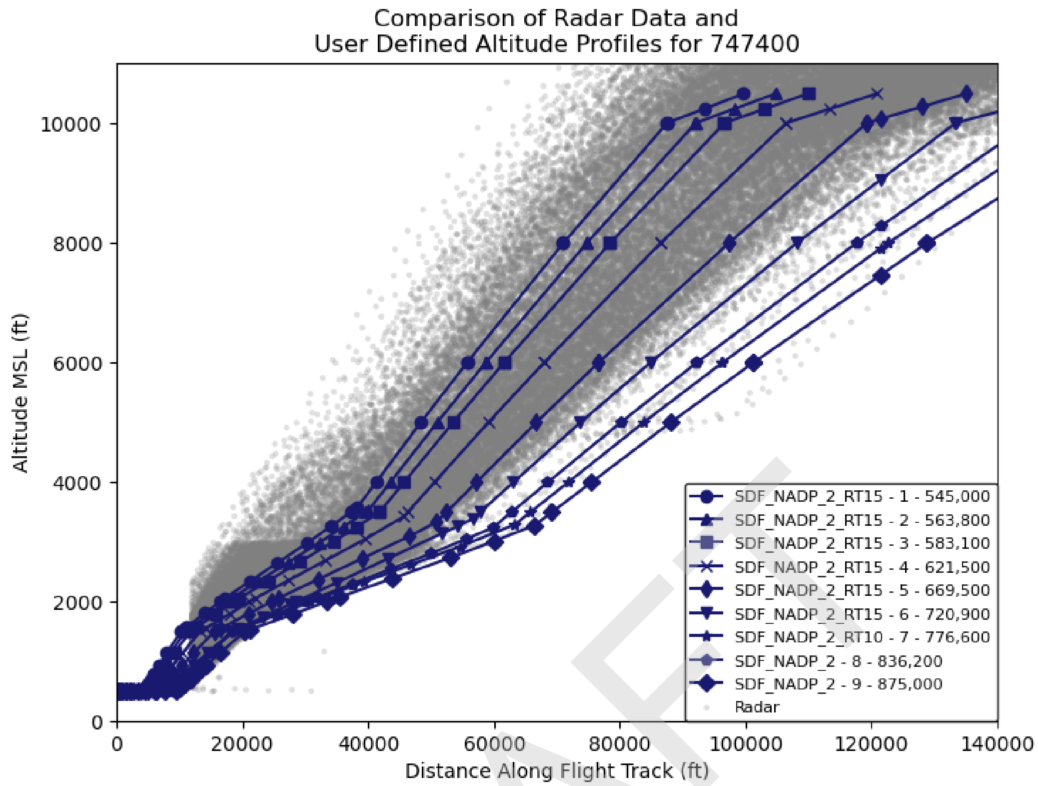

Figure B-3. 747400 Proposed Altitude Profiles Compared to Actual Aircraft Performance

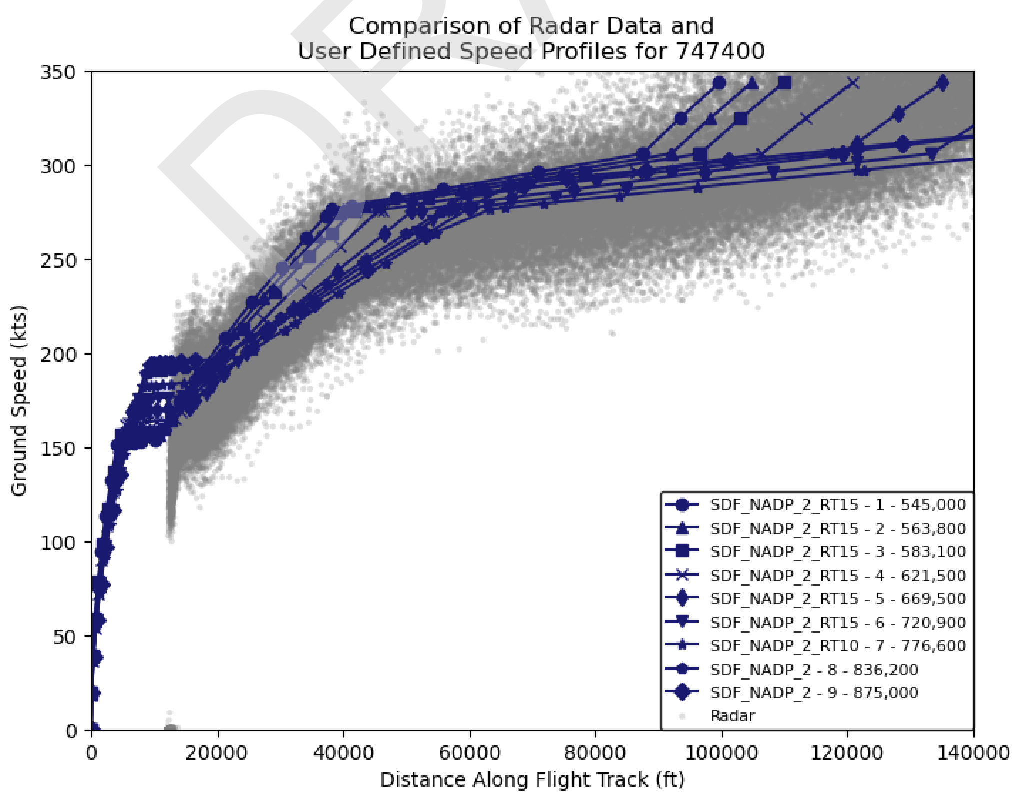

Figure B-4. 747400 Proposed Speed Profiles Compared to Actual Aircraft Performance

B.1.2. Analysis Demonstrating Benefit

The differences between the existing 747400 profiles in AEDT 3f and the proposed user-defined profiles are primarily due to the use of reduced thrust and climb altitude on departure. The sound exposure level results under the flight path from the user-defined departure procedures are shown in **Section B.1.5.1**. Overall, the proposed user-defined profiles at most weights show less noise associated with the take-off roll, a different location where aircraft change from take-off thrust to climb thrust, and additional noise under the flight path miles out because of a slower climb. At the higher weights with maximum thrust, the proposed user-defined profiles produce noise results almost identical to the AEDT standard profiles.

B.1.3. Concurrence on Aircraft Performance

Preparation of these profiles for the current project and AEDT 3f was done in cooperation with the relevant airline. Airline concurrence documentation accompanies this memorandum for submission to FAA.

B.1.4. Certification of New Parameters

The profiles developed for this study are procedure step profiles created by modifying profiles already included in AEDT 3f. Screenshots from the AEDT user interface (UI) of starting default profiles and the proposed user-defined profiles are presented for comparison as **Figure B-5** through **Figure B-22**. An AEDT study containing the profiles developed for this project is available in electronic form upon request. Altitudes are listed as feet above airfield elevation. Speeds are entered as true airspeed in units of knots. Thrust is in units of pounds which matches the units of thrust settings used in the aircraft's associated noise-power-distance curves.

B.1.4.1. 747400, Profile Weight 545,000

The “stage length 1” user-defined profile for the 747400 assumes a weight of 545,000 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1 to remove the climb at 3,869 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

3093	MODIFIED_RT15	Procedural	545000	1	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT151	1	Takeoff	10	Max Takeoff 15% Reduced			
MODIFIED_RT151	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT151	3	Percent Accelerate	10	Max Climb 10% Reduced		190.8	50
MODIFIED_RT151	4	Percent Accelerate	T_05	Max Climb 10% Reduced		242	55
MODIFIED_RT151	5	Climb	5	Max Climb 10% Reduced	3869		
MODIFIED_RT151	6	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
MODIFIED_RT151	7	Climb	T_00H	Max Climb 10% Reduced	5500		
MODIFIED_RT151	8	Climb	T_00H	Max Climb 10% Reduced	7500		
MODIFIED_RT151	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-5. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1

100007	SDF_NADP_2_RT15	Procedural	545000	1	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT151	1	Takeoff	10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT151	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT151	3	Percent Accelerate	10	Max Climb 10% Reduced		190.8	50
SDF_NADP_2_RT151	4	Percent Accelerate	T_05	Max Climb 10% Reduced		242	55
SDF_NADP_2_RT151	5	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
SDF_NADP_2_RT151	6	Climb	T_00H	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT151	7	Climb	T_00H	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT151	8	Climb	T_00H	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT151	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-6. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1

B.1.4.2. 747400, Profile Weight 563,800

The “stage length 2” user-defined profile for the 747400 assumes a weight of 563,800 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_15; PROF_ID2: 2. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2 to remove the climb at 3,756 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

3094	MODIFIED_RT15	Procedural	563800	2	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT152	1	Takeoff	10	Max Takeoff 15% Reduced			
MODIFIED_RT152	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT152	3	Percent Accelerate	10	Max Climb 10% Reduced		192.9	50
MODIFIED_RT152	4	Percent Accelerate	T_05	Max Climb 10% Reduced		244.6	55
MODIFIED_RT152	5	Climb	T_01	Max Climb 10% Reduced	3756		
MODIFIED_RT152	6	Percent Accelerate	T_00H	Max Climb 10% Reduced		269	55
MODIFIED_RT152	7	Climb	T_00H	Max Climb 10% Reduced	5500		
MODIFIED_RT152	8	Climb	T_00H	Max Climb 10% Reduced	7500		
MODIFIED_RT152	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-7. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2

100008	SDF_NADP_2_RT15	Procedural	563800	2	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT152	1	Takeoff	10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT152	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT152	3	Percent Accelerate	10	Max Climb 10% Reduced		192.9	50
SDF_NADP_2_RT152	4	Percent Accelerate	T_05	Max Climb 10% Reduced		244.6	55
SDF_NADP_2_RT152	5	Percent Accelerate	T_00H	Max Climb 10% Reduced		269	55
SDF_NADP_2_RT152	6	Climb	T_00H	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT152	7	Climb	T_00H	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT152	8	Climb	T_00H	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT152	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-8. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2

B.1.4.3. 747400, Profile Weight 583,100

The “stage length 3” user-defined profile for the 747400 assumes a weight of 583,100 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_15; PROF_ID2: 3. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 3 to remove the climb at 3,637 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

3095	MODIFIED_RT15	Procedural	583100	3	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT153	1	Takeoff	10	Max Takeoff 15% Reduced			
MODIFIED_RT153	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT153	3	Percent Accelerate	10	Max Climb 10% Reduced		195.1	50
MODIFIED_RT153	4	Percent Accelerate	T_05	Max Climb 10% Reduced		247.2	55
MODIFIED_RT153	5	Climb	T_01	Max Climb 10% Reduced	3637		
MODIFIED_RT153	6	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
MODIFIED_RT153	7	Climb	T_00H	Max Climb 10% Reduced	5500		
MODIFIED_RT153	8	Climb	T_00H	Max Climb 10% Reduced	7500		
MODIFIED_RT153	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-9. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 3

100009	SDF_NADP_2_RT15	Procedural	583100	3	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT153	1	Takeoff	10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT153	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT153	3	Percent Accelerate	10	Max Climb 10% Reduced		195.1	50
SDF_NADP_2_RT153	4	Percent Accelerate	T_05	Max Climb 10% Reduced		247.2	55
SDF_NADP_2_RT153	5	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
SDF_NADP_2_RT153	6	Climb	T_00H	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT153	7	Climb	T_00H	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT153	8	Climb	T_00H	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT153	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-10. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 3

B.1.4.4. 747400, Profile Weight 621,500

The “stage length 4” user-defined profile for the 747400 assumes a weight of 621,500 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_15; PROF_ID2: 4. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 4 to remove the climb at 3,435 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

3096	MODIFIED_RT15	Procedural	621500	4	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT154	1	Takeoff	10	Max Takeoff 15% Reduced			
MODIFIED_RT154	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT154	3	Percent Accelerate	10	Max Climb 10% Reduced		199.4	50
MODIFIED_RT154	4	Percent Accelerate	T_05	Max Climb 10% Reduced		252.3	55
MODIFIED_RT154	5	Climb	T_01	Max Climb 10% Reduced	3435		
MODIFIED_RT154	6	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
MODIFIED_RT154	7	Climb	T_00H	Max Climb 10% Reduced	5500		
MODIFIED_RT154	8	Climb	T_00H	Max Climb 10% Reduced	7500		
MODIFIED_RT154	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-11. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 4

100025	SDF_NADP_2_RT15	Procedural	621500	4	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT154	1	Takeoff	10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT154	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT154	3	Percent Accelerate	10	Max Climb 10% Reduced		199.4	50
SDF_NADP_2_RT154	4	Percent Accelerate	T_05	Max Climb 10% Reduced		252.3	55
SDF_NADP_2_RT154	5	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
SDF_NADP_2_RT154	6	Climb	T_00H	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT154	7	Climb	T_00H	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT154	8	Climb	T_00H	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT154	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-12. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 4

B.1.4.5. 747400, Profile Weight 669,500

The "stage length 5" user-defined profile for the 747400 assumes a weight of 669,500 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_15; PROF_ID2: 5. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 5 to remove the climb at 3,199 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

3097	MODIFIED_RT15	Procedural	669500	5	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT155	1	Takeoff	10	Max Takeoff 15% Reduced			
MODIFIED_RT155	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT155	3	Percent Accelerate	10	Max Climb 10% Reduced		204.8	50
MODIFIED_RT155	4	Percent Accelerate	T_05	Max Climb 10% Reduced		258.4	55
MODIFIED_RT155	5	Climb	T_01	Max Climb 10% Reduced	3199		
MODIFIED_RT155	6	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
MODIFIED_RT155	7	Climb	T_00H	Max Climb 10% Reduced	5500		
MODIFIED_RT155	8	Climb	T_00H	Max Climb 10% Reduced	7500		
MODIFIED_RT155	9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure B-13. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 5

100026	SDF_NADP_2_RT15	Procedural	669500	5	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT155	1	Takeoff	10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT155	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT155	3	Percent Accelerate	10	Max Climb 10% Reduced		204.8	50
SDF_NADP_2_RT155	4	Percent Accelerate	T_05	Max Climb 10% Reduced		258.4	55
SDF_NADP_2_RT155	5	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	55
SDF_NADP_2_RT155	6	Climb	T_00H	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT155	7	Climb	T_00H	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT155	8	Climb	T_00H	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT155	9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure B-14. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 5

B.1.4.6. 747400, Profile Weight 720,900

The "stage length 6" user-defined profile for the 747400 assumes a weight of 720,900 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_15; PROF_ID2: 6. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 6 to remove the climb at 3,004 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3098	MODIFIED_RT15	Procedural	720900	6	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT156	1	Takeoff	10	Max Takeoff 15% Reduced			
MODIFIED_RT156	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT156	3	Percent Accelerate	5	Max Climb 10% Reduced		210.4	55
MODIFIED_RT156	4	Percent Accelerate	5	Max Climb 10% Reduced		259.5	50
MODIFIED_RT156	5	Percent Accelerate	T_01	Max Climb 10% Reduced		264.7	55
MODIFIED_RT156	6	Climb	T_01	Max Climb 10% Reduced	3004		
MODIFIED_RT156	7	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	50
MODIFIED_RT156	8	Climb	T_00H	Max Climb 10% Reduced	5500		
MODIFIED_RT156	9	Climb	T_00H	Max Climb 10% Reduced	7500		
MODIFIED_RT156	10	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-15. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 6

100027	SDF_NADP_2_RT15	Procedural	720900	6	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT156	1	Takeoff	10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT156	2	Climb	T_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT156	3	Percent Accelerate	5	Max Climb 10% Reduced		210.4	55
SDF_NADP_2_RT156	4	Percent Accelerate	5	Max Climb 10% Reduced		259.5	50
SDF_NADP_2_RT156	5	Percent Accelerate	T_01	Max Climb 10% Reduced		264.7	55
SDF_NADP_2_RT156	6	Percent Accelerate	ZERO	Max Climb 10% Reduced		269	50
SDF_NADP_2_RT156	7	Climb	T_00H	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT156	8	Climb	T_00H	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT156	9	Climb	T_00H	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT156	10	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-16. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 6

B.1.4.7. 747400, Profile Weight 776,600

The "stage length 7" user-defined profile for the 747400 assumes a weight of 776,600 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_10; PROF_ID2: 7. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 7 to remove the climb at 2,544 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

3090	MODIFIED_RT10	Procedural	776600	7	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT107	1	Takeoff	10	Max Takeoff 10% Reduced			
MODIFIED_RT107	2	Climb	T_10H	Max Takeoff 10% Reduced	1000		
MODIFIED_RT107	3	Percent Accelerate	10	Max Climb 10% Reduced		216.4	50
MODIFIED_RT107	4	Percent Accelerate	5	Max Climb 10% Reduced		259.6	55
MODIFIED_RT107	5	Climb	T_01	Max Climb 10% Reduced	2544		
MODIFIED_RT107	6	Percent Accelerate	T_05	Max Climb 10% Reduced		270	45
MODIFIED_RT107	7	Climb	T_00H	Max Climb 10% Reduced	5500		
MODIFIED_RT107	8	Climb	T_00H	Max Climb 10% Reduced	7500		
MODIFIED_RT107	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-17. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 7

100028	SDF_NADP_2_RT10	Procedural	776600	7	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT107	1	Takeoff	10	Max Takeoff 10% Reduced			
SDF_NADP_2_RT107	2	Climb	T_10H	Max Takeoff 10% Reduced	1000		
SDF_NADP_2_RT107	3	Percent Accelerate	10	Max Climb 10% Reduced		216.4	50
SDF_NADP_2_RT107	4	Percent Accelerate	5	Max Climb 10% Reduced		259.6	55
SDF_NADP_2_RT107	5	Percent Accelerate	T_05	Max Climb 10% Reduced		270	45
SDF_NADP_2_RT107	6	Climb	T_00H	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT107	7	Climb	T_00H	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT107	8	Climb	T_00H	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT107	9	Climb	T_00H	Max Climb 10% Reduced	10000		

Figure B-18. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 7

B.1.4.8. 747400, Profile Weight 836,200

The “stage length 8” user-defined profile for the 747400 assumes a weight of 836,200 lbs, and is identified as PROF_ID1: SDF_NADP_2; PROF_ID2: 8. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 8 to change the thrust level to “Max Takeoff” in Steps 1 and 2, and to remove the climb at 2,561 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

⊟	3082	MODIFIED_RT05	Procedural	836200	8	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT058	1	Takeoff	10	Max Takeoff 5% Reduced			
MODIFIED_RT058	2	Climb	T_10H	Max Takeoff 5% Reduced	1000		
MODIFIED_RT058	3	Percent Accelerate	10	Max Climb		222.8	50
MODIFIED_RT058	4	Percent Accelerate	5	Max Climb		259.6	55
MODIFIED_RT058	5	Climb	T_01	Max Climb	2561		
MODIFIED_RT058	6	Percent Accelerate	T_01	Max Climb		270	55
MODIFIED_RT058	7	Percent Accelerate	T_00H	Max Climb		278	55
MODIFIED_RT058	8	Climb	T_00H	Max Climb	5500		
MODIFIED_RT058	9	Climb	T_00H	Max Climb	7500		
MODIFIED_RT058	10	Climb	T_00H	Max Climb	10000		

Figure B-19. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 8

⊟	100029	SDF_NADP_2	Procedural	836200	8	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_28	1	Takeoff	10	Max Takeoff			
SDF_NADP_28	2	Climb	T_10H	Max Takeoff	1000		
SDF_NADP_28	3	Percent Accelerate	10	Max Climb		222.8	50
SDF_NADP_28	4	Percent Accelerate	5	Max Climb		259.6	55
SDF_NADP_28	5	Percent Accelerate	T_01	Max Climb		270	55
SDF_NADP_28	6	Percent Accelerate	T_00H	Max Climb		278	55
SDF_NADP_28	7	Climb	T_00H	Max Climb	4500		
SDF_NADP_28	8	Climb	T_00H	Max Climb	5500		
SDF_NADP_28	9	Climb	T_00H	Max Climb	7500		
SDF_NADP_28	10	Climb	T_00H	Max Climb	10000		

Figure B-20. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2; PROF_ID2: 8

B.1.4.9. 747400, Profile Weight 875,000

The "stage length 9" user-defined profile for the 747400 assumes a weight of 875,000 lbs, and is identified as PROF_ID1: SDF_NADP_2; PROF_ID2: 9. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 9 to change the thrust level to "Max Takeoff" in Steps 1 and 2, and to remove the climb at 2,600 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3083	MODIFIED_RT05	Procedural	875000	9	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT059	1	Takeoff	10	Max Takeoff 5% Reduced			
MODIFIED_RT059	2	Climb	T_10H	Max Takeoff 5% Reduced	1000		
MODIFIED_RT059	3	Percent Accelerate	10	Max Climb		226.8	50
MODIFIED_RT059	4	Percent Accelerate	5	Max Climb		259.6	55
MODIFIED_RT059	5	Climb	T_01	Max Climb	2600		
MODIFIED_RT059	6	Percent Accelerate	T_01	Max Climb		271.8	55
MODIFIED_RT059	7	Percent Accelerate	T_00H	Max Climb		282.7	55
MODIFIED_RT059	8	Climb	T_00H	Max Climb	5500		
MODIFIED_RT059	9	Climb	T_00H	Max Climb	7500		
MODIFIED_RT059	10	Climb	T_00H	Max Climb	10000		

Figure B-21. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 9

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_29	1	Takeoff	10	Max Takeoff			
SDF_NADP_29	2	Climb	T_10H	Max Takeoff	1000		
SDF_NADP_29	3	Percent Accelerate	10	Max Climb		226.8	50
SDF_NADP_29	4	Percent Accelerate	5	Max Climb		259.6	55
SDF_NADP_29	5	Percent Accelerate	T_01	Max Climb		271.8	55
SDF_NADP_29	6	Percent Accelerate	T_00H	Max Climb		282.7	55
SDF_NADP_29	7	Climb	T_00H	Max Climb	4500		
SDF_NADP_29	8	Climb	T_00H	Max Climb	5500		
SDF_NADP_29	9	Climb	T_00H	Max Climb	7500		
SDF_NADP_29	10	Climb	T_00H	Max Climb	10000		

Figure B-22. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2; PROF_ID2: 9

B.1.5. Graphical and Tabular Comparison

An accompanying MS Excel file, “Appendix_A_Profile_Performance.xls”, contains the profile points as found in the AEDT XML Performance Report Export file for comparison of performance data to the AEDT Standard profiles.

B.1.5.1. Tables and Figures Supporting Analysis Demonstrating Benefit

Table B-1 through **Table B-9** show the Sound Exposure Level (SEL) results under the flight path from the user-defined departure profiles; SEL values resulting from the standard AEDT departure profiles are presented for comparison. **Figure B-23** through **Figure B-31** show the same SEL computations in the form of SEL contours.

Table B-1. SELs for 747400 Departures at 545,000 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 545,000 lbs. (PROF_ID2 = 1) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	135.9	131.1	-4.8
0.5	122.4	120.3	-2.2
1.0	105.8	105.9	0.0
1.5	99.0	100.3	1.3
2.0	96.0	96.3	0.3
2.5	94.1	94.5	0.4
3.0	92.7	92.8	0.2
3.5	91.3	91.5	0.3
4.0	90.0	90.4	0.5
4.5	88.8	89.3	0.5
5.0	87.8	88.2	0.5
5.5	86.8	87.3	0.5
6.0	86.0	86.5	0.5
6.5	85.1	85.6	0.5
7.0	84.2	84.6	0.5
7.5	83.6	83.9	0.3
8.0	82.8	83.1	0.2
8.5	82.3	82.5	0.2
9.0	81.7	81.8	0.0
9.5	81.2	81.2	0.0
10.0	80.7	80.7	0.0

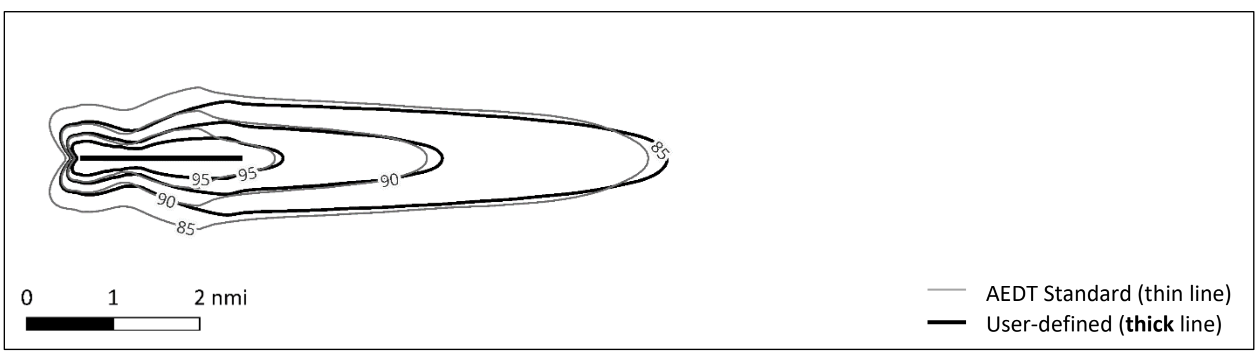

Figure B-23. SEL Contours for 747400 Departures at Take-Off Weight 545,000 Pounds

Table B-2. SELs for 747400 Departures at 563,800 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 563,800 lbs. (PROF_ID2 = 2) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	135.8	131.0	-4.8
0.5	122.4	120.2	-2.2
1.0	106.6	107.0	0.5
1.5	101.0	101.0	0.0
2.0	96.3	96.7	0.5
2.5	94.5	94.8	0.4
3.0	93.0	93.3	0.3
3.5	91.8	92.0	0.3
4.0	90.5	90.9	0.4
4.5	89.2	89.8	0.5
5.0	88.1	88.8	0.7
5.5	87.2	87.9	0.8
6.0	86.4	87.0	0.6
6.5	85.4	86.1	0.6
7.0	84.5	85.3	0.8
7.5	83.9	84.5	0.6
8.0	83.2	83.7	0.5
8.5	82.6	83.0	0.3
9.0	82.1	82.4	0.3
9.5	81.6	81.7	0.2
10.0	81.1	81.2	0.1

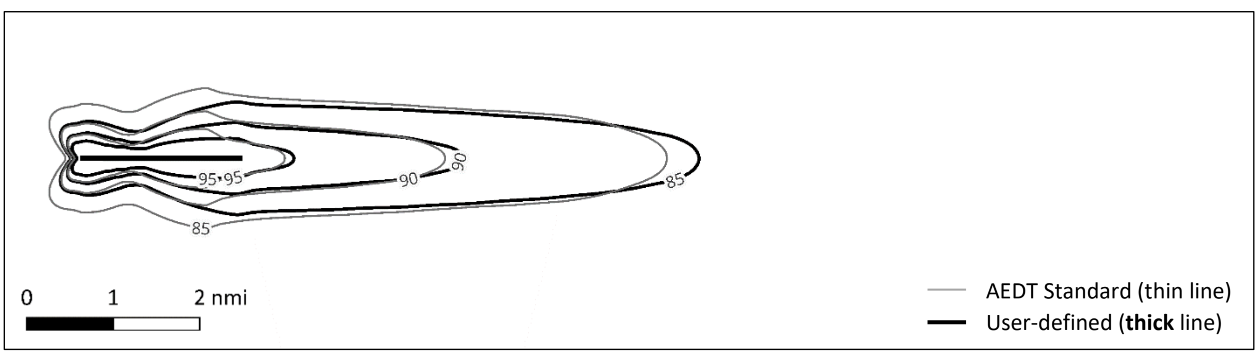

Figure B-24. SEL Contours for 747400 Departures at Take-Off Weight 563,800 Pounds

Table B-3. SELs for 747400 Departures at 583,100 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 583,100 lbs. (PROF_ID2 = 3) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	135.7	130.9	-4.8
0.5	123.1	120.2	-2.9
1.0	107.5	108.4	1.0
1.5	102.3	101.6	-0.7
2.0	96.7	98.0	1.3
2.5	94.9	95.3	0.5
3.0	93.5	93.8	0.3
3.5	92.2	92.4	0.2
4.0	91.0	91.3	0.4
4.5	89.8	90.3	0.5
5.0	88.7	89.3	0.6
5.5	87.7	88.4	0.7
6.0	86.8	87.6	0.8
6.5	85.9	86.7	0.8
7.0	85.1	85.8	0.8
7.5	84.4	85.0	0.6
8.0	83.7	84.3	0.6
8.5	83.1	83.6	0.5
9.0	82.6	82.9	0.3
9.5	82.0	82.3	0.3
10.0	81.5	81.7	0.2

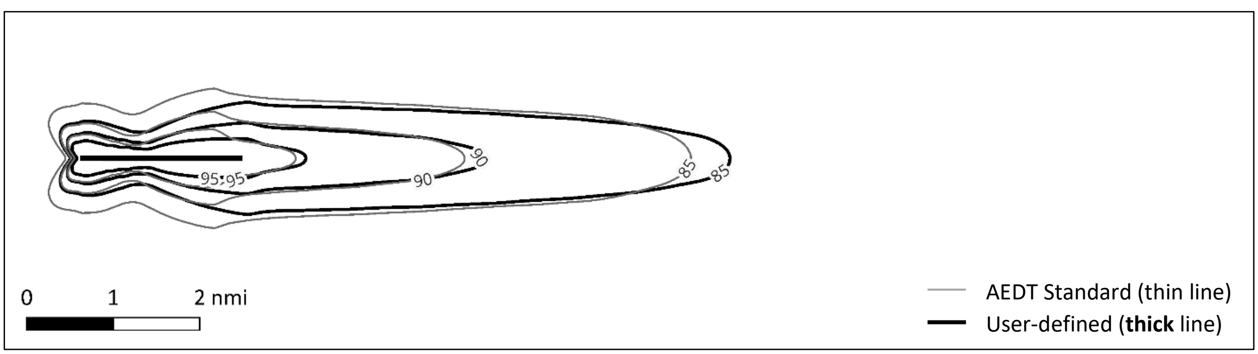

Figure B-25. SEL Contours for 747400 Departures at Take-Off Weight 583,100 Pounds

Table B-4. SELs for 747400 Departures at 621,500 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 621,500 lbs. (PROF_ID2 = 4) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	136.1	131.3	-4.8
0.5	123.0	120.6	-2.3
1.0	109.6	112.2	2.6
1.5	103.2	103.2	0.0
2.0	97.5	99.5	2.0
2.5	95.7	96.1	0.4
3.0	94.2	94.6	0.4
3.5	93.0	93.4	0.3
4.0	91.8	92.1	0.3
4.5	90.8	91.2	0.4
5.0	89.8	90.3	0.5
5.5	88.8	89.4	0.6
6.0	87.8	88.6	0.8
6.5	87.0	87.8	0.8
7.0	86.2	87.0	0.8
7.5	85.3	86.2	0.9
8.0	84.7	85.5	0.8
8.5	84.0	84.7	0.7
9.0	83.5	84.1	0.6
9.5	82.9	83.4	0.5
10.0	82.4	82.8	0.4

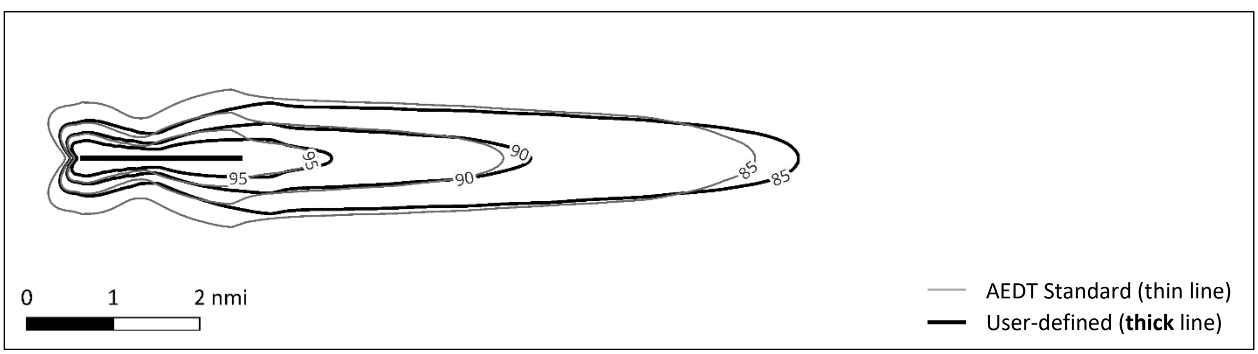

Figure B-26. SEL Contours for 747400 Departures at Take-Off Weight 621,500 Pounds

Table B-5. SELs for 747400 Departures at 669,500 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 669,500 lbs. (PROF_ID2 = 5) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	135.9	131.1	-4.8
0.5	123.6	120.5	-3.1
1.0	113.6	118.5	5.0
1.5	104.7	105.4	0.6
2.0	101.3	101.1	-0.3
2.5	96.5	98.6	2.0
3.0	95.1	95.6	0.5
3.5	93.8	94.4	0.6
4.0	92.9	93.3	0.4
4.5	91.8	92.2	0.4
5.0	91.0	91.5	0.5
5.5	90.0	90.6	0.6
6.0	89.2	89.8	0.6
6.5	88.3	89.0	0.7
7.0	87.5	88.3	0.8
7.5	86.7	87.7	1.0
8.0	85.9	87.0	1.1
8.5	85.3	86.3	1.0
9.0	84.6	85.6	1.0
9.5	84.1	84.8	0.8
10.0	83.6	84.2	0.7

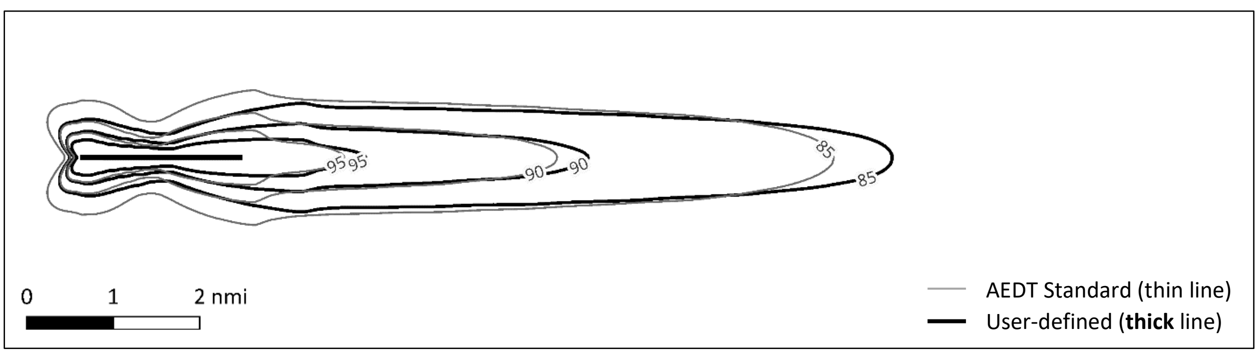

Figure B-27. SEL Contours for 747400 Departures at Take-Off Weight 669,500 Pounds

Table B-6. SELs for 747400 Departures at 720,900 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 720,900 lbs. (PROF_ID2 = 6) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	135.8	130.9	-4.8
0.5	123.6	121.2	-2.4
1.0	120.8	118.5	-2.3
1.5	106.7	108.5	1.8
2.0	102.5	103.0	0.5
2.5	97.7	100.1	2.4
3.0	95.9	98.1	2.2
3.5	94.6	95.4	0.7
4.0	93.5	94.2	0.7
4.5	92.6	93.2	0.6
5.0	91.6	92.2	0.6
5.5	90.9	91.5	0.6
6.0	90.0	90.6	0.7
6.5	89.3	89.9	0.7
7.0	88.6	89.3	0.7
7.5	87.8	88.5	0.7
8.0	87.0	87.9	0.9
8.5	86.3	87.3	1.1
9.0	85.7	86.8	1.1
9.5	85.0	86.1	1.0
10.0	84.5	85.5	1.0

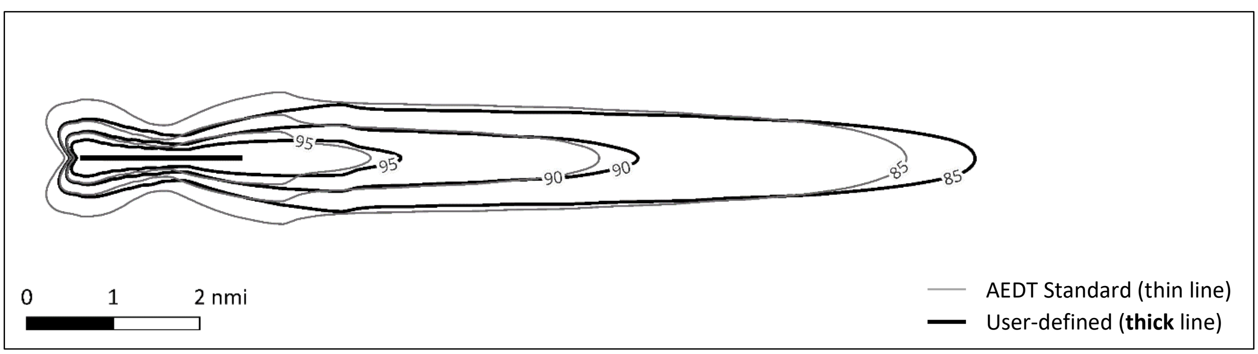

Figure B-28. SEL Contours for 747400 Departures at Take-Off Weight 720,900 Pounds

Table B-7. SELs for 747400 Departures at 720,900 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 720,900 lbs. (PROF_ID2 = 7) User PROF_ID1: SDF_NADP_2			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	136.0	132.8	-3.2
0.5	124.0	121.7	-2.4
1.0	120.8	119.6	-1.2
1.5	109.4	111.5	2.0
2.0	103.7	104.2	0.5
2.5	100.9	100.9	0.0
3.0	96.5	98.8	2.2
3.5	95.5	95.4	-0.1
4.0	94.5	94.6	0.1
4.5	93.6	93.6	0.0
5.0	92.8	92.9	0.2
5.5	92.0	92.1	0.1
6.0	91.3	91.4	0.2
6.5	90.5	90.8	0.3
7.0	89.8	90.1	0.3
7.5	89.2	89.7	0.5
8.0	88.4	89.0	0.5
8.5	87.9	88.5	0.6
9.0	87.3	87.9	0.6
9.5	86.7	87.4	0.7
10.0	86.0	87.0	0.9

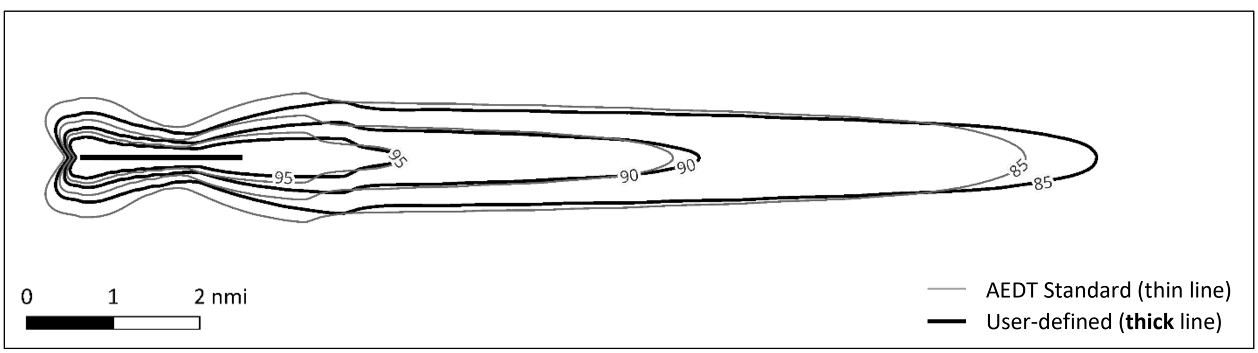

Figure B-29. SEL Contours for 747400 Departures at Take-Off Weight 720,900 Pounds

Table B-8. SELs for 747400 Departures at 836,200 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 836,200 lbs. (PROF_ID2 = 8) User PROF_ID1: SDF_NADP_2			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	135.9	135.9	0.0
0.5	124.8	124.8	0.0
1.0	121.3	121.3	0.0
1.5	115.6	115.6	0.0
2.0	106.0	106.0	0.0
2.5	102.5	102.5	0.0
3.0	100.3	100.3	0.0
3.5	96.3	96.3	0.0
4.0	95.5	95.5	0.0
4.5	94.5	94.5	0.0
5.0	93.8	93.8	0.0
5.5	92.9	92.9	0.0
6.0	92.4	92.3	0.0
6.5	91.6	91.6	0.0
7.0	91.1	91.1	0.0
7.5	90.4	90.4	0.0
8.0	89.8	89.8	0.0
8.5	89.1	89.2	0.1
9.0	88.4	88.6	0.2
9.5	87.9	88.1	0.2
10.0	87.4	87.5	0.1

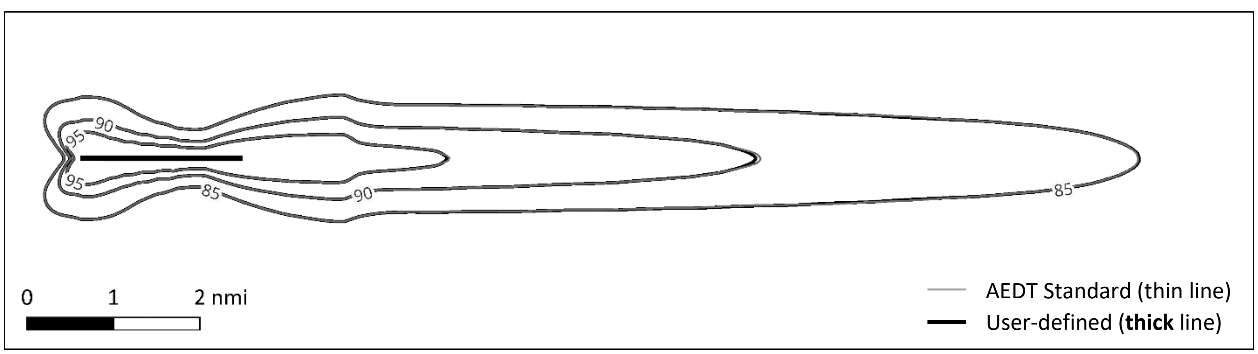

Figure B-30. SEL Contours for 747400 Departures at Take-Off Weight 836,200 Pounds

Table B-9. SELs for 747400 Departures at 875,000 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 747400 Profile Weight: 875,000 lbs. (PROF_ID2 = 9) User PROF_ID1: SDF_NADP_2			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	135.8	135.8	0.0
0.5	124.7	124.7	0.0
1.0	121.3	121.3	0.0
1.5	119.9	119.9	0.0
2.0	107.9	107.9	0.0
2.5	103.6	103.6	0.0
3.0	101.1	101.1	0.0
3.5	97.3	97.3	0.0
4.0	95.9	95.9	0.0
4.5	95.2	95.2	0.0
5.0	94.3	94.3	0.0
5.5	93.7	93.6	-0.1
6.0	92.9	92.9	0.0
6.5	92.3	92.3	-0.1
7.0	91.8	91.8	0.0
7.5	91.1	91.1	0.0
8.0	90.6	90.5	-0.1
8.5	90.0	90.1	0.0
9.0	89.3	89.5	0.2
9.5	88.6	88.9	0.3
10.0	88.1	88.4	0.3

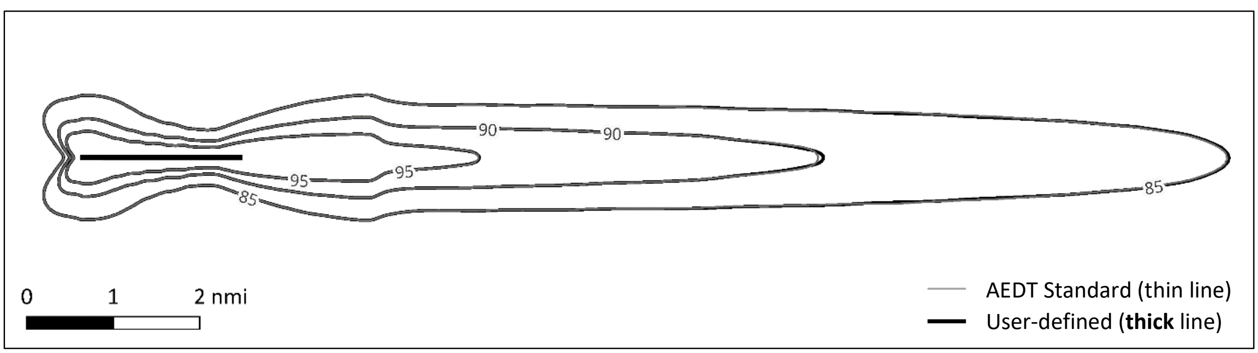

Figure B-31. SEL Contours for 747400 Departures at Take-Off Weight 875,000 Pounds

B.1.5.3. Graphical Comparison of Profiles

Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are included as **Figure** , **Figure** , and **Figure** , respectively.

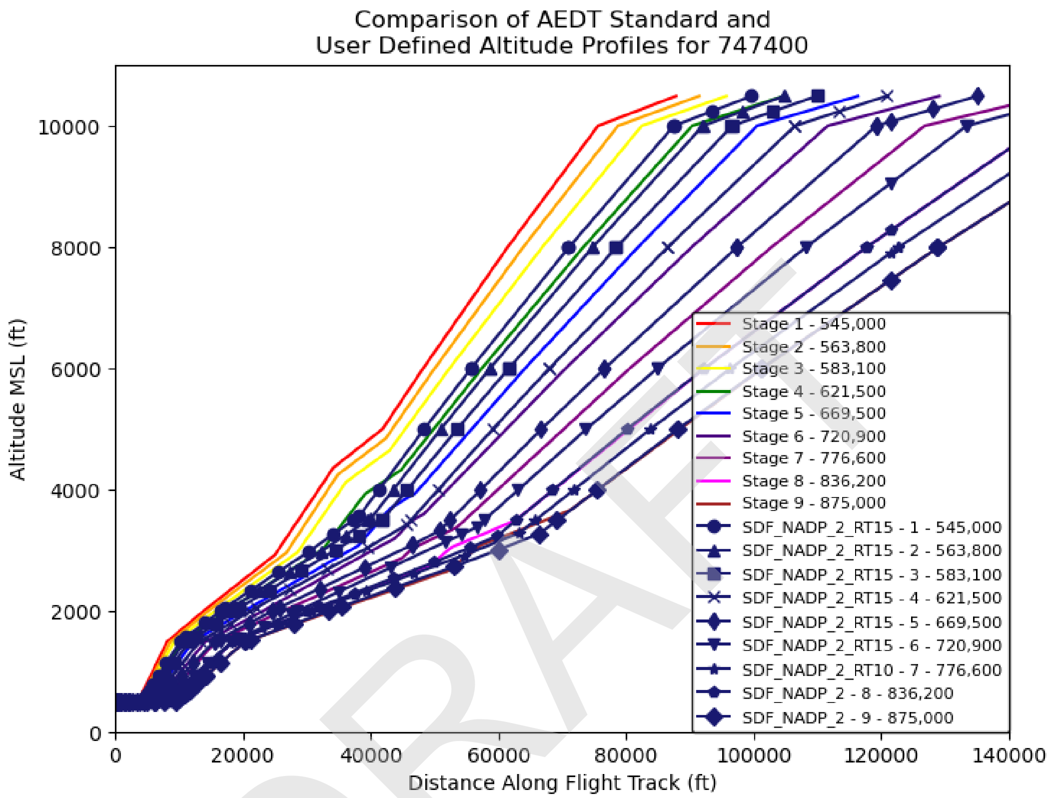

Figure B-32. 747400 AEDT Profiles, Altitude vs. Distance

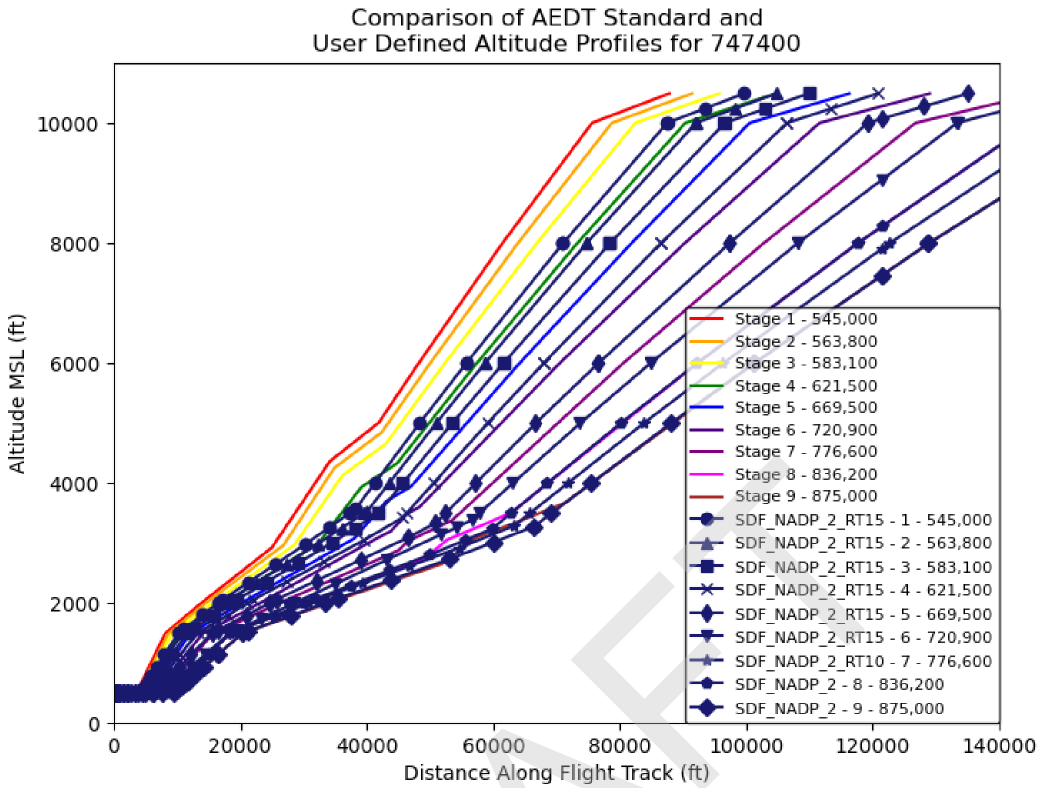

Figure B-33. 747400 AEDT Profiles, Speed vs. Distance

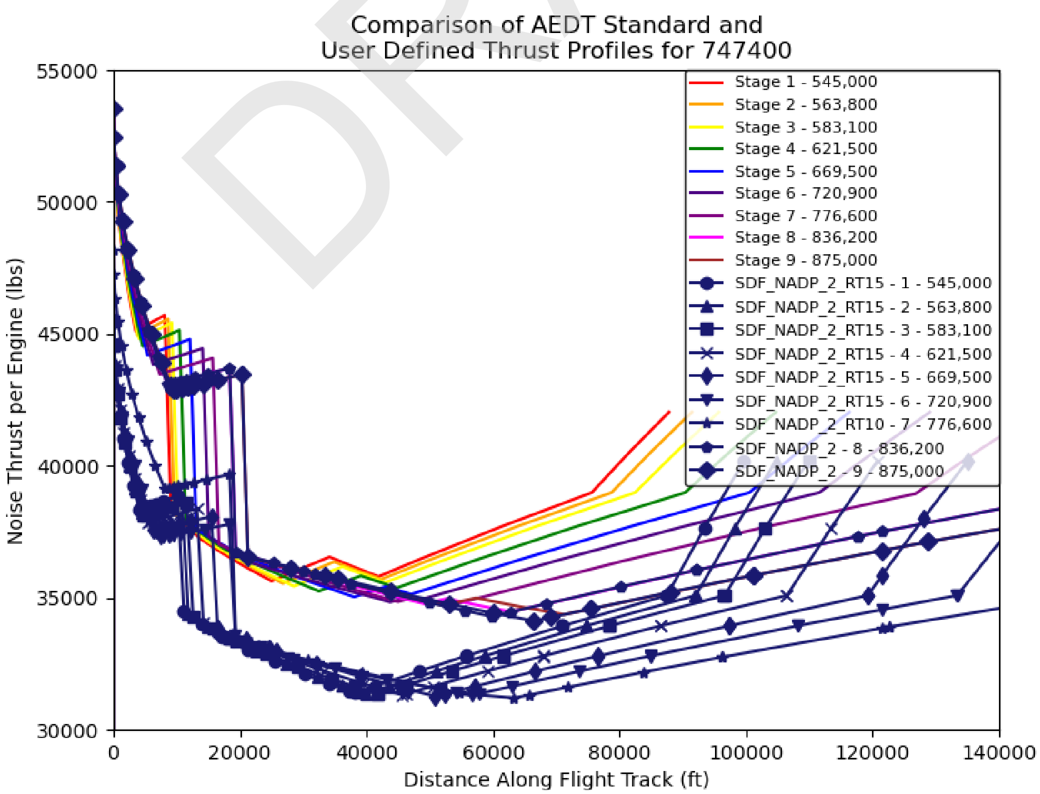

Figure B-34. 747400 AEDT Profiles, Thrust vs. Distance

B.2. Boeing 747-8 (ANP Type 7478) Profile Review with AEDT 3f

B.2.1. Statement of Benefit

Operators at SDF use a version of "Noise Abatement Departures Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. The proposed 7478 climb profiles and thrust settings during the various stages of flight provide a better representation of what is actually being flown by cargo aircraft at SDF. These profiles were developed from the default (i.e. included) reduced thrust profiles in AEDT.

The proposed user-defined profiles were developed with considerations of SDF runway specific length and minimum climb requirements. Correspondence with the operators has indicated high agreement with their procedures at SDF.

B.2.1.1. Figures Supporting Statement of Benefit

Figure B-35 and **Figure B-37** compare the standard AEDT profiles and proposed profiles to actual aircraft climb performance at SDF. **Figure B-36** and **Figure B-38** compare the standard AEDT profiles and proposed profiles to actual aircraft speed profiles at SDF. The standard profiles are identified in the figure legends as "Stage length - Weight". The proposed profiles are identified in the figure legends as "Name – Stage length - Weight."

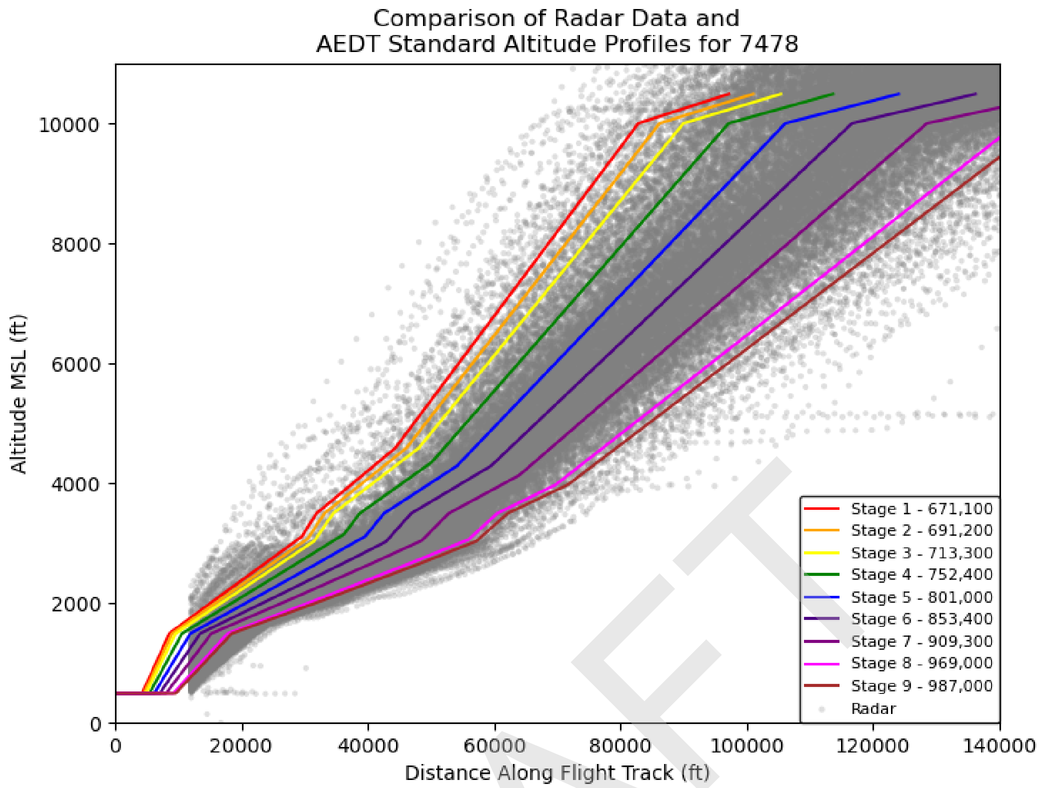

Figure B-35. 7478 AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

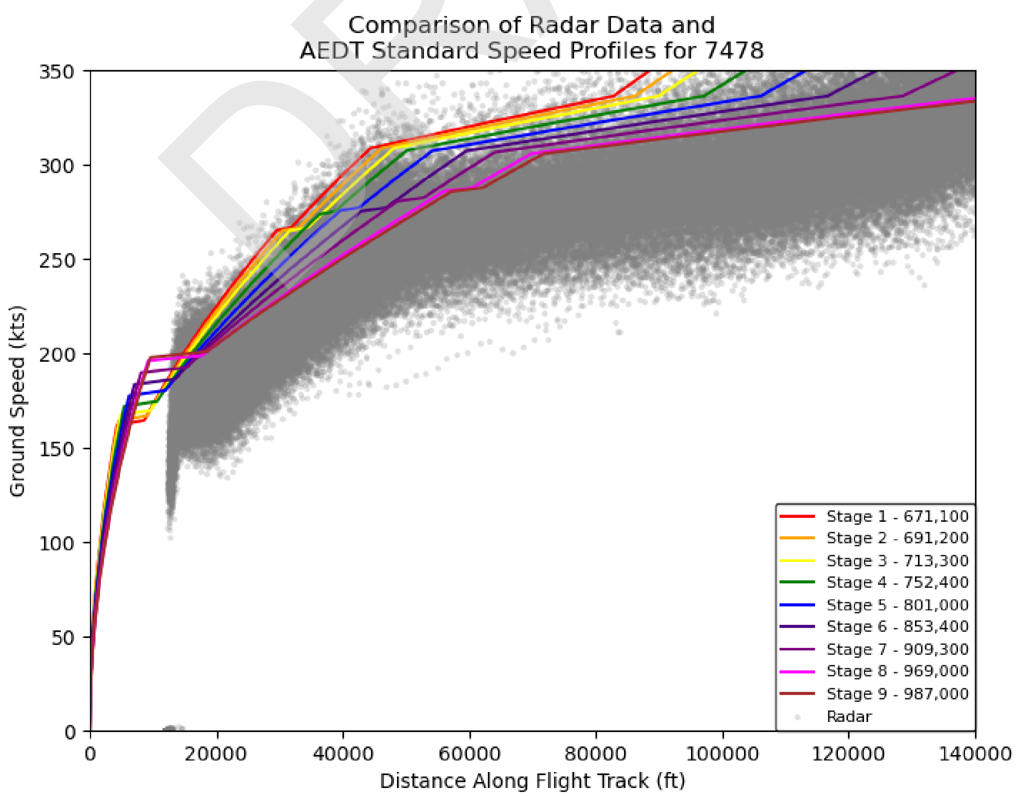

Figure B-36. 7478 AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

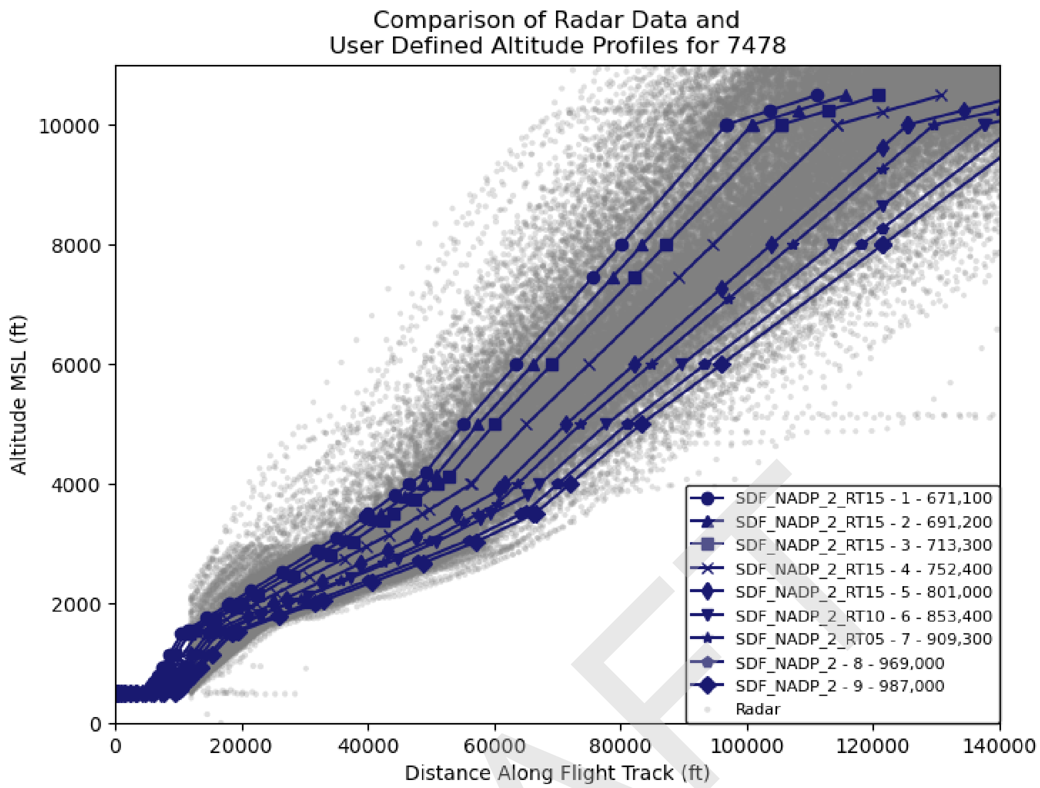

Figure B-37. 7478 Boeing Altitude Profiles Compared to Actual Aircraft Performance

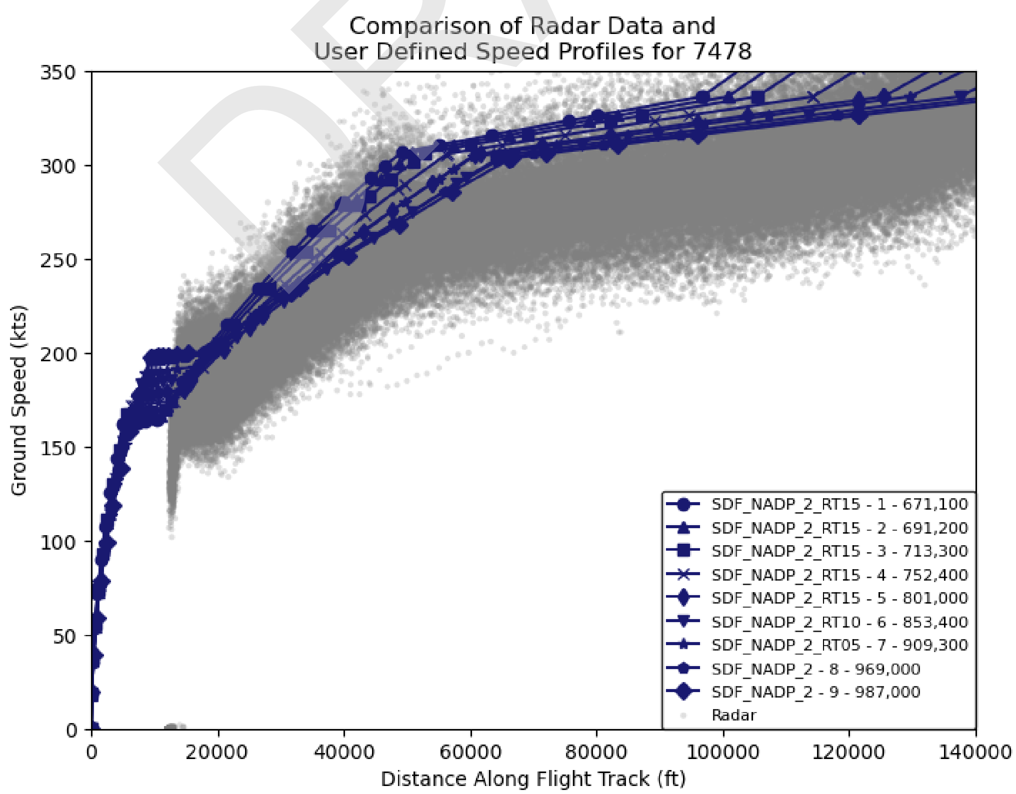

Figure B-38. 7478 Boeing Speed Profiles Compared to Actual Aircraft Performance

B.2.2. Analysis Demonstrating Benefit

The differences between the existing 7478 profiles in AEDT 3f and the proposed user-defined profiles are primarily due to the use of reduced thrust and climb altitude on departure. The sound exposure level results under the flight path from the user-defined departure procedures are shown in **Section B.2.5.1**. Overall, the proposed user-defined profiles at most weights show less noise associated with the take-off roll, a different location where aircraft change from take-off thrust to climb thrust, and additional noise under the flight path miles out because of a slower climb. At the higher weights with maximum thrust, the proposed user-defined profiles produce noise results almost identical to the AEDT standard profiles.

B.2.3. Concurrence on Aircraft Performance

Preparation of these profiles for the current project and AEDT 3f was done in cooperation with the relevant airline. Airline concurrence documentation accompanies this memorandum for submission to FAA.

B.2.4. Certification of New Parameters

The profiles developed for this study are procedure step profiles created by modifying profiles already included in AEDT 3f. Screenshots from the AEDT UI of starting default profiles and the proposed user-defined profiles are presented for comparison as **Figure B-39** through **Figure B-56**. An AEDT study containing the profiles developed for this project is available in electronic form upon request. Altitudes are listed as feet above airfield elevation. Speeds are entered in units of true airspeed in knots. Thrust is in units of pounds which matches the units of thrust settings used in the aircraft's associated noise-power-distance curves.

B.2.4.1. 7478, Profile Weight 671,100

The "stage length 1" user-defined profile for the 7478 assumes a weight of 671,100, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3156	MODIFIED_RT15	Procedural	671100	1	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT151	1	Takeoff	F_10	Max Takeoff 15% Reduced			
MODIFIED_RT151	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT151	3	Percent Accelerate	F_10	Max Climb 10% Reduced		215	55
MODIFIED_RT151	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
MODIFIED_RT151	5	Percent Accelerate	F_1	Max Climb 10% Reduced		260	55
MODIFIED_RT151	6	Climb	F_0	Max Climb 10% Reduced	3000		
MODIFIED_RT151	7	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
MODIFIED_RT151	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-39. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1

100016	SDF_NADP_2_RT15	Procedural	671100	1	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT151	1	Takeoff	F_10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT151	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT151	3	Percent Accelerate	F_10	Max Climb 10% Reduced		215	55
SDF_NADP_2_RT151	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
SDF_NADP_2_RT151	5	Percent Accelerate	F_1	Max Climb 10% Reduced		260	55
SDF_NADP_2_RT151	6	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
SDF_NADP_2_RT151	7	Climb	F_0	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT151	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-40. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1

B.2.4.2. 7478, Profile Weight 691,200

The “stage length 2” user-defined profile for the 7478 assumes a weight of 691,200 pounds, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3157	MODIFIED_RT15	Procedural	691200	2	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT152	1	Takeoff	F_10	Max Takeoff 15% Reduced			
MODIFIED_RT152	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT152	3	Percent Accelerate	F_10	Max Climb 10% Reduced		215	55
MODIFIED_RT152	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
MODIFIED_RT152	5	Percent Accelerate	F_1	Max Climb 10% Reduced		260	55
MODIFIED_RT152	6	Climb	F_0	Max Climb 10% Reduced	3000		
MODIFIED_RT152	7	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
MODIFIED_RT152	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-41. AEDT UI Screenshot of Starting Default Profile Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2

100017	SDF_NADP_2_RT15	Procedural	691200	2	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT152	1	Takeoff	F_10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT152	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT152	3	Percent Accelerate	F_10	Max Climb 10% Reduced		215	55
SDF_NADP_2_RT152	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
SDF_NADP_2_RT152	5	Percent Accelerate	F_1	Max Climb 10% Reduced		260	55
SDF_NADP_2_RT152	6	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
SDF_NADP_2_RT152	7	Climb	F_0	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT152	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-42. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2

B.2.4.3. 7478, Profile Weight 713,300

The “stage length 3” user-defined profile for the 7478 assumes a weight of 713,300, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 3. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 3 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3158	MODIFIED_RT15	Procedural	713300	3	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT153	1	Takeoff	F_10	Max Takeoff 15% Reduced			
MODIFIED_RT153	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT153	3	Percent Accelerate	F_10	Max Climb 10% Reduced		215	55
MODIFIED_RT153	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
MODIFIED_RT153	5	Percent Accelerate	F_1	Max Climb 10% Reduced		260	55
MODIFIED_RT153	6	Climb	F_0	Max Climb 10% Reduced	3000		
MODIFIED_RT153	7	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
MODIFIED_RT153	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-43. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 3

100018	SDF_NADP_2_RT15	Procedural	713300	3	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT153	1	Takeoff	F_10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT153	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT153	3	Percent Accelerate	F_10	Max Climb 10% Reduced		215	55
SDF_NADP_2_RT153	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
SDF_NADP_2_RT153	5	Percent Accelerate	F_1	Max Climb 10% Reduced		260	55
SDF_NADP_2_RT153	6	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
SDF_NADP_2_RT153	7	Climb	F_0	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT153	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-44. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 3

B.2.4.4. 7478, Profile Weight 752,400

The “stage length 4” user-defined profile for the 7478 assumes a weight of 752,400, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 4. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 4 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

⊟ 3159	MODIFIED_RT15	Procedural	752400	4	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT154	1	Takeoff	F_10	Max Takeoff 15% Reduced			
MODIFIED_RT154	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT154	3	Percent Accelerate	F_10	Max Climb 10% Reduced		220	55
MODIFIED_RT154	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
MODIFIED_RT154	5	Percent Accelerate	F_1	Max Climb 10% Reduced		268	55
MODIFIED_RT154	6	Climb	F_0	Max Climb 10% Reduced	3000		
MODIFIED_RT154	7	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
MODIFIED_RT154	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-45. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 4

⊟ 100031	SDF_NADP_2_RT15	Procedural	752400	4	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT154	1	Takeoff	F_10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT154	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT154	3	Percent Accelerate	F_10	Max Climb 10% Reduced		220	55
SDF_NADP_2_RT154	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
SDF_NADP_2_RT154	5	Percent Accelerate	F_1	Max Climb 10% Reduced		268	55
SDF_NADP_2_RT154	6	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
SDF_NADP_2_RT154	7	Climb	F_0	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT154	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-46. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 4

B.2.4.5. 7478, Profile Weight 801,000

The “stage length 5” user-defined profile for the 7478 assumes a weight of 801,000, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 5. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 5 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3160	MODIFIED_RT15	Procedural	801000	5	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT155	1	Takeoff	F_10	Max Takeoff 15% Reduced			
MODIFIED_RT155	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
MODIFIED_RT155	3	Percent Accelerate	F_10	Max Climb 10% Reduced		220	55
MODIFIED_RT155	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
MODIFIED_RT155	5	Percent Accelerate	F_1	Max Climb 10% Reduced		270	55
MODIFIED_RT155	6	Climb	F_0	Max Climb 10% Reduced	3000		
MODIFIED_RT155	7	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
MODIFIED_RT155	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-47. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 5

100032	SDF_NADP_2_RT15	Procedural	801000	5	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT155	1	Takeoff	F_10	Max Takeoff 15% Reduced			
SDF_NADP_2_RT155	2	Climb	F_10	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT155	3	Percent Accelerate	F_10	Max Climb 10% Reduced		220	55
SDF_NADP_2_RT155	4	Percent Accelerate	F_5	Max Climb 10% Reduced		250	55
SDF_NADP_2_RT155	5	Percent Accelerate	F_1	Max Climb 10% Reduced		270	55
SDF_NADP_2_RT155	6	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
SDF_NADP_2_RT155	7	Climb	F_0	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT155	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-48. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 5

B.2.4.6. 7478, Profile Weight 853,400

The “stage length 6” user-defined profile for the 7478 assumes a weight of 853,400, and is identified as PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 6. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 6 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

⊟	3152	MODIFIED_RT10	Procedural	853400	6	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT106	1	Takeoff	F_10	Max Takeoff 10% Reduced			
MODIFIED_RT106	2	Climb	F_10	Max Takeoff 10% Reduced	1000		
MODIFIED_RT106	3	Percent Accelerate	F_10	Max Climb 10% Reduced		227	55
MODIFIED_RT106	4	Percent Accelerate	F_5	Max Climb 10% Reduced		258	55
MODIFIED_RT106	5	Percent Accelerate	F_1	Max Climb 10% Reduced		270	55
MODIFIED_RT106	6	Climb	F_0	Max Climb 10% Reduced	3000		
MODIFIED_RT106	7	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
MODIFIED_RT106	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-49. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 6

⊟	100033	SDF_NADP_2_RT10	Procedural	853400	6	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT106	1	Takeoff	F_10	Max Takeoff 10% Reduced			
SDF_NADP_2_RT106	2	Climb	F_10	Max Takeoff 10% Reduced	1000		
SDF_NADP_2_RT106	3	Percent Accelerate	F_10	Max Climb 10% Reduced		227	55
SDF_NADP_2_RT106	4	Percent Accelerate	F_5	Max Climb 10% Reduced		258	55
SDF_NADP_2_RT106	5	Percent Accelerate	F_1	Max Climb 10% Reduced		270	55
SDF_NADP_2_RT106	6	Percent Accelerate	F_0	Max Climb 10% Reduced		295	50
SDF_NADP_2_RT106	7	Climb	F_0	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT106	8	Climb	F_0	Max Climb 10% Reduced	10000		

Figure B-50. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 6

B.2.4.7. 7478, Profile Weight 909,300

The “stage length 7” user-defined profile for the 7478 assumes a weight of 909,300, and is identified as PROF_ID1: SDF_NADP_2_RT05; PROF_ID2: 7. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 7 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3144	MODIFIED_RT05	Procedural	909300	7	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT057	1	Takeoff	F_10	Max Takeoff 5% Reduced			
MODIFIED_RT057	2	Climb	F_10	Max Takeoff 5% Reduced	1000		
MODIFIED_RT057	3	Percent Accelerate	F_10	Max Climb		230	55
MODIFIED_RT057	4	Percent Accelerate	F_5	Max Climb		260	55
MODIFIED_RT057	5	Percent Accelerate	F_1	Max Climb		275	55
MODIFIED_RT057	6	Climb	F_0	Max Climb	3000		
MODIFIED_RT057	7	Percent Accelerate	F_0	Max Climb		295	50
MODIFIED_RT057	8	Climb	F_0	Max Climb	10000		

Figure B-51. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 7

100034	SDF_NADP_2_RT05	Procedural	909300	7	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT057	1	Takeoff	F_10	Max Takeoff 5% Reduced			
SDF_NADP_2_RT057	2	Climb	F_10	Max Takeoff 5% Reduced	1000		
SDF_NADP_2_RT057	3	Percent Accelerate	F_10	Max Climb		230	55
SDF_NADP_2_RT057	4	Percent Accelerate	F_5	Max Climb		260	55
SDF_NADP_2_RT057	5	Percent Accelerate	F_1	Max Climb		275	55
SDF_NADP_2_RT057	6	Percent Accelerate	F_0	Max Climb		295	50
SDF_NADP_2_RT057	7	Climb	F_0	Max Climb	4500		
SDF_NADP_2_RT057	8	Climb	F_0	Max Climb	10000		

Figure B-52. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT05; PROF_ID2: 7

B.2.4.8. 7478, Profile Weight 969,000

The "stage length 8" user-defined profile for the 7478 assumes a weight of 969,000, and is identified as PROF_ID1: SDF_NADP_2; PROF_ID2: 8. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 8 to change the thrust level to "Max Takeoff" in steps 1 and 2, and to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3145	MODIFIED_RT05	Procedural	969000	8	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT058	1	Takeoff	F_10	Max Takeoff 5% Reduced			
MODIFIED_RT058	2	Climb	F_10	Max Takeoff 5% Reduced	1000		
MODIFIED_RT058	3	Percent Accelerate	F_10	Max Climb		235	55
MODIFIED_RT058	4	Percent Accelerate	F_5	Max Climb		265	55
MODIFIED_RT058	5	Percent Accelerate	F_1	Max Climb		280	55
MODIFIED_RT058	6	Climb	F_0	Max Climb	3000		
MODIFIED_RT058	7	Percent Accelerate	F_0	Max Climb		295	50
MODIFIED_RT058	8	Climb	F_0	Max Climb	10000		

Figure B-53. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 8

100035	SDF_NADP_2	Procedural	969000	8	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_28	1	Takeoff	F_10	Max Takeoff			
SDF_NADP_28	2	Climb	F_10	Max Takeoff	1000		
SDF_NADP_28	3	Percent Accelerate	F_10	Max Climb		235	55
SDF_NADP_28	4	Percent Accelerate	F_5	Max Climb		265	55
SDF_NADP_28	5	Percent Accelerate	F_1	Max Climb		280	55
SDF_NADP_28	6	Percent Accelerate	F_0	Max Climb		295	50
SDF_NADP_28	7	Climb	F_0	Max Climb	4500		
SDF_NADP_28	8	Climb	F_0	Max Climb	10000		

Figure B-54. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2; PROF_ID2: 8

B.2.4.9. 7478, Profile Weight 987,000

The “stage length 9” user-defined profile for the 7478 assumes a weight of 987,000, and is identified as PROF_ID1: SDF_NADP_2; PROF_ID2: 9. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 9 to change the thrust level to “Max Takeoff” in Steps 1 and 2, and to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

3146	MODIFIED_RT05	Procedural	987000	9	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT059	1	Takeoff	F_10	Max Takeoff 5% Reduced			
MODIFIED_RT059	2	Climb	F_10	Max Takeoff 5% Reduced	1000		
MODIFIED_RT059	3	Percent Accelerate	F_10	Max Climb		235	55
MODIFIED_RT059	4	Percent Accelerate	F_5	Max Climb		265	55
MODIFIED_RT059	5	Percent Accelerate	F_1	Max Climb		280	55
MODIFIED_RT059	6	Climb	F_0	Max Climb	3000		
MODIFIED_RT059	7	Percent Accelerate	F_0	Max Climb		295	50
MODIFIED_RT059	8	Climb	F_0	Max Climb	10000		

Figure B-55. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 9

100036	SDF_NADP_2	Procedural	987000	9	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_29	1	Takeoff	F_10	Max Takeoff			
SDF_NADP_29	2	Climb	F_10	Max Takeoff	1000		
SDF_NADP_29	3	Percent Accelerate	F_10	Max Climb		235	55
SDF_NADP_29	4	Percent Accelerate	F_5	Max Climb		265	55
SDF_NADP_29	5	Percent Accelerate	F_1	Max Climb		280	55
SDF_NADP_29	6	Percent Accelerate	F_0	Max Climb		295	50
SDF_NADP_29	7	Climb	F_0	Max Climb	4500		
SDF_NADP_29	8	Climb	F_0	Max Climb	10000		

Figure B-56. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2; PROF_ID2: 9

B.2.5. Graphical and Tabular Comparison

An accompanying MS Excel file, “Appendix_A_Profile_Performance.xls”, contains the profile points as found in the AEDT XML Performance Report Export file for comparison of performance data to the AEDT Standard profiles.

B.2.5.1. Tables and Figures Supporting Analysis Demonstrating Benefit

Table B-10 through **Table B-18** show the SEL results under the flight path from the user-defined departure profiles; SEL values resulting from the standard AEDT departure profiles are presented for comparison. **Figure B-57** through **Figure B-65** show the same SEL computations in the form of SEL contours.

Table B-10. SELs for 7478 Departures at 671,100 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 671,100 lbs. (PROF_ID2 = 1) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	User-Defined Profile, SEL (dBA)	Difference SEL (dBA)
0.0	133.1	129.8	-3.3
0.5	121.2	119.9	-1.3
1.0	105.5	107.2	1.8
1.5	99.0	99.5	0.6
2.0	95.1	95.4	0.3
2.5	93.4	93.8	0.3
3.0	92.0	92.4	0.4
3.5	90.8	91.1	0.3
4.0	89.6	90.1	0.5
4.5	88.5	89.1	0.6
5.0	87.3	88.2	0.8
5.5	86.3	87.3	1.0
6.0	85.3	86.3	1.0
6.5	84.5	85.5	0.9
7.0	83.7	84.7	1.0
7.5	82.8	84.0	1.2
8.0	82.1	83.2	1.1
8.5	81.3	82.5	1.1
9.0	80.6	81.6	1.0
9.5	80.0	80.9	0.9
10.0	79.4	80.2	0.8

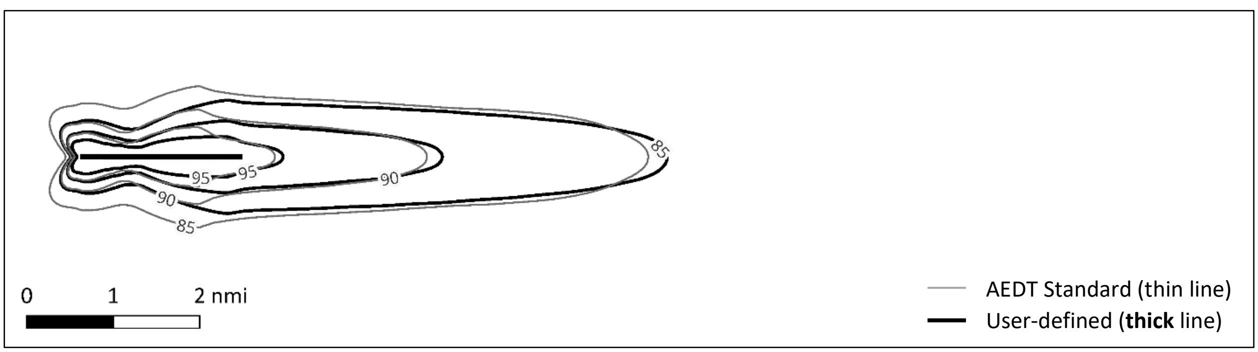

Figure B-57. SEL Contours for 7478 Departures at Take-Off Weight 671,100 Pounds

Table B-11. SELs for 7478 Departures at 691,200 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 691,200 lbs. (PROF_ID2 = 2) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	133.0	129.8	-3.3
0.5	121.2	119.4	-1.8
1.0	106.5	109.0	2.5
1.5	100.4	100.1	-0.2
2.0	95.4	95.8	0.4
2.5	93.8	94.0	0.3
3.0	92.3	92.8	0.5
3.5	91.1	91.5	0.4
4.0	90.0	90.4	0.4
4.5	88.9	89.5	0.6
5.0	87.7	88.5	0.8
5.5	86.7	87.7	1.0
6.0	85.7	86.7	1.0
6.5	84.9	86.0	1.0
7.0	84.1	85.2	1.1
7.5	83.3	84.4	1.1
8.0	82.6	83.7	1.2
8.5	81.8	82.9	1.2
9.0	81.1	82.2	1.1
9.5	80.4	81.4	1.0
10.0	79.9	80.8	0.9

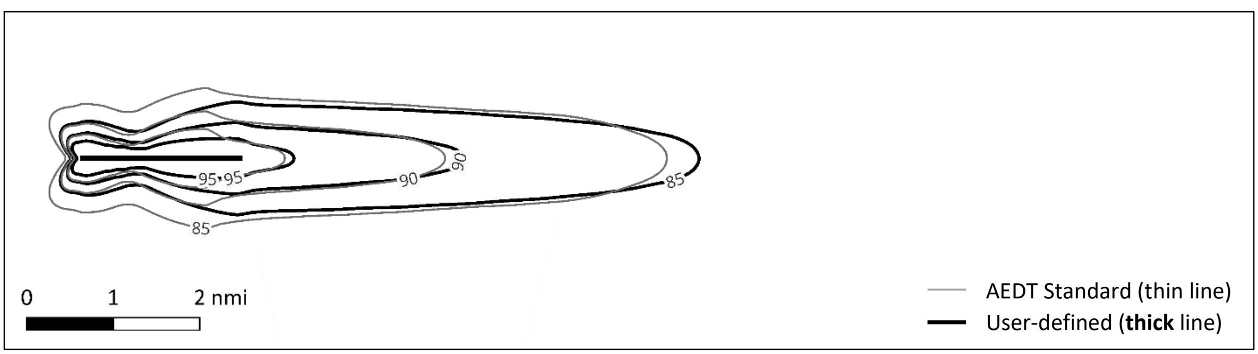

Figure B-58. SEL Contours for 7478 Departures at Take-Off Weight 691,200 Pounds

Table B-12. SELs for 7478 Departures at 713,300 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 713,300 lbs. (PROF_ID2 = 3) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	133.0	129.7	-3.3
0.5	121.2	119.3	-1.8
1.0	107.9	112.7	4.8
1.5	100.8	101.0	0.2
2.0	95.7	97.1	1.4
2.5	94.2	94.5	0.3
3.0	92.7	93.1	0.4
3.5	91.5	91.9	0.5
4.0	90.4	90.8	0.4
4.5	89.3	90.0	0.6
5.0	88.3	89.0	0.7
5.5	87.2	88.1	0.9
6.0	86.2	87.3	1.1
6.5	85.3	86.4	1.1
7.0	84.6	85.7	1.1
7.5	83.9	85.0	1.1
8.0	83.0	84.2	1.2
8.5	82.3	83.5	1.2
9.0	81.6	82.8	1.2
9.5	80.9	82.1	1.1
10.0	80.3	81.3	1.0

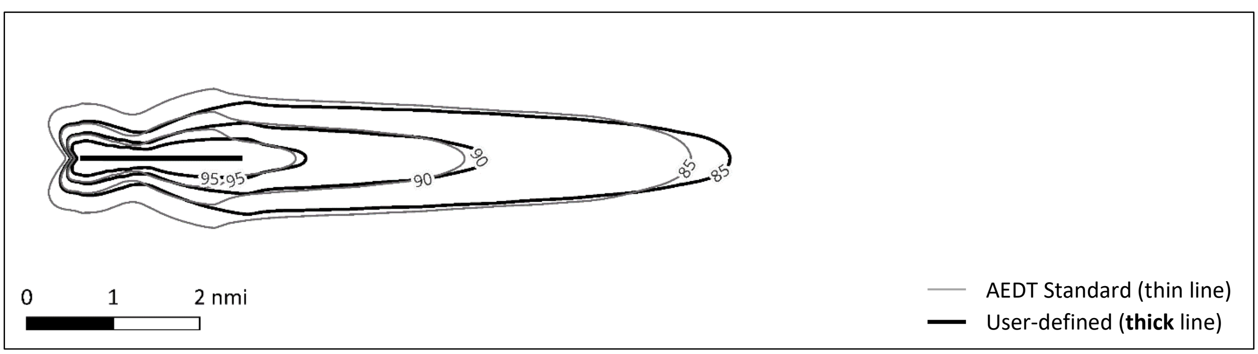

Figure B-59. SEL Contours for 7478 Departures at Take-Off Weight 713,300 Pounds

Table B-13. SELs for 7478 Departures at 752,400 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 752,400 lbs. (PROF_ID2 = 4) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.8	129.6	-3.3
0.5	121.8	119.2	-2.5
1.0	111.2	117.4	6.2
1.5	101.8	102.6	0.8
2.0	96.4	98.1	1.8
2.5	94.7	94.9	0.3
3.0	93.3	93.7	0.4
3.5	92.1	92.6	0.5
4.0	91.1	91.5	0.4
4.5	90.1	90.6	0.5
5.0	89.1	89.8	0.7
5.5	88.1	88.9	0.8
6.0	87.2	88.1	0.9
6.5	86.3	87.3	1.0
7.0	85.5	86.6	1.1
7.5	84.8	85.9	1.1
8.0	84.0	85.2	1.1
8.5	83.3	84.5	1.2
9.0	82.6	83.9	1.3
9.5	81.9	83.2	1.3
10.0	81.3	82.5	1.2

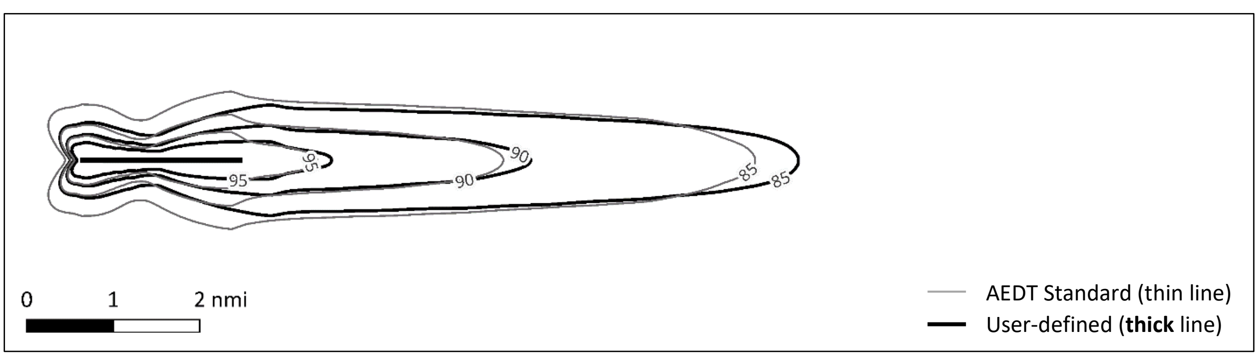

Figure B-60. SEL Contours for 7478 Departures at Take-Off Weight 752,400 Pounds

Table B-14. SELs for 7478 Departures at 801,000 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 801,000 lbs. (PROF_ID2 = 5) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.7	129.4	-3.3
0.5	121.7	119.9	-1.8
1.0	119.4	117.3	-2.0
1.5	103.5	105.2	1.7
2.0	99.2	99.6	0.4
2.5	95.3	96.5	1.2
3.0	94.0	94.3	0.3
3.5	92.9	93.3	0.4
4.0	91.7	92.3	0.6
4.5	90.8	91.3	0.5
5.0	90.0	90.5	0.6
5.5	89.1	89.8	0.7
6.0	88.2	89.1	0.8
6.5	87.3	88.3	1.0
7.0	86.5	87.6	1.1
7.5	85.7	86.9	1.2
8.0	85.0	86.2	1.2
8.5	84.4	85.6	1.2
9.0	83.6	84.9	1.3
9.5	83.0	84.3	1.3
10.0	82.3	83.7	1.4

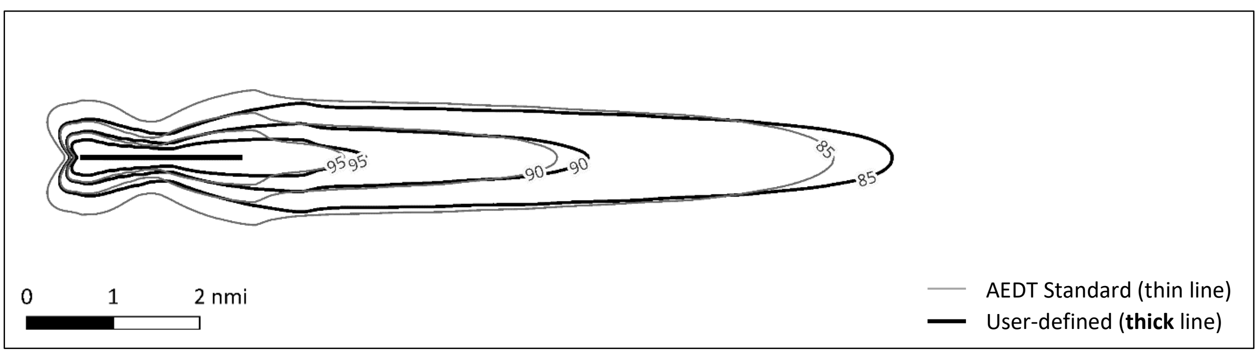

Figure B-61. SEL Contours for 7478 Departures at Take-Off Weight 801,000 Pounds

Table B-15. SELs for 7478 Departures at 853,400 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 853,400 lbs. (PROF_ID2 = 6) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	User-Defined Profile, SEL (dBA)	Difference SEL (dBA)
0.0	133.0	130.8	-2.2
0.5	122.1	120.3	-1.8
1.0	119.3	118.3	-1.0
1.5	105.8	107.5	1.7
2.0	100.5	100.9	0.3
2.5	95.9	97.8	1.8
3.0	94.7	94.5	-0.2
3.5	93.6	93.7	0.1
4.0	92.6	92.7	0.1
4.5	91.6	91.9	0.3
5.0	90.9	91.1	0.1
5.5	90.0	90.4	0.3
6.0	89.3	89.8	0.5
6.5	88.5	89.0	0.5
7.0	87.6	88.5	0.8
7.5	86.8	87.8	1.0
8.0	86.0	87.2	1.1
8.5	85.4	86.5	1.2
9.0	84.8	85.9	1.1
9.5	84.2	85.4	1.2
10.0	83.5	84.8	1.3

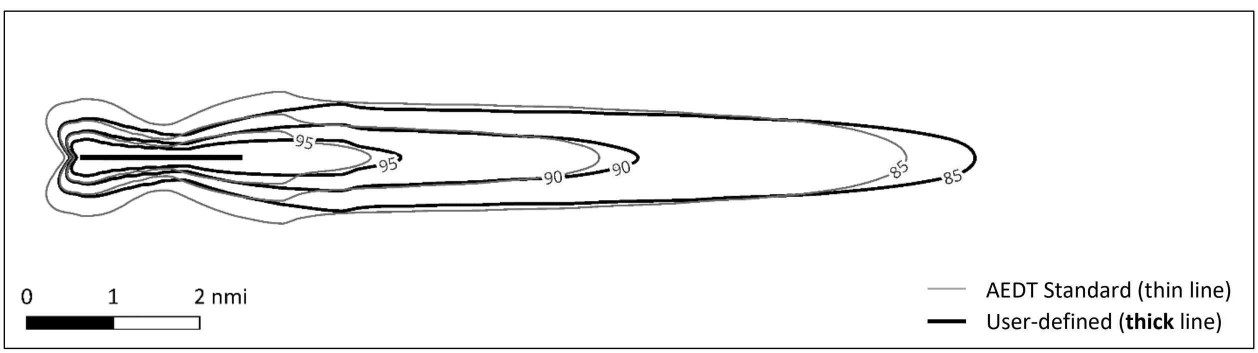

Figure B-62. SEL Contours for 7478 Departures at Take-Off Weight 853,400 Pounds

Table B-16. SELs for 7478 Departures at 909,300 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 909,300 lbs. (PROF_ID2 = 7) User PROF_ID1: SDF_NADP_2_RT05			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.9	131.8	-1.1
0.5	122.1	122.4	0.3
1.0	119.8	119.0	-0.8
1.5	109.5	111.5	2.0
2.0	102.2	102.5	0.3
2.5	99.1	98.8	-0.2
3.0	95.2	95.7	0.4
3.5	94.4	94.7	0.3
4.0	93.3	93.6	0.3
4.5	92.5	92.7	0.2
5.0	91.6	91.9	0.3
5.5	91.0	91.2	0.2
6.0	90.2	90.4	0.3
6.5	89.5	89.7	0.2
7.0	88.8	89.0	0.2
7.5	88.1	88.3	0.2
8.0	87.3	87.7	0.4
8.5	86.6	87.1	0.4
9.0	85.9	86.4	0.5
9.5	85.3	85.8	0.5
10.0	84.8	85.1	0.3

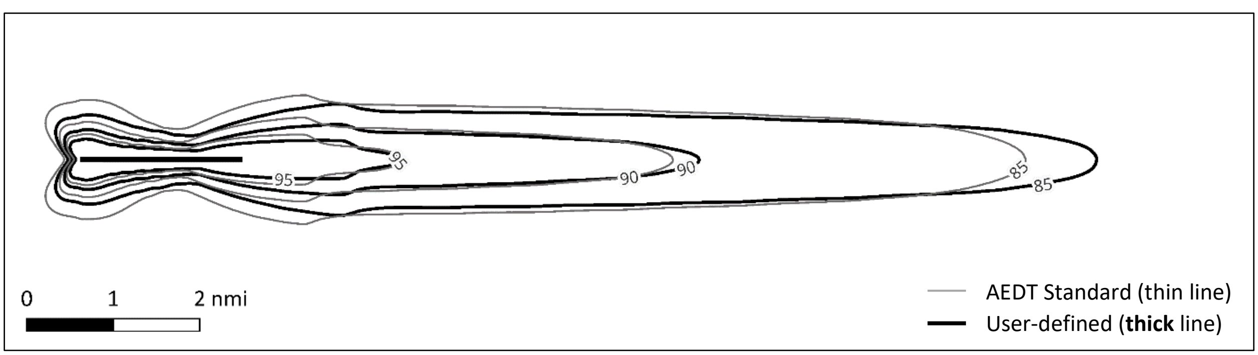

Figure B-63. SEL Contours for 7478 Departures at Take-Off Weight 909,300 Pounds

Table B-17. SELs for 7478 Departures at 969,000 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 969,000 lbs. (PROF_ID2 = 8) User PROF_ID1: SDF_NADP_2			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.7	132.7	0.0
0.5	122.7	122.7	0.0
1.0	119.8	119.8	0.0
1.5	118.5	118.5	0.0
2.0	104.8	104.8	0.0
2.5	100.8	100.8	0.0
3.0	97.8	97.8	0.0
3.5	95.0	95.0	0.0
4.0	94.3	94.3	0.0
4.5	93.3	93.3	0.0
5.0	92.6	92.6	0.0
5.5	91.8	91.8	0.0
6.0	91.2	91.2	0.0
6.5	90.6	90.6	0.0
7.0	89.9	89.9	0.0
7.5	89.4	89.4	0.0
8.0	88.7	88.7	0.0
8.5	88.1	88.1	0.0
9.0	87.6	87.6	0.0
9.5	86.9	86.9	0.1
10.0	86.1	86.3	0.3

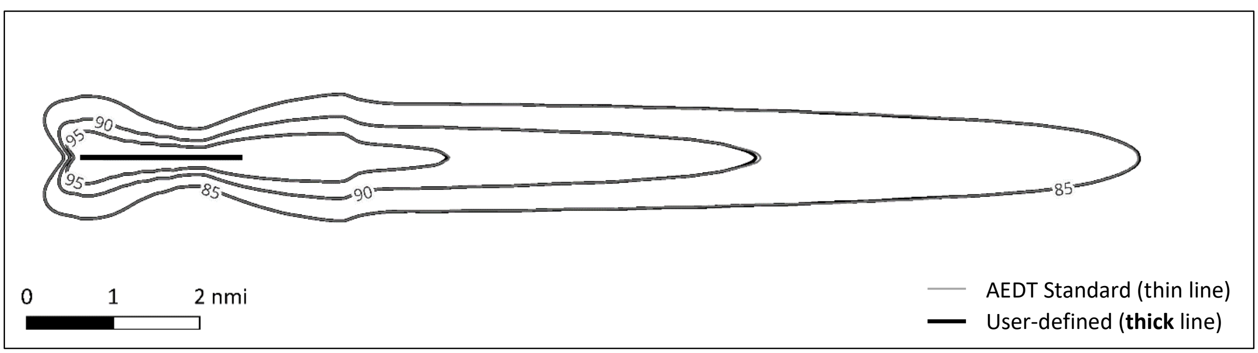

Figure B-64. SEL Contours for 7478 Departures at Take-Off Weight 969,000 Pounds

Table B-18. SELs for 7478 Departures at 987,000 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7478 Profile Weight: 987,000 lbs. (PROF_ID2 = 9) User PROF_ID1: SDF_NADP_2			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.7	132.7	0.0
0.5	122.7	122.7	0.0
1.0	120.3	120.3	0.0
1.5	118.5	118.5	0.0
2.0	105.7	105.7	0.0
2.5	101.2	101.2	0.0
3.0	98.7	98.7	0.0
3.5	95.2	95.2	0.0
4.0	94.4	94.4	0.0
4.5	93.5	93.5	0.0
5.0	92.9	92.9	0.0
5.5	92.1	92.1	0.0
6.0	91.4	91.4	0.0
6.5	90.9	90.9	0.0
7.0	90.2	90.2	0.0
7.5	89.6	89.6	0.0
8.0	89.0	89.0	0.0
8.5	88.3	88.4	0.0
9.0	87.9	87.9	0.0
9.5	87.2	87.3	0.1
10.0	86.5	86.6	0.1

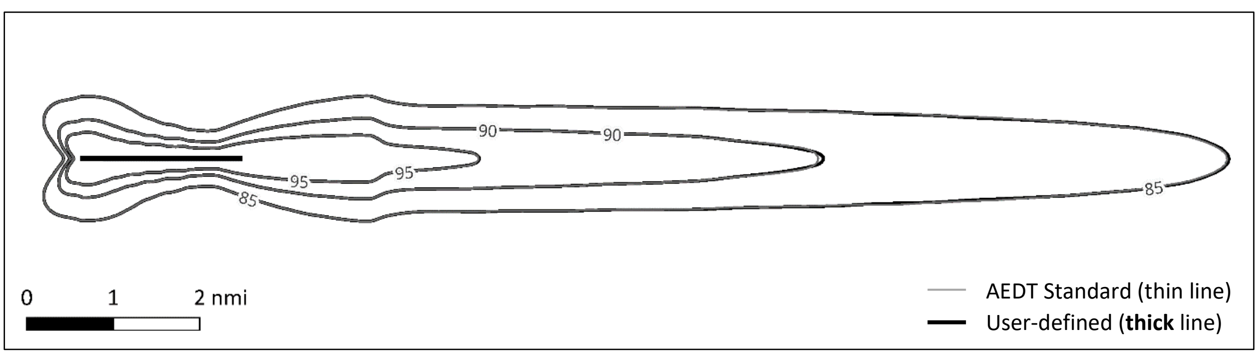

Figure B-65. SEL Contours for 7478 Departures at Take-Off Weight 987,000 Pounds

B.2.5.3. Graphical Comparison of Profiles

Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are included as **Figure B-66**, **Figure B-67** and **Figure B-68**, respectively.

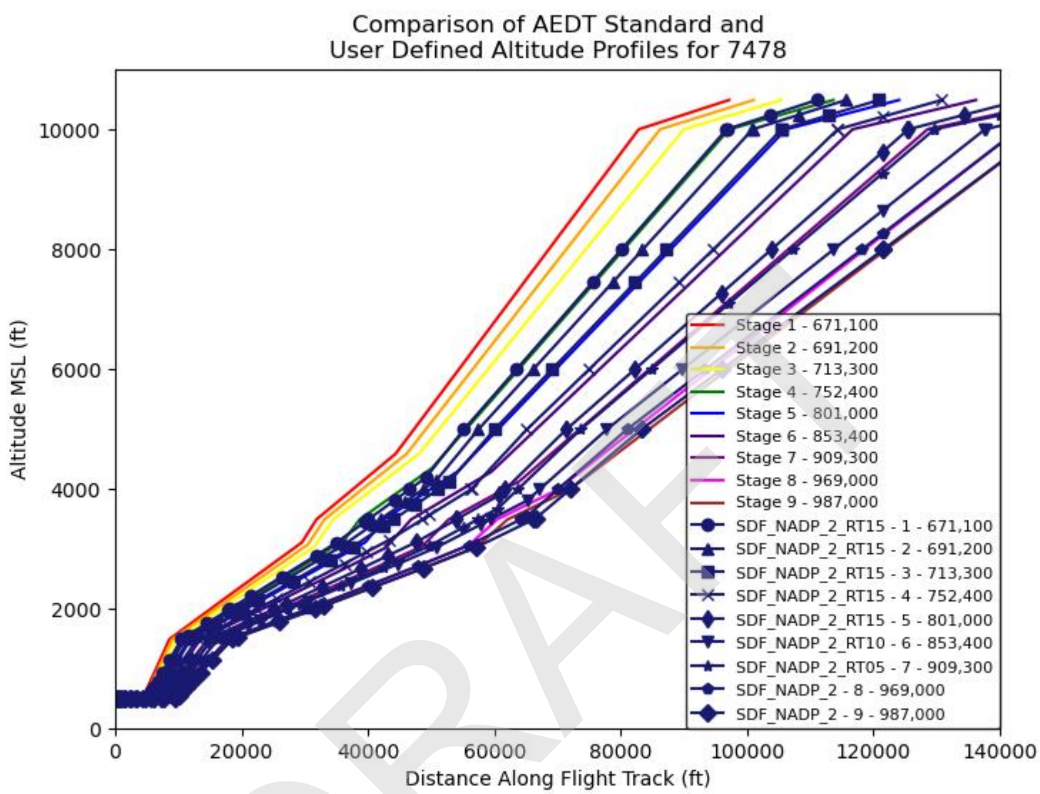

Figure B-66. 7478 AEDT Profiles, Altitude vs. Distance

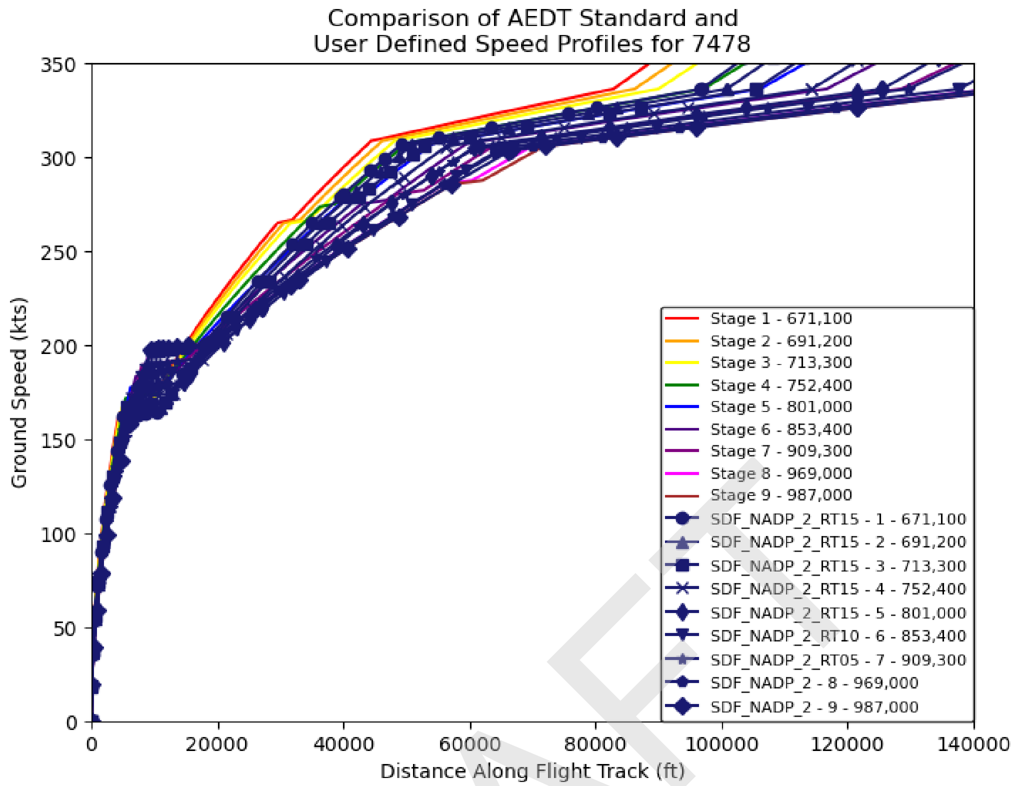

Figure B-67. 7478 AEDT Profiles, Speed vs. Distance

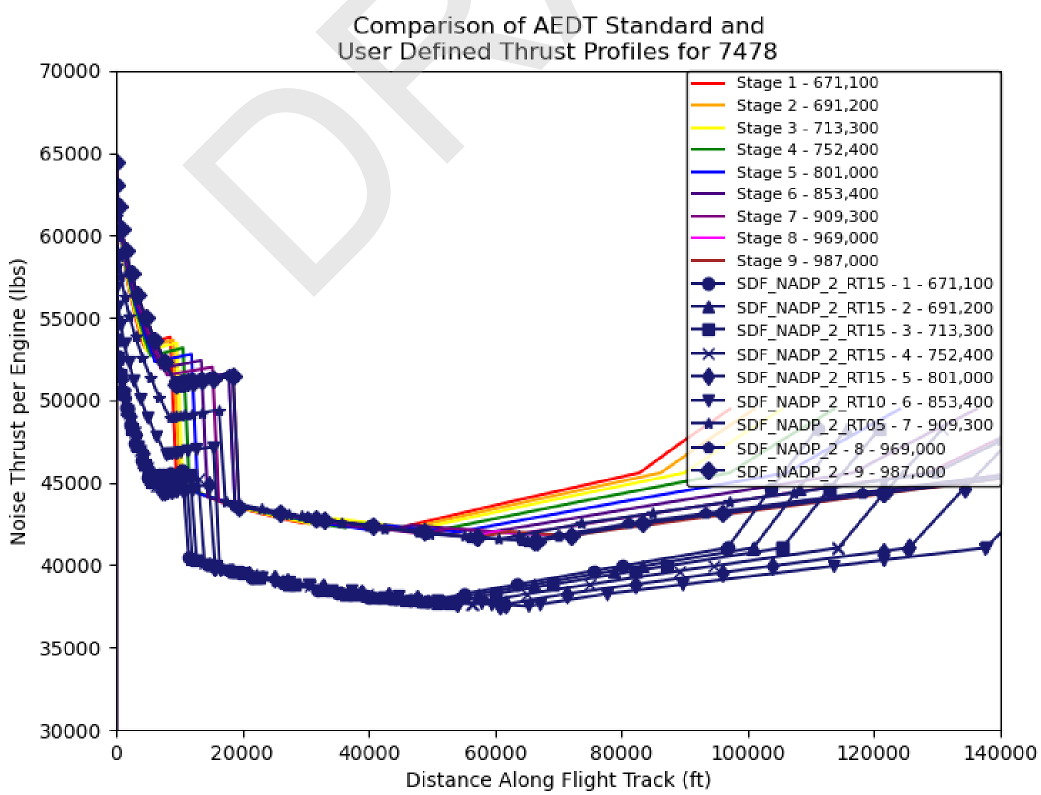

Figure B-68. 7478 AEDT Profiles, Thrust vs. Distance

B.3. Additional Graphs: Comparison of Altitude and Speed Profiles by Stage Length

The additional graphs of altitude vs. distance and speed vs. distance, organized by stage length, are included in this section in response to FAA's request in the feedback dated May 29, 2024. The following figures are complementary to Figures B-1 through B-4 in the original memorandum dated April 18, 2024 and show the same data. **Figures B-69** through **B-104** reorganize the data by specific profile weights and respective stage lengths.

The distribution of departures by stage length (as derived by an analysis of the city-pair data in the 12-month NOMS sample) show that:

- 7% of the 747400 departures are in stage length 1, 18% in stage length 2, 1% in stage length 3, 24% in stage length 4, 24% in stage length 5, 20% in stage length 6, and 6 % in stage length 8. The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Boeing 747-400 operations will be represented with AEDT ANP stage lengths 2 – 6. Although 747400 stage length 7 (PROF_ID2 = 7, with representative profile weight of 720,900 pounds) and 747400 stage length 9 (PROF_ID2 = 9, with representative profile weight of 875,000 pounds) did not appear in the 12-month flight track sample, we include those departure profiles in this documentation in case the forecast data indicate that such operations should be included in the forecast NEM.
- 3% of the 7478 departures are in stage length 1, 7% in stage length 2, less than 1% in stage length 3, 4% in stage length 4, 34% in stage length 5, 38% in stage length 6, and 13% in stage length 8. The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Boeing 747-8 operations will be represented with AEDT ANP stage lengths 5 – 8. Although 7478 stage length 7 (PROF_ID2 = 7, with representative profile weight of 909,300 pounds) and 7478 stage length 9 (PROF_ID2 = 9, with representative profile weight of 987,000 pounds) did not appear in the 12-month flight track sample, we include those departure profiles in this documentation in case the forecast data indicate that such operations should be included in the forecast NEM.

As noted in the "Statement of Benefit" (section B.1.1) operators at SDF use a version of "Noise Abatement Departure Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. Operators did not provide the exact reduced thrust. Therefore, we used the thrust-to-weight ratio of the AEDT maximum thrust profile associated with current and historical B747-400 operations at SDF. The similar thrust-to-weight ratio should maintain a similar acceleration rate during the take-off roll and, combined with the lower rotation speed needed for a lower weight aircraft, should have a shorter take-off roll. Therefore, all of the proposed procedures follow the NADP 2 described on page B-1, although they may use various thrust settings based on weight. This should not be confused with AEDT's definition of a single procedure (PROF_ID1 and PROF_ID2), which combines both the altitude and flap retractation speeds along with the power settings. It also should be noted that our efforts to develop the proposed profiles were limited to the selection of thrust coefficients already available in AEDT. In other words, we did not attempt to define new thrust coefficients to represent power levels not already represented in AEDT. We did not modify the flap retraction speed schedule relative to that in AEDT, and we also kept all clean climbs (i.e. flaps fully retracted) at a speed of 250 knots calibrated airspeed, which matches both the AEDT standard profiles and the indicated airspeed listed in the procedures provided by the operator. In addition, the comparison of the AEDT profiles is done at the SDF annual average day conditions documented in the AEDT database, which will be used in the calculation of the NEM contours. As such, the ground speeds reported by AEDT compared to the flight track data do not match precisely; therefore, we recommend viewing the general speed patterns rather than comparing absolute values.

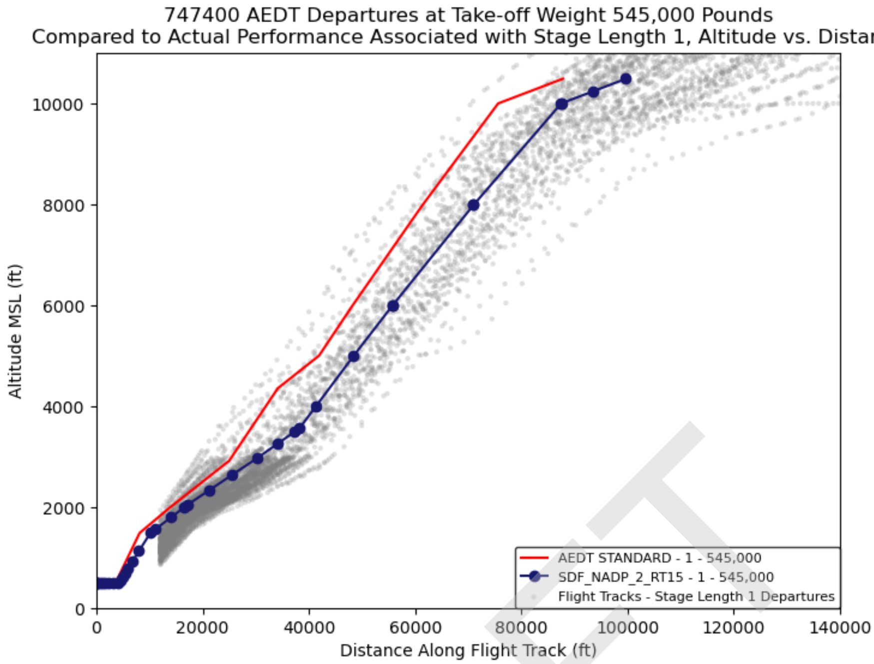

Figure B-69. 747400 Departures, Stage Length 1, Altitude vs. Distance

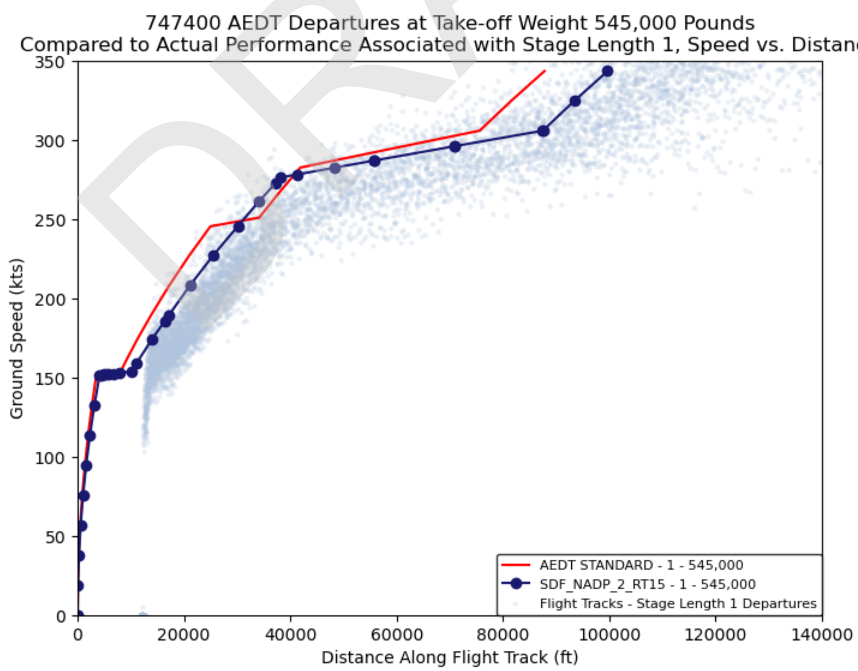

Figure B-70. 747400 Departures, Stage Length 1, Speed vs. Distance

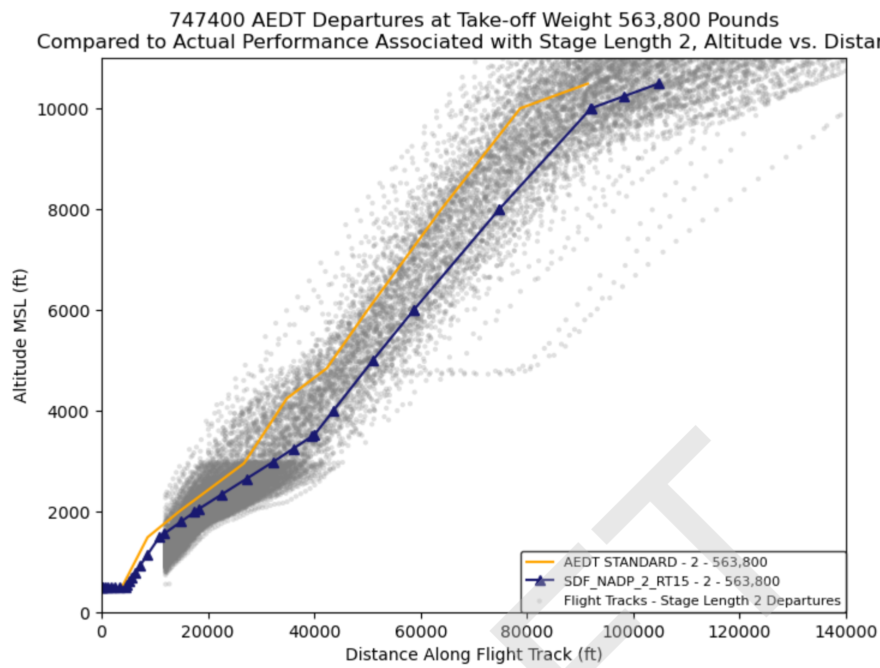

Figure B-71. 747400 Departures, Stage Length 2, Altitude vs. Distance

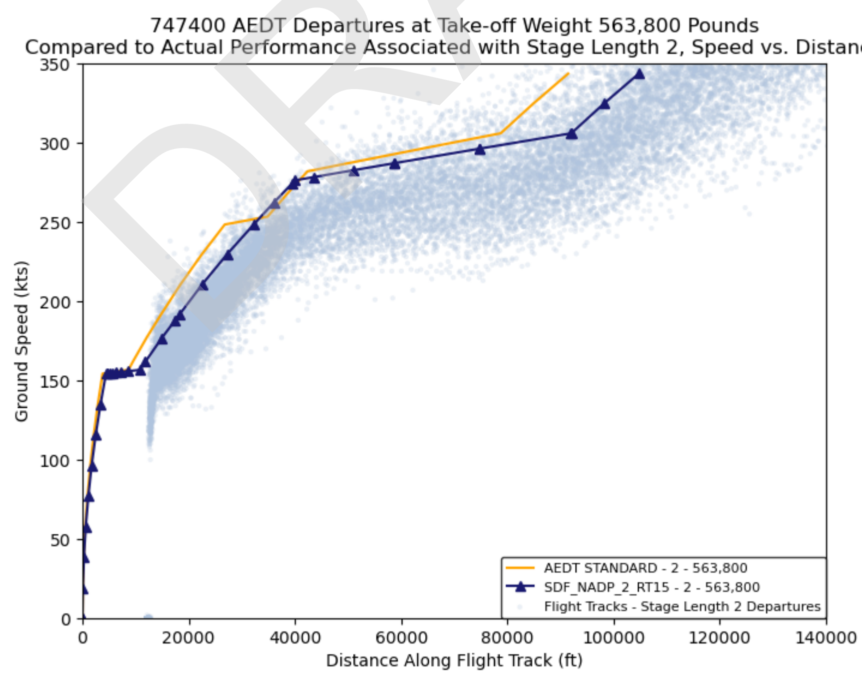

Figure B-72. 747400 Departures, Stage Length 2, Speed vs. Distance

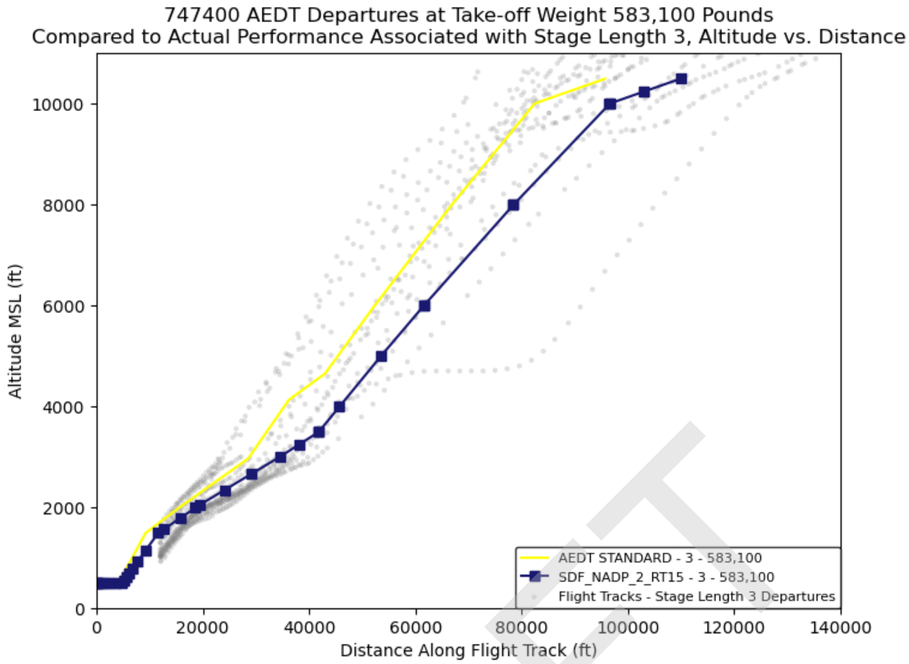

Figure B-73. 747400 Departures, Stage Length 3, Altitude vs. Distance

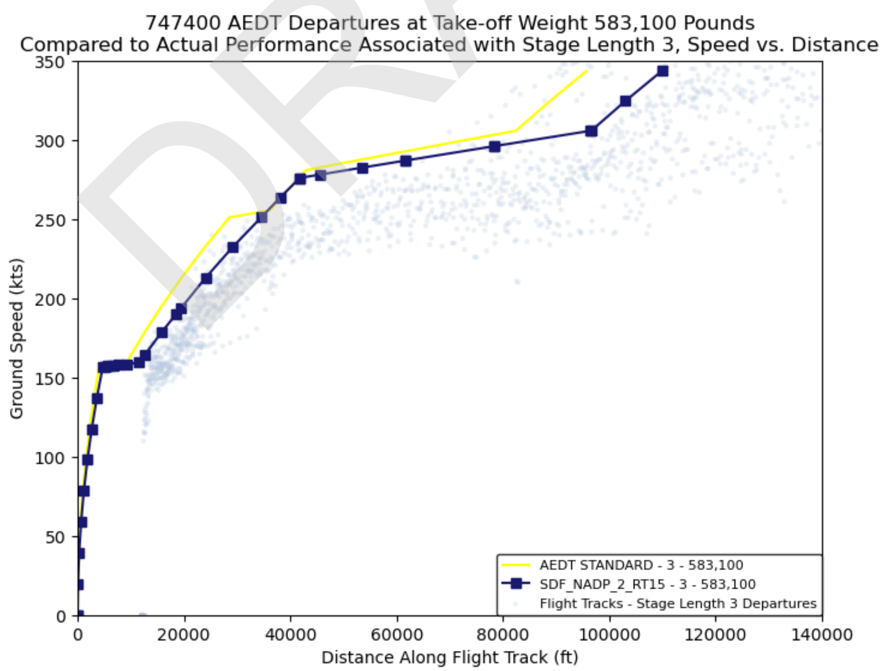

Figure B-74. 747400 Departures, Stage Length 3, Speed vs. Distance

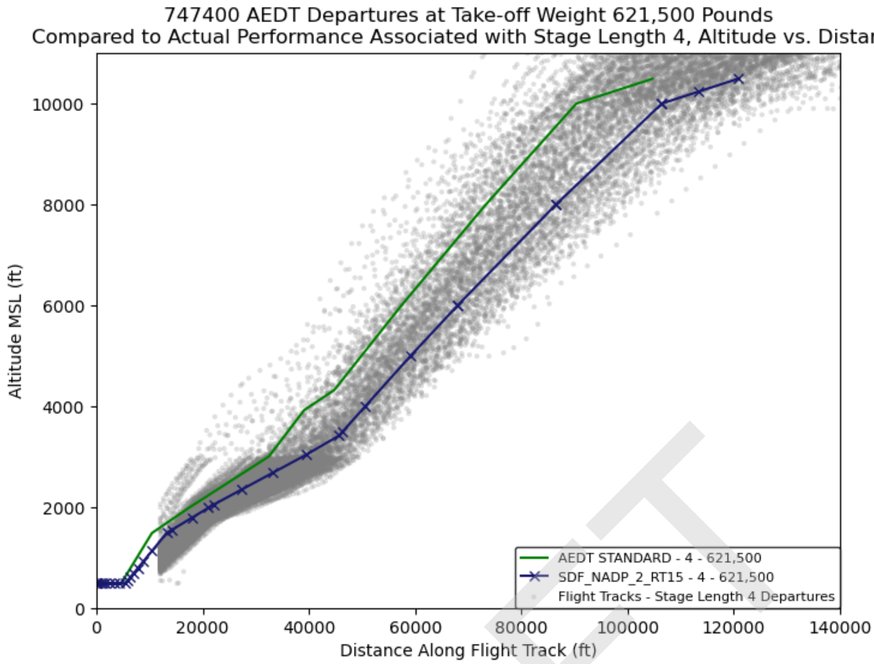

Figure B-75. 747400 Departures, Stage Length 4, Altitude vs. Distance

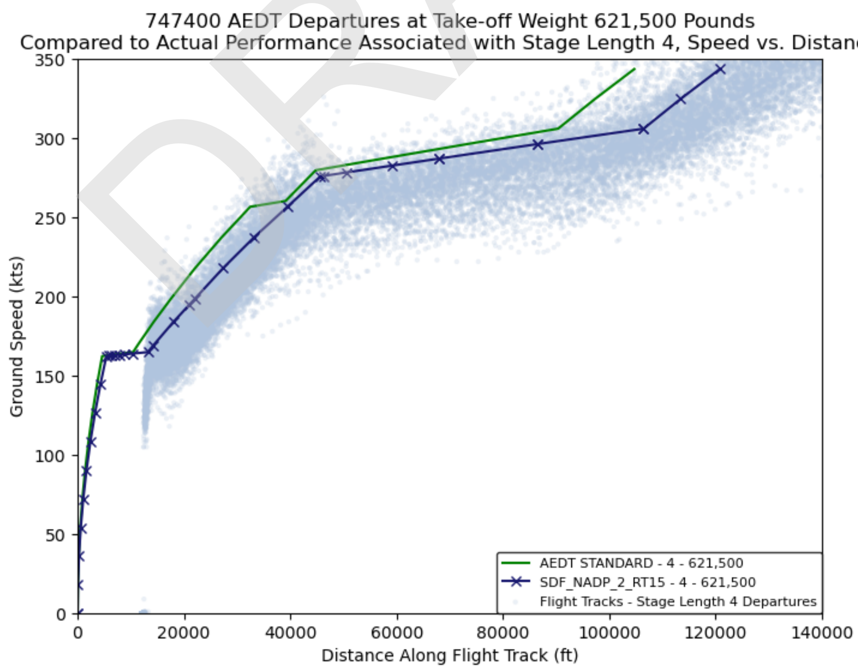

Figure B-76. 747400 Departures, Stage Length 4, Speed vs. Distance

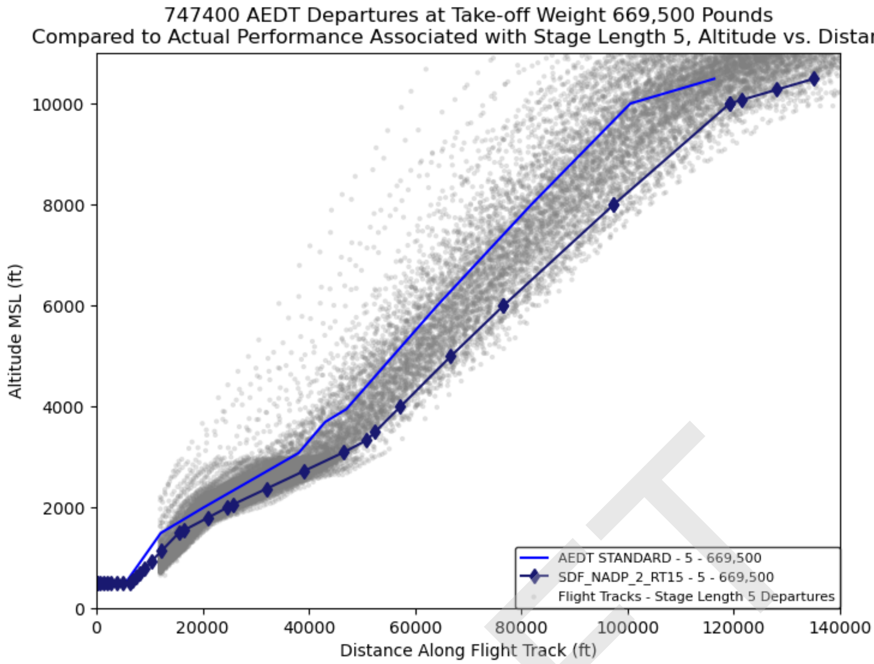

Figure B-77. 747400 Departures, Stage Length 5, Altitude vs. Distance

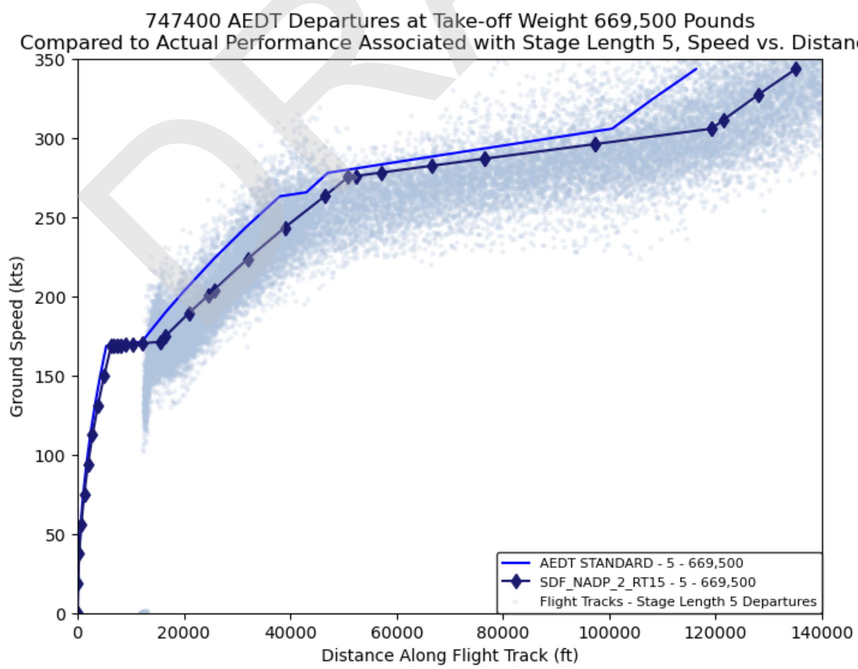

Figure B-78. 747400 Departures, Stage Length 5, Speed vs. Distance

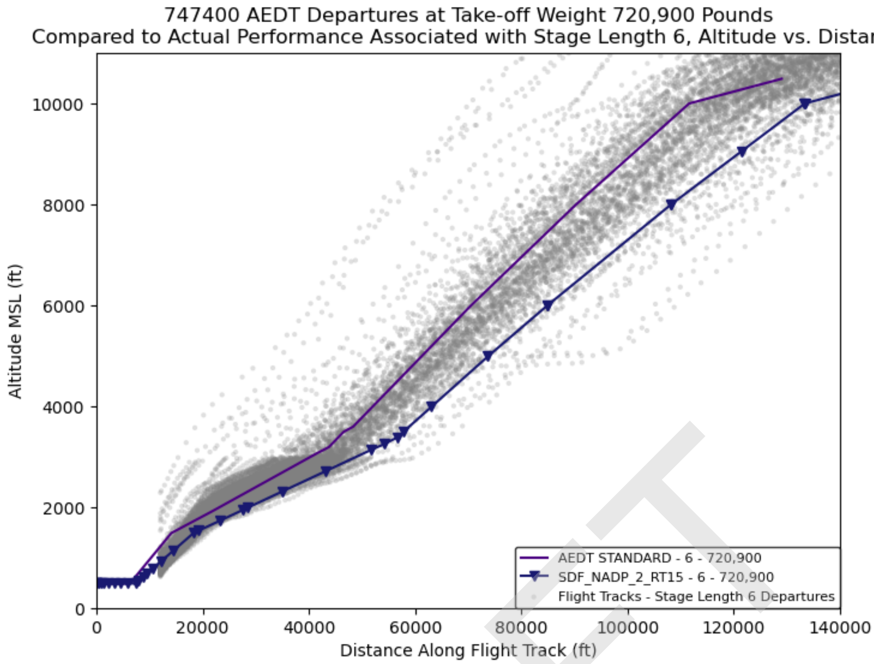

Figure B-79. 747400 Departures, Stage Length 6, Altitude vs. Distance

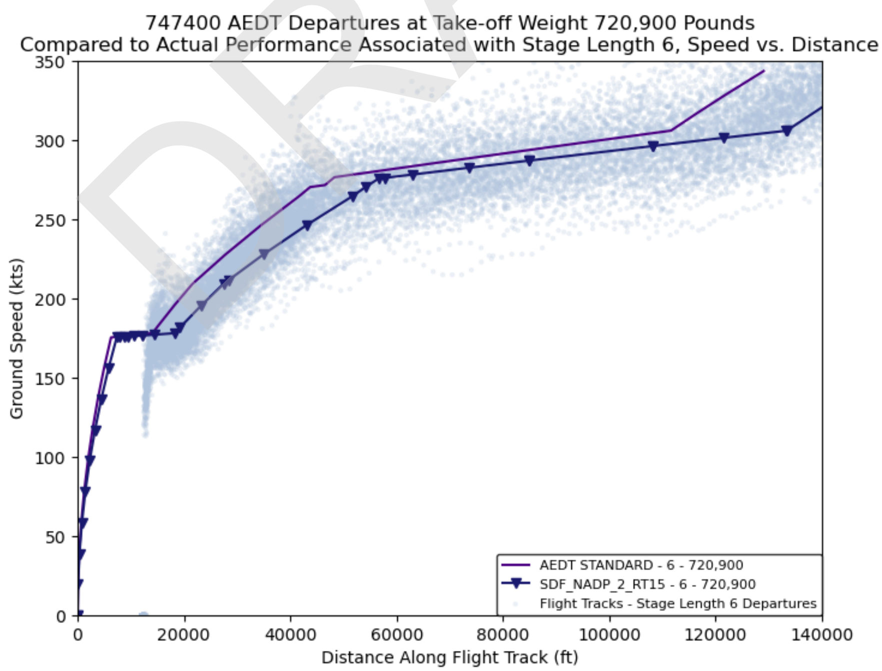

Figure B-80. 747400 Departures, Stage Length 6, Speed vs. Distance

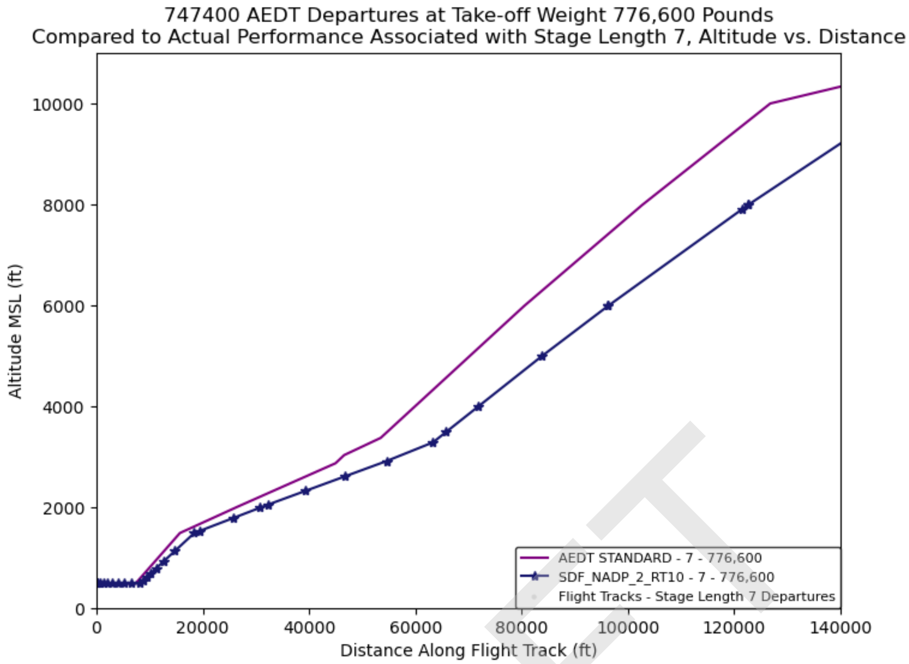

Figure B-81. 747400 Departures, Stage Length 7, Altitude vs. Distance

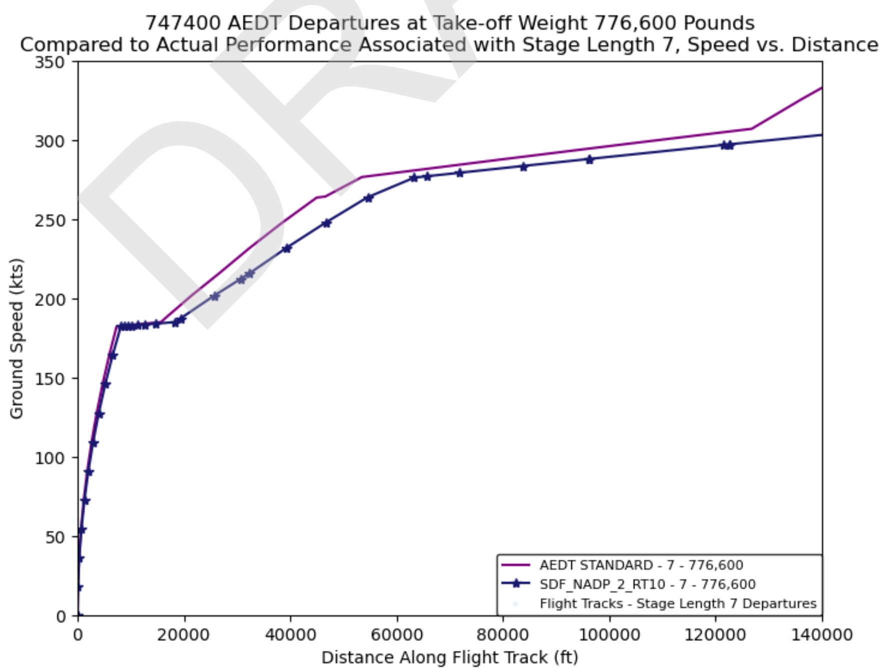

Figure B-82. 747400 Departures, Stage Length 7, Speed vs. Distance

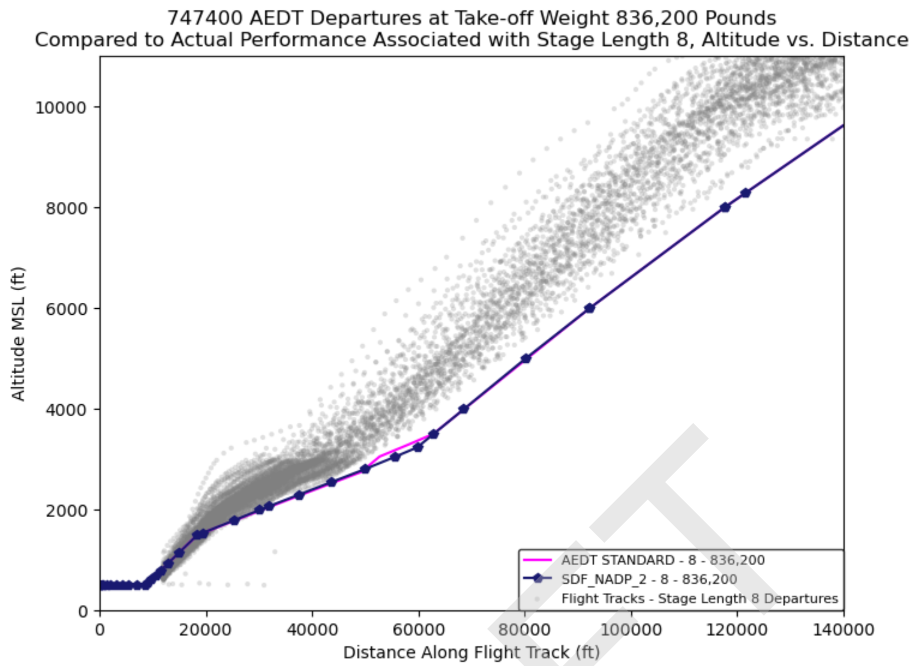

Figure B-83. 747400 Departures, Stage Length 8, Altitude vs. Distance

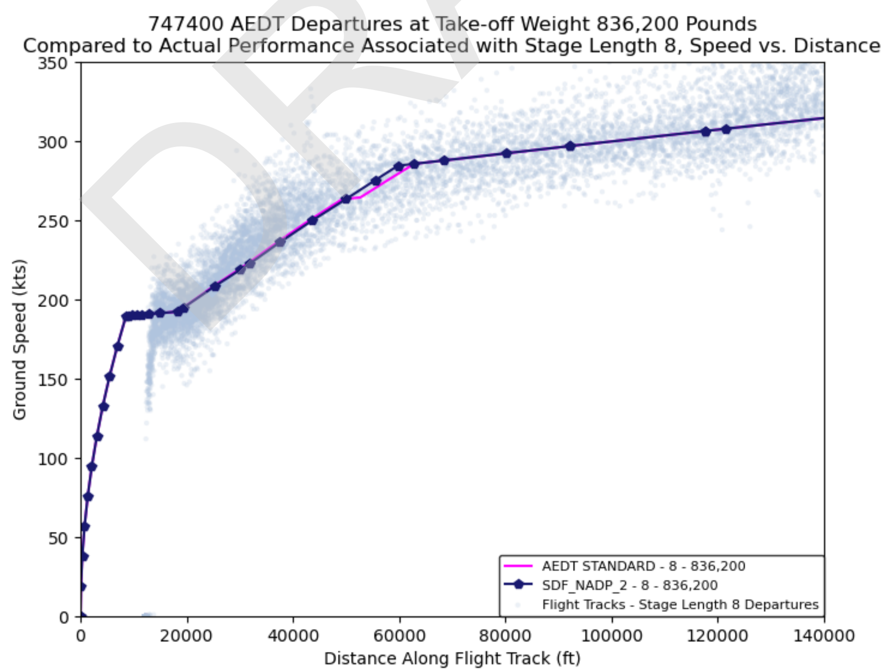

Figure B-84. 747400 Departures, Stage Length 8, Speed vs. Distance

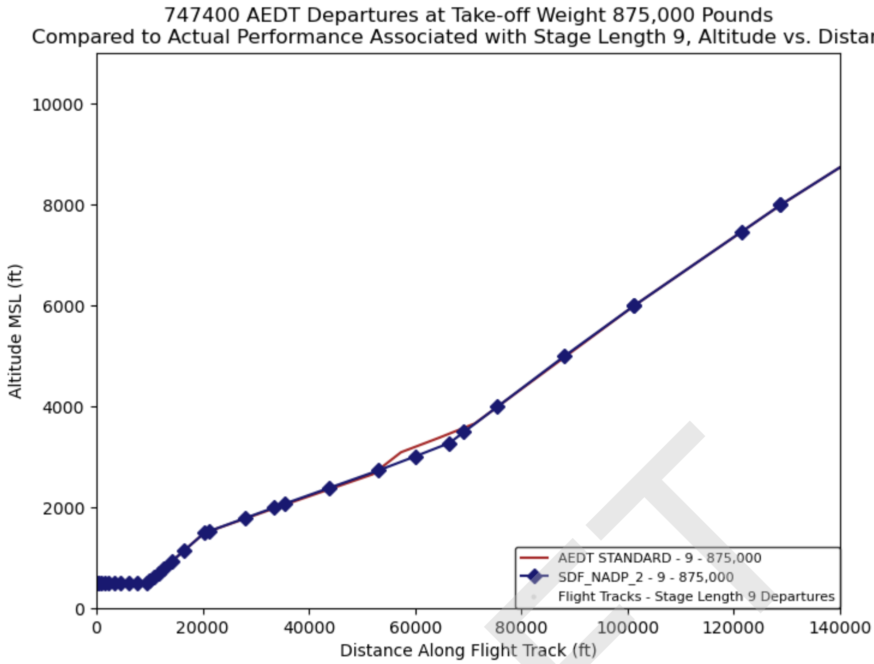

Figure B-85. 747400 Departures, Stage Length 9, Altitude vs. Distance

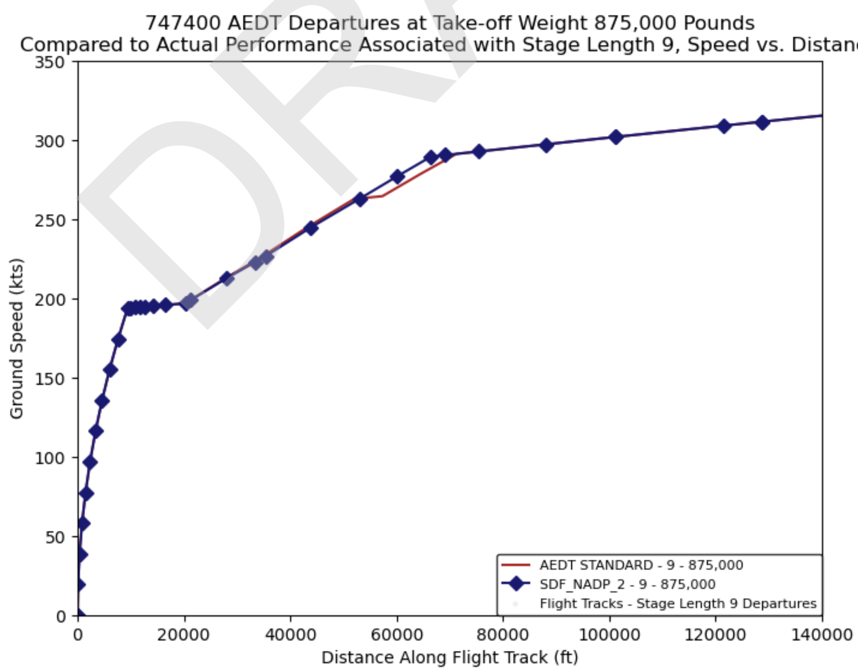

Figure B-86. 747400 Departures, Stage Length 9, Speed vs. Distance

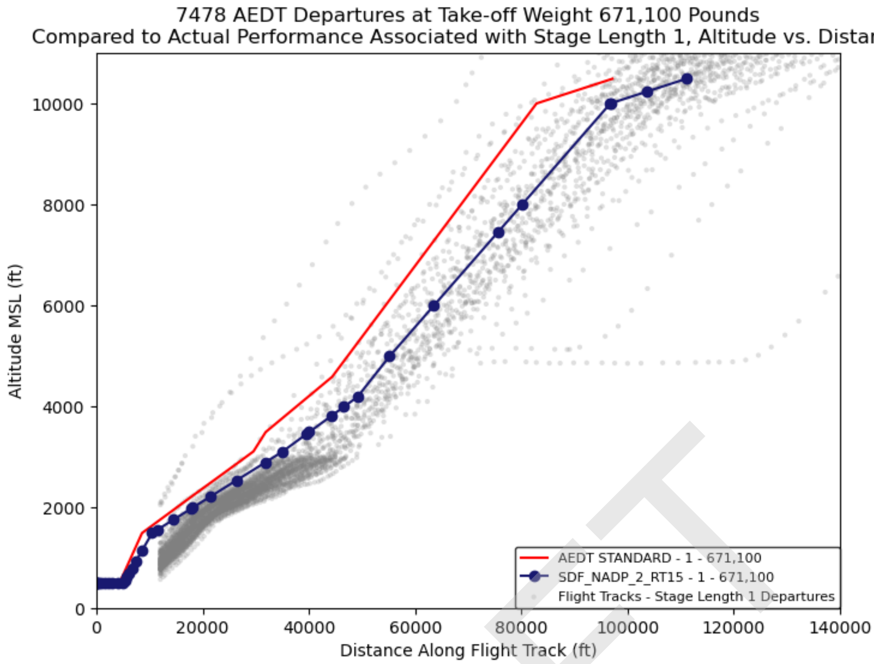

Figure B-87. 7478 Departures, Stage Length 1, Altitude vs. Distance

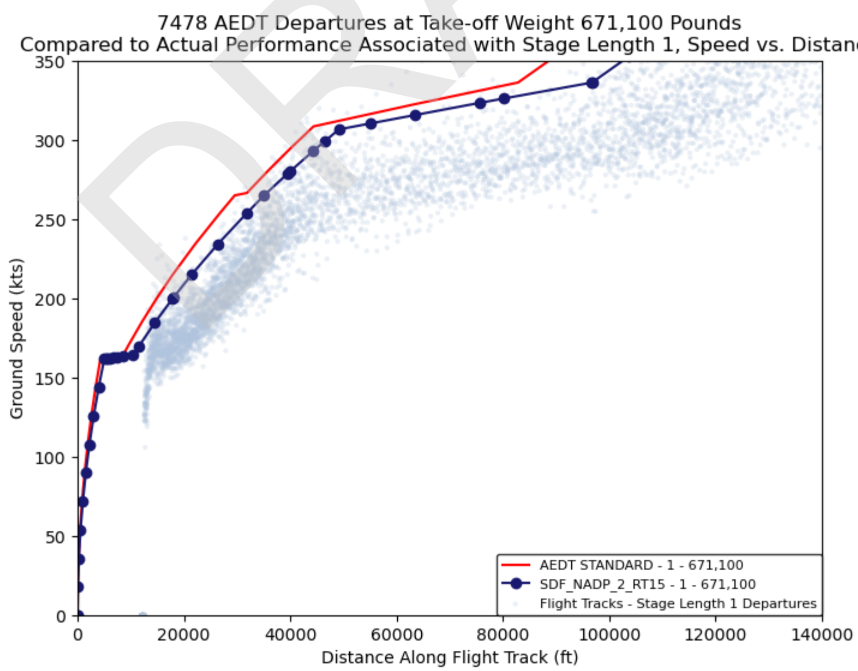

Figure B-88. 7478 Departures, Stage Length 1, Speed vs. Distance

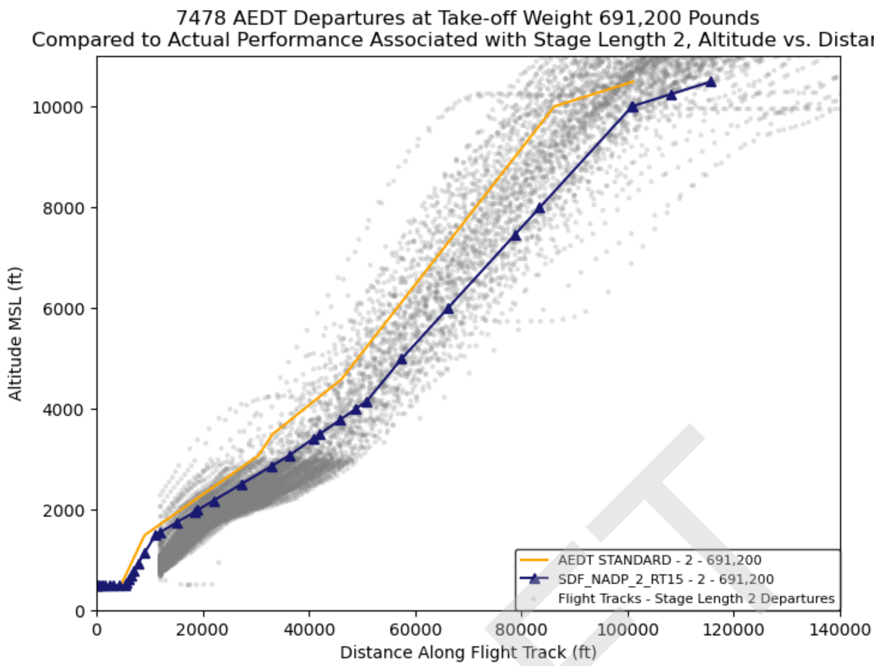

Figure B-89. 7478 Departures, Stage Length 2, Altitude vs. Distance

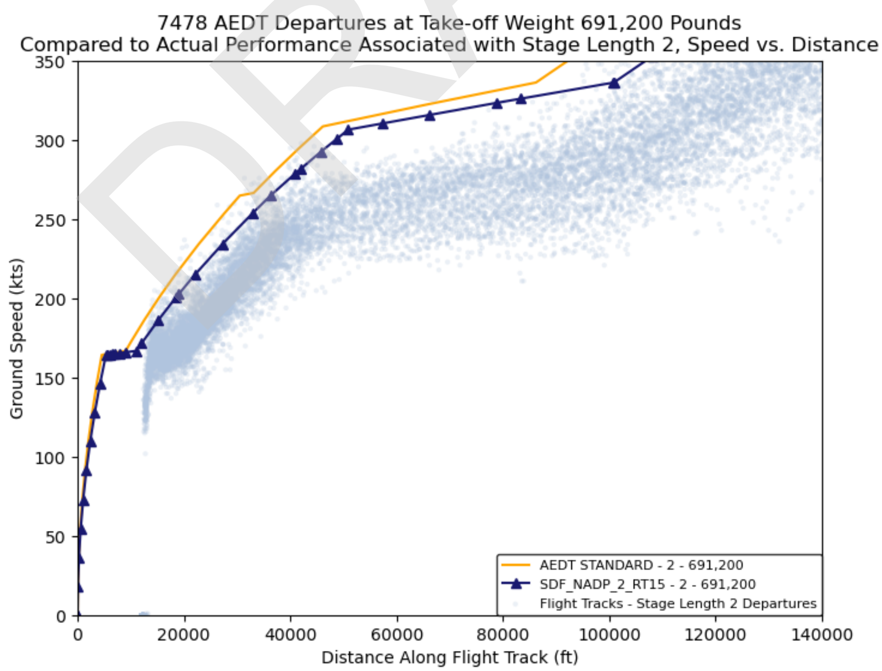

Figure B-90. 7478 Departures, Stage Length 2, Speed vs. Distance

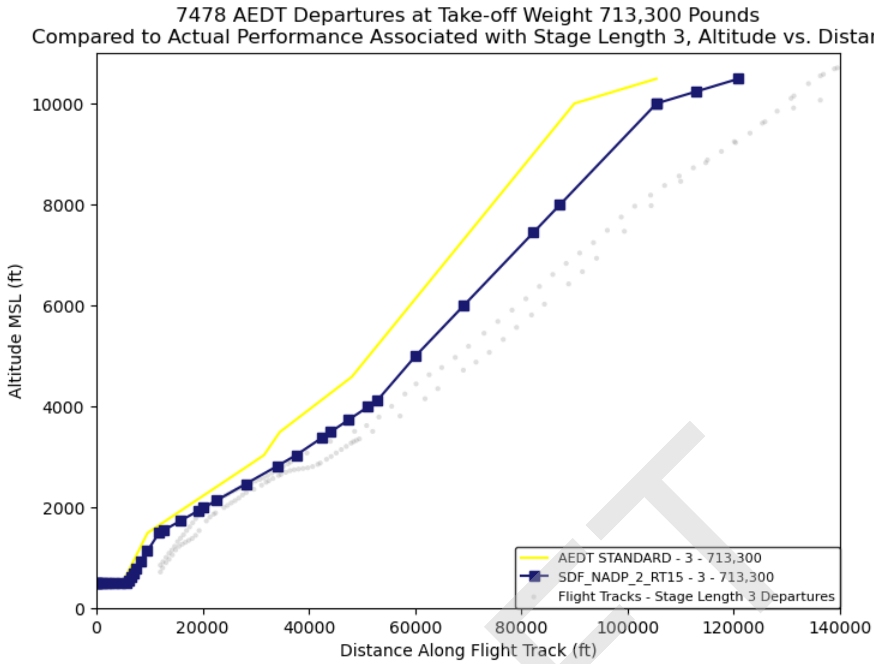

Figure B-91. 7478 Departures, Stage Length 3, Altitude vs. Distance

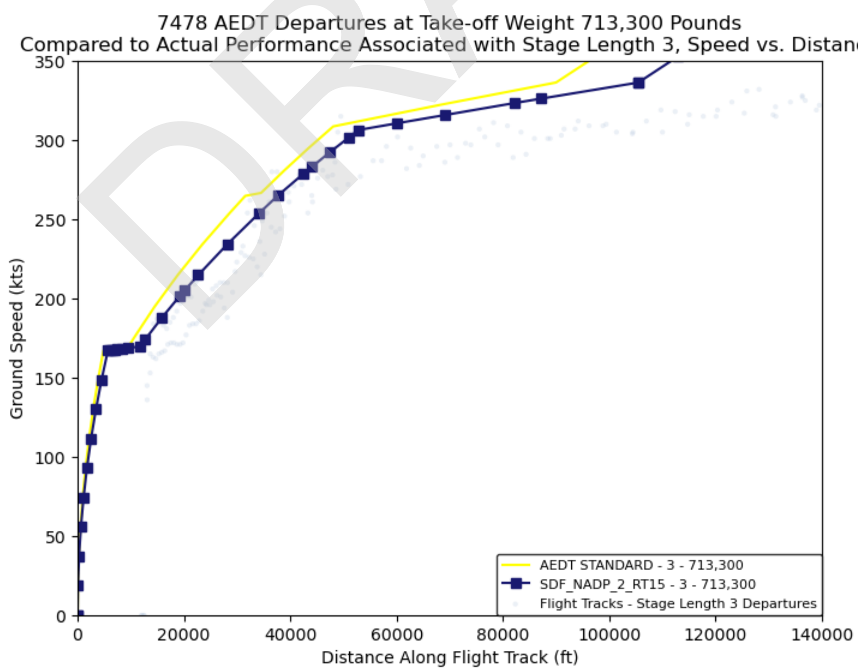

Figure B-92. 7478 Departures, Stage Length 3, Speed vs. Distance

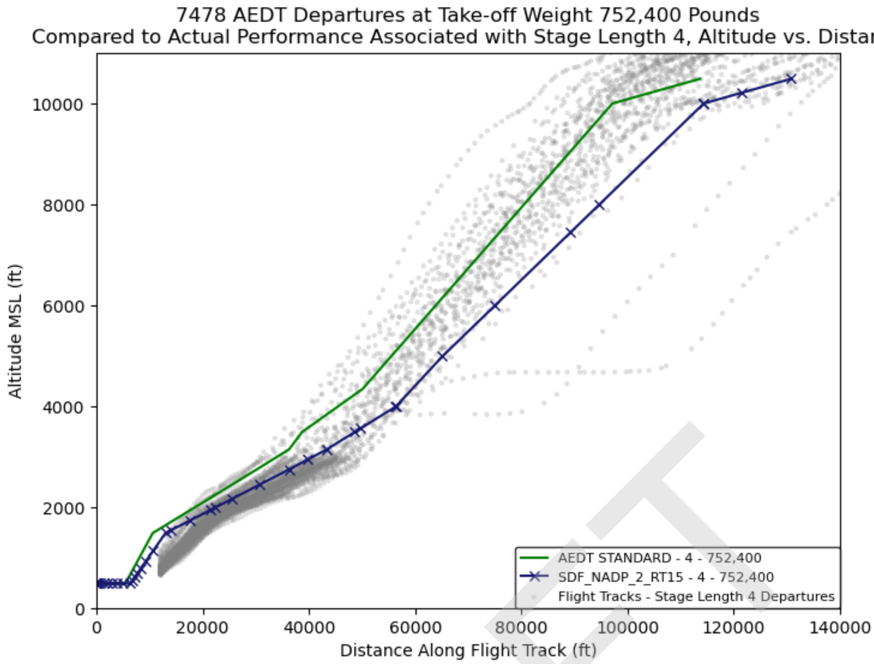

Figure B-93. 7478 Departures, Stage Length 4, Altitude vs. Distance

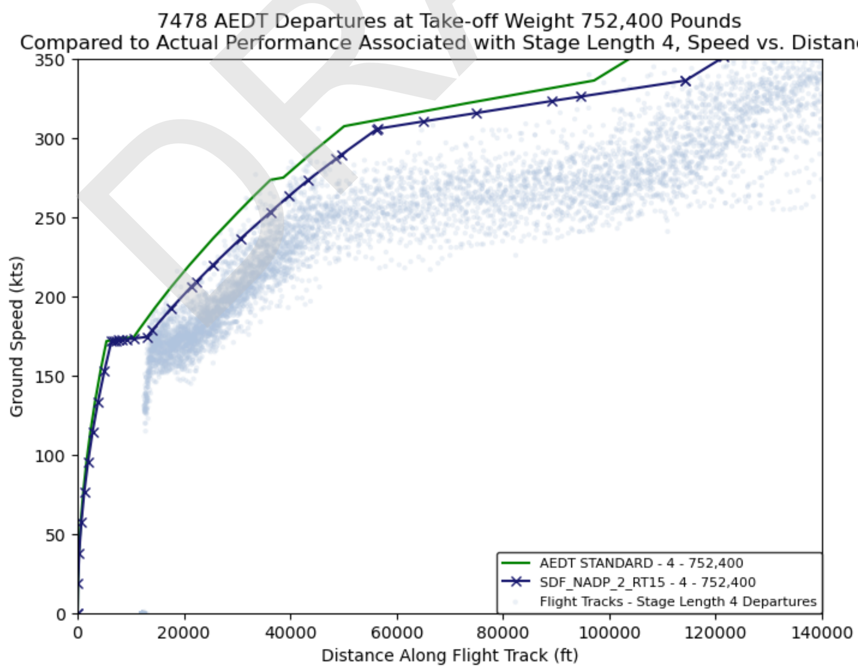

Figure B-94. 7478 Departures, Stage Length 4, Speed vs. Distance

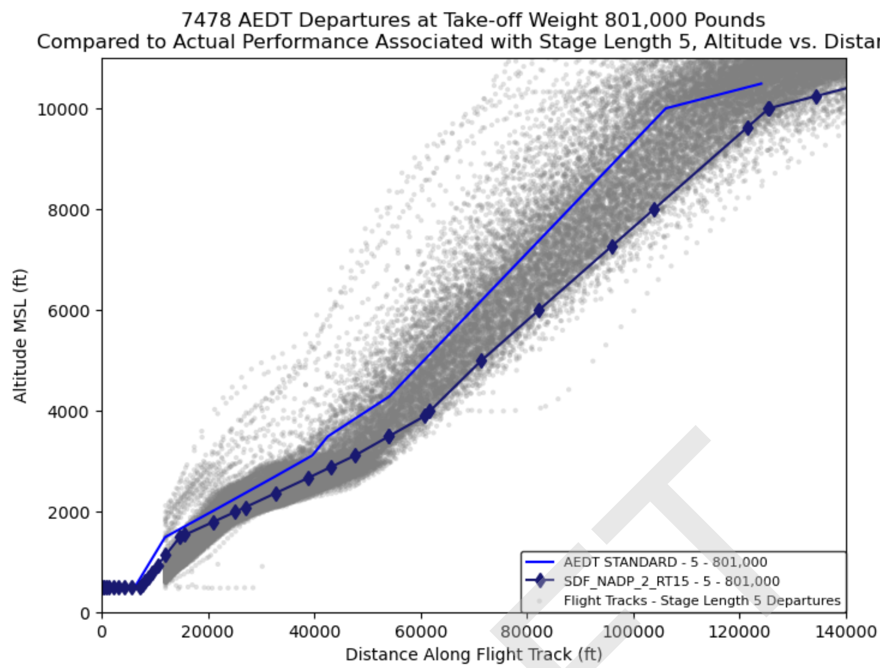

Figure B-95. 7478 Departures, Stage Length 5, Altitude vs. Distance

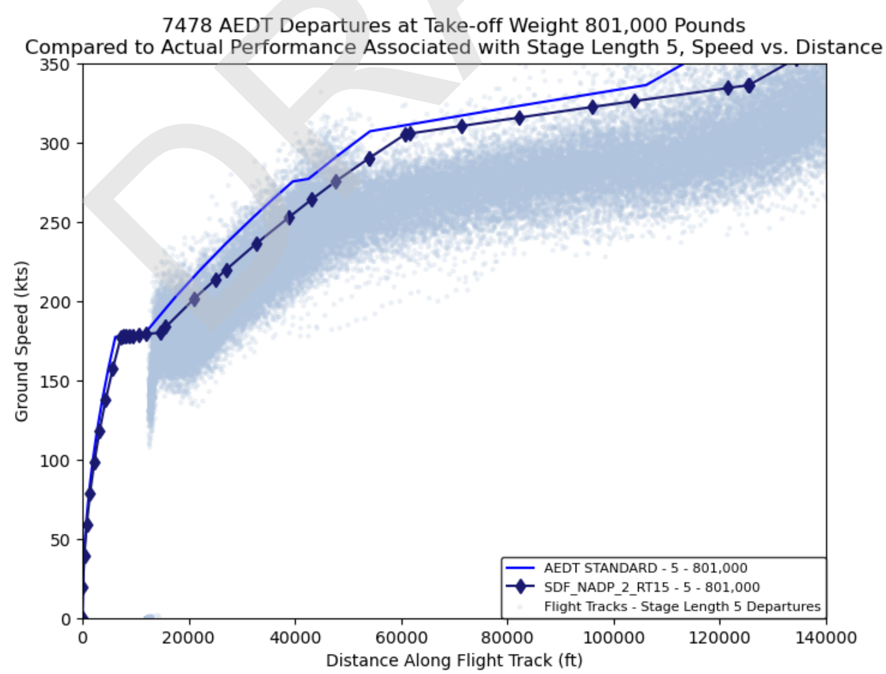

Figure B-96. 7478 Departures, Stage Length 5, Speed vs. Distance

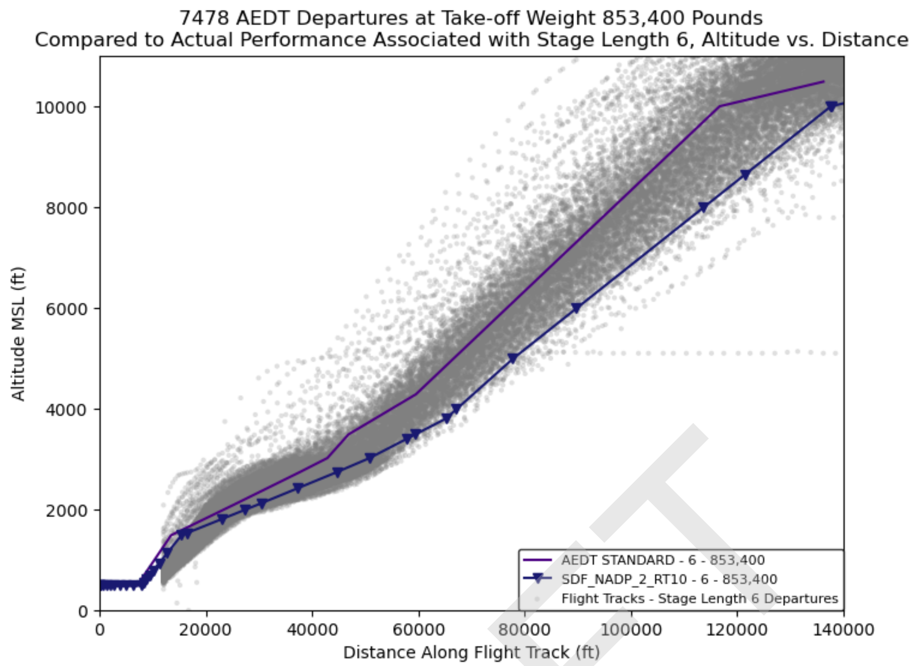

Figure B-97. 7478 Departures, Stage Length 6, Altitude vs. Distance

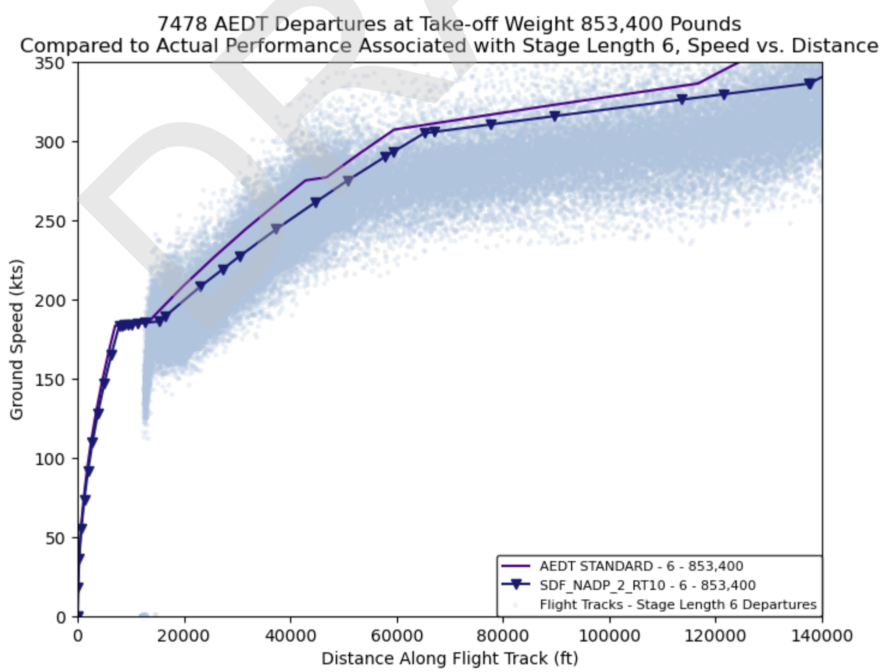

Figure B-98. 7478 Departures, Stage Length 6, Speed vs. Distance

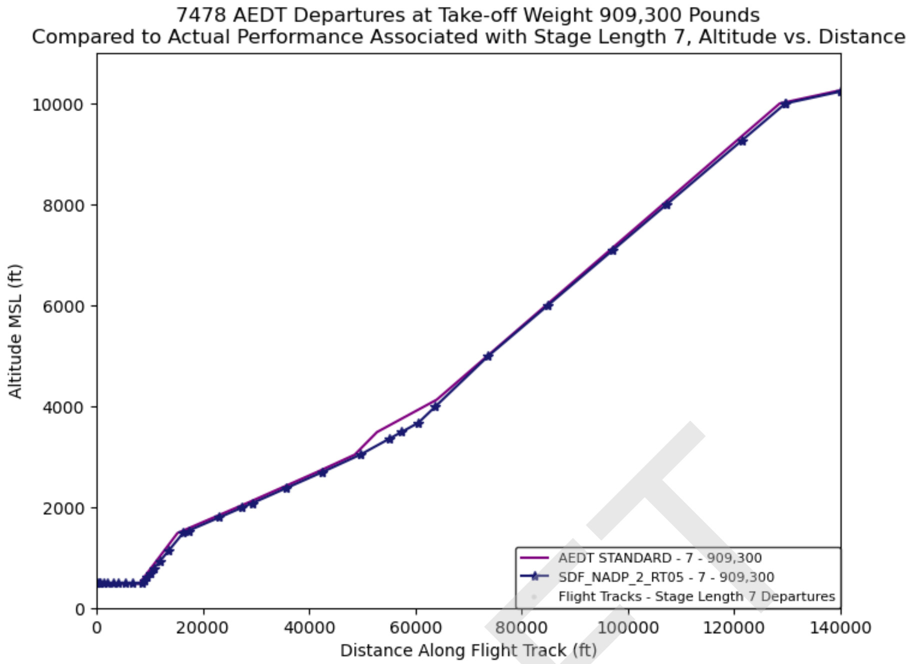

Figure B-99. 7478 Departures, Stage Length 7, Altitude vs. Distance

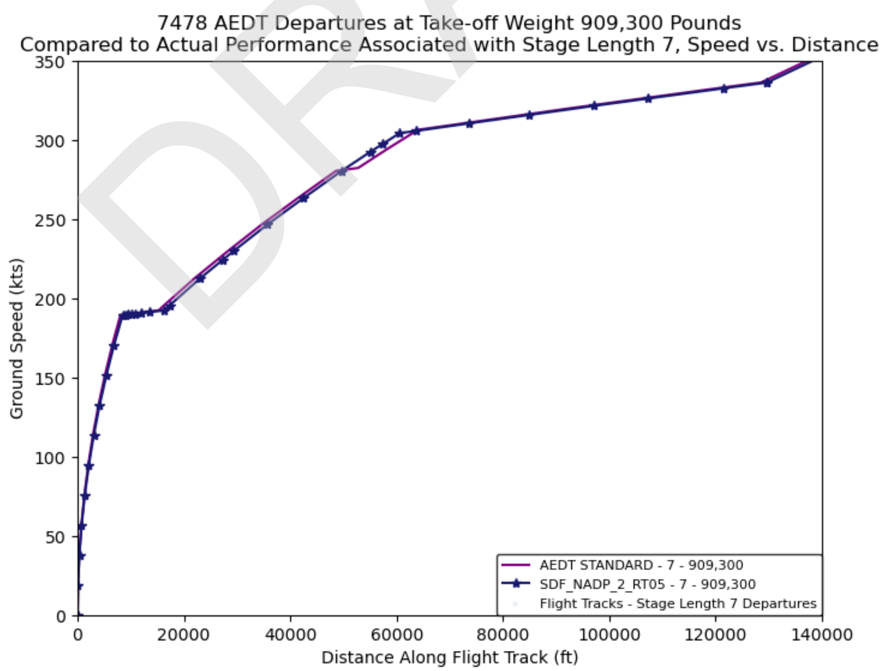

Figure B-100. 7478 Departures, Stage Length 7, Speed vs. Distance

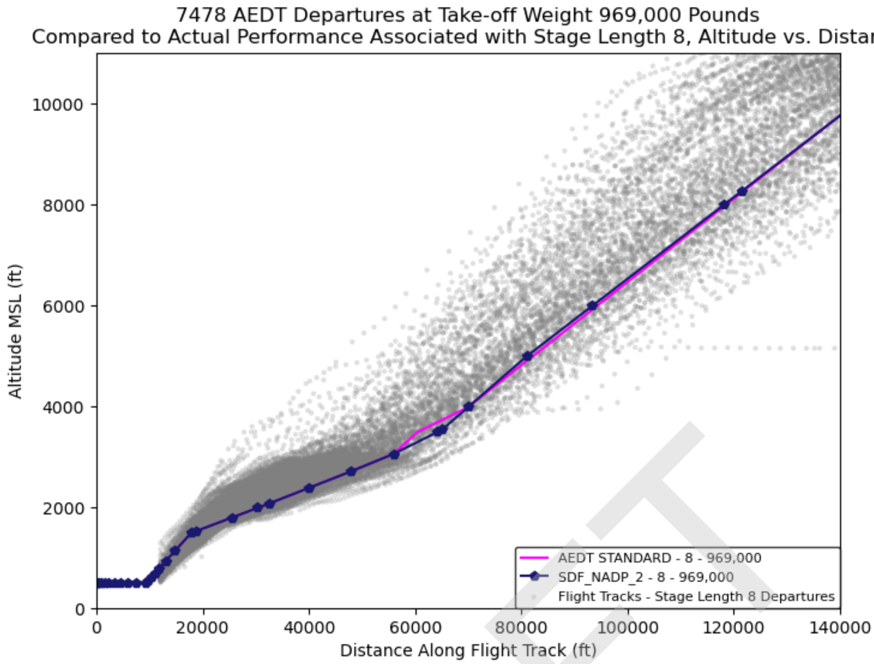

Figure B-101. 7478 Departures, Stage Length 8, Altitude vs. Distance

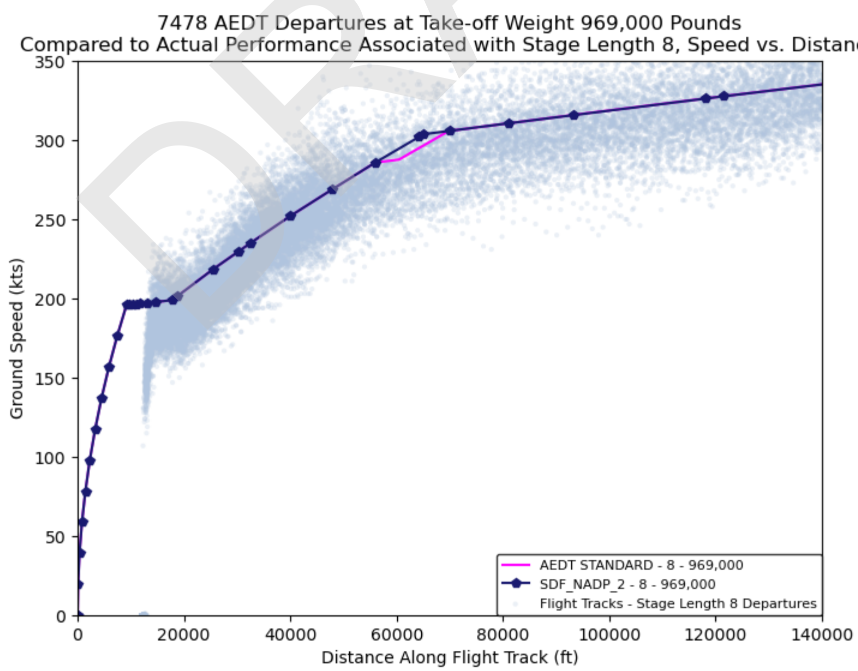

Figure B-102. 7478 Departures, Stage Length 8, Speed vs. Distance

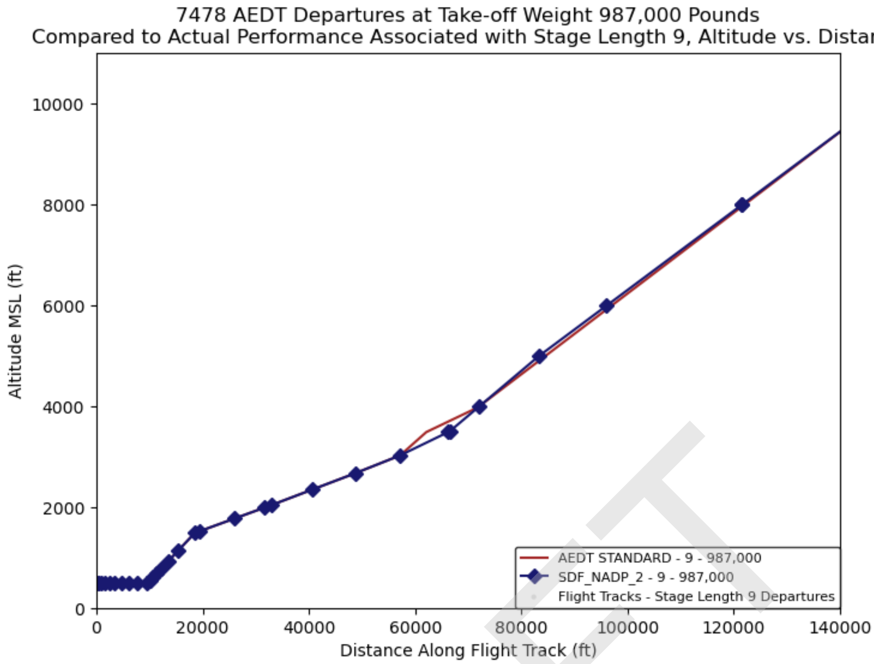

Figure B-103. 7478 Departures, Stage Length 9, Altitude vs. Distance

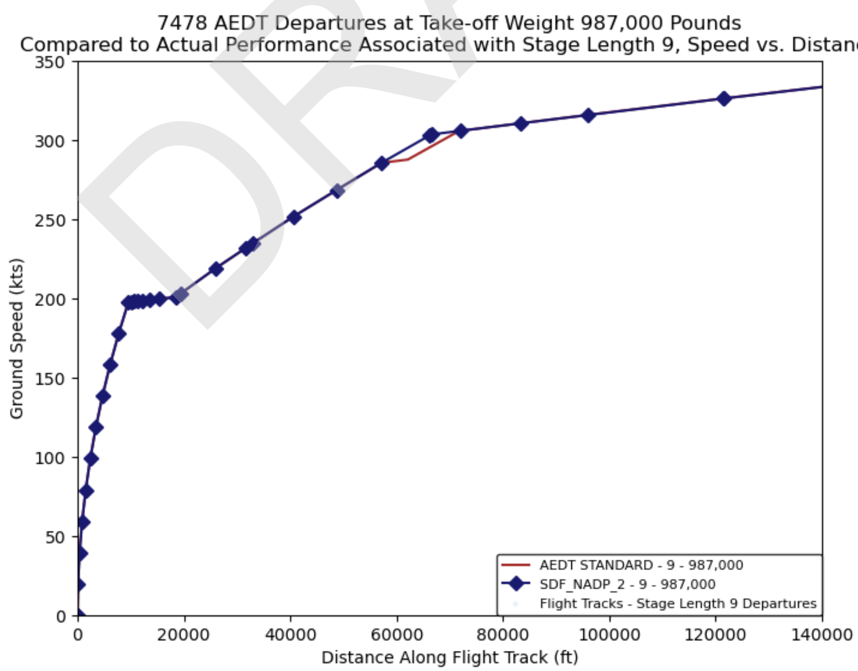

Figure B-104. 7478 Departures, Stage Length 9, Speed vs. Distance

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Section C:

Boeing 757-200 and 767-300

This section describes the user-defined inputs for Boeing 757-200 and 767-300. These aircraft make up a notable portion of SDF existing operations, both daytime and nighttime. The 757-200 at SDF is represented by two ANP types: 757PW and 757RR, depending on the engine. The 767-300 is represented by ANP type 7673ER. Our discussion with operators indicates that procedures are the same for the 757-200 and 767-300 and that both aircraft are flown by the same group of pilots. From the operators' perspective, there is no operational difference for the 757-200 represented by ANP type 757PW versus those 757-200 represented by ANP type 757RR.

Current operators of the 757-200 and 767-300 at SDF have provided information related to development of these AEDT profiles and have indicated that these profiles are representative of current 2024 operations and are expected to be in place in the future. This user-defined profile submission has been prepared in accordance with FAA guidance. The profile information and supporting documentation is included in the following sections.

Overall, the proposed user-defined profiles reflect current SDF 757-200 and 767-300 procedures that operators refer to as "NADP 2." In simple terms, these procedures are described with the following steps:

- Take-off thrust and take-off flaps while climbing at constant airspeed speed to 1,000 ft Above Field Elevation (AFE);
- At 1,000 ft AFE, reduce thrust to climb thrust setting, reduce aircraft pitch, accelerate and retract flaps on the aircraft manufacturer's recommended speed schedule (i.e., sometimes referred to as "retract flaps on schedule" or "flap retraction schedule");
- Continue accelerating to 250 knots indicated airspeed with flaps fully retracted; and
- Constant speed climb at 250 knots to 10,000 ft AFE.

The closest profiles available with AEDT include an additional climb step between acceleration for the "retract flaps on schedule" step and the "accelerating to 250 knots indicated airspeed with flaps fully retracted" step. Current operators of the Boeing 757-200 and Boeing 767-300 have indicated that the extra climb segment within the default AEDT profiles is not representative of actual operations at SDF. The proposed user-defined profiles developed are modifications of existing AEDT profiles and continue to use AEDT's flap retraction schedule for a given weight.

The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Boeing 757-200 and 767-300 operations will be represented with AEDT ANP stage lengths 1 – 4, while stage lengths 5, 6 and 7 will be used much less often. Stage lengths 8 and 9 are not expected to be used for these aircraft.

HMMH has prepared this documentation in accordance with Section 5 of FAA's document titled "Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA" dated October 27, 2017.[1]

[1] https://aedt.faa.gov/Documents/guidance_aedt_nepa.pdf

Contents

Figures

Tables

C.1. Boeing 757-200 (ANP Type 757PW) Profile Review with AEDT 3f

C.1.1. Statement of Benefit

Operators at SDF use a version of "Noise Abatement Departures Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. The proposed 757PW climb profiles and thrust settings during the various stages of flight provide a better representation of what is actually being flown by cargo aircraft at SDF. These profiles were developed from the default (i.e. included) reduced thrust profiles in AEDT.

The proposed user-defined profiles were developed with considerations of SDF runway specific length and minimum climb requirements. Correspondence with the operators has indicated a high agreement with their procedures at SDF.

C.1.1.1. Figures Supporting Statement of Benefit

Figure C-1 and **Figure C-3** compare the standard AEDT profiles and proposed profiles to actual aircraft climb performance at SDF. **Figure C-2** and **Figure C-4** compare the standard AEDT profiles and proposed profiles to actual aircraft ground speed profiles at SDF. The standard profiles are identified in the figure legends as "Stage length - Weight". The proposed profiles are identified in the figure legends as "Name – Stage length - Weight."

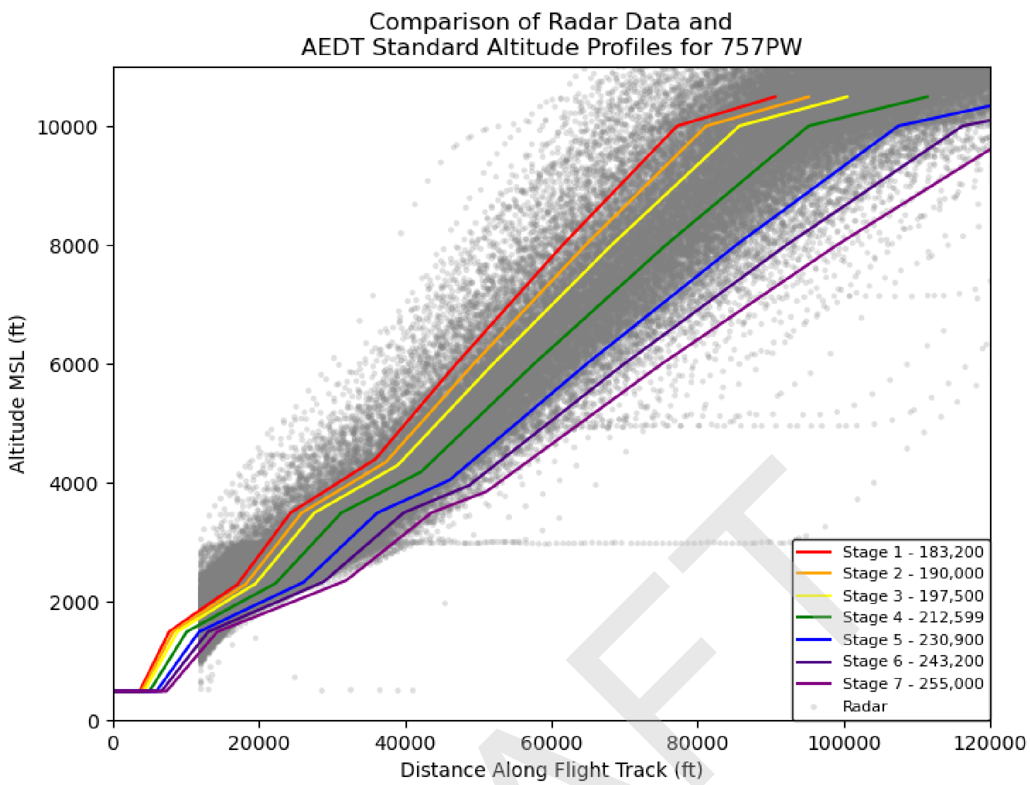

Figure C-1. 757PW AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

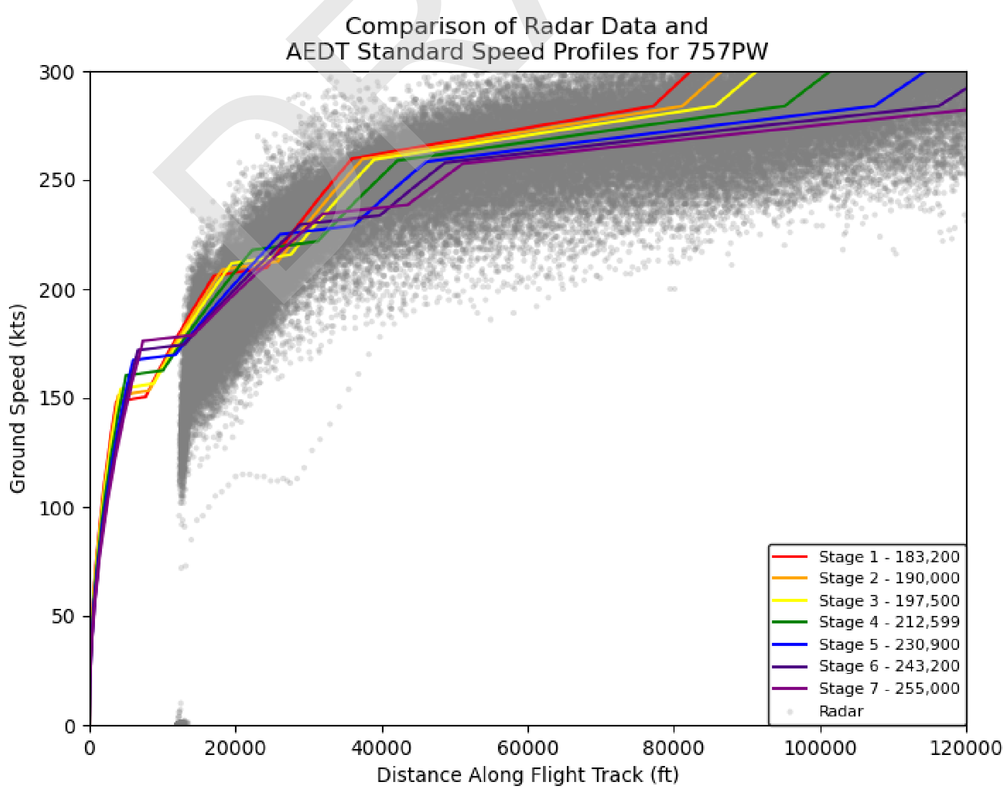

Figure C-2. 757PW AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

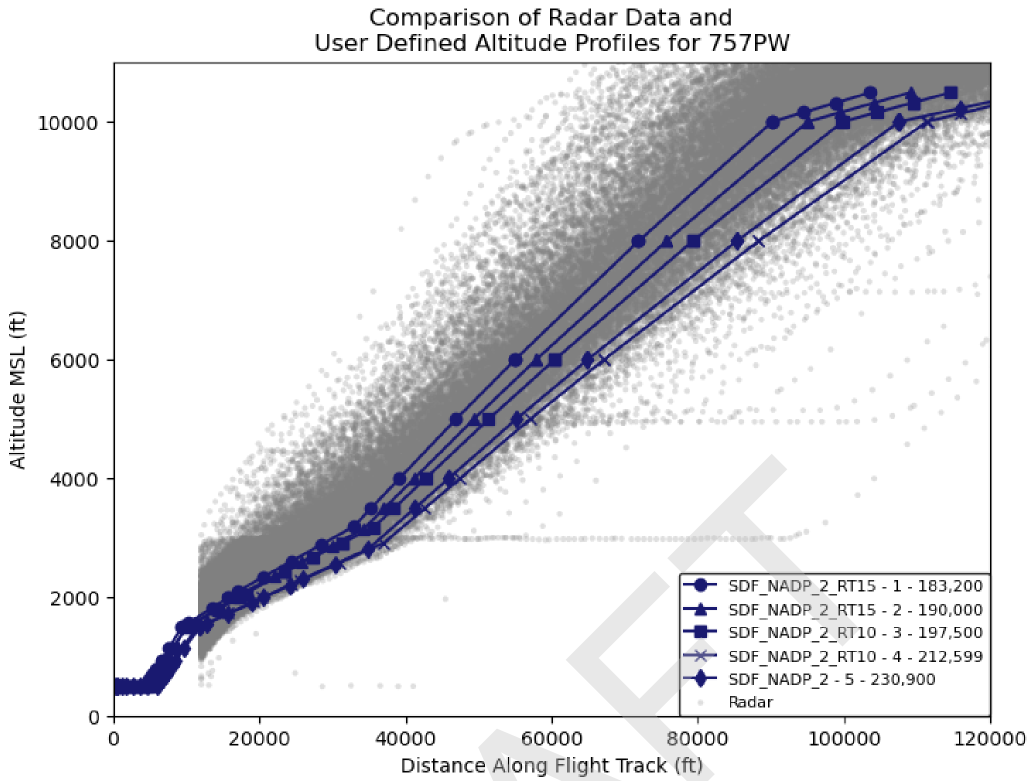

Figure C-3. 757PW Proposed Altitude Profiles Compared to Actual Aircraft Performance

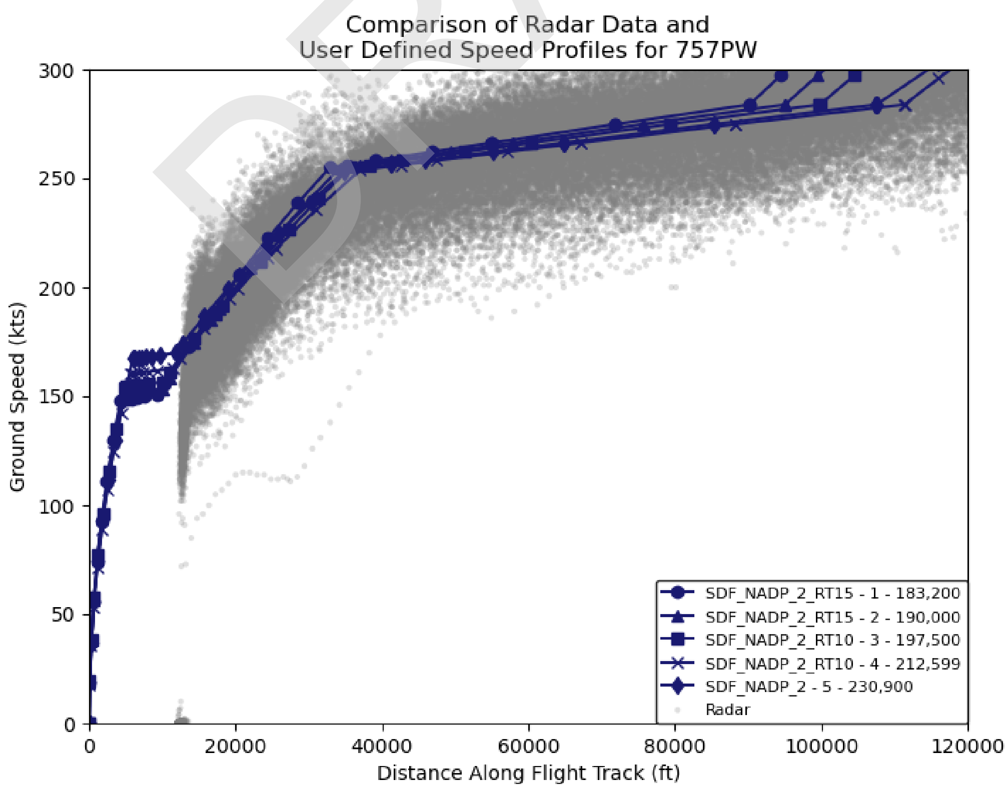

Figure C-4. 757PW Proposed Speed Profiles Compared to Actual Aircraft Performance

C.1.2. Analysis Demonstrating Benefit

The differences between the existing 757PW profiles in AEDT 3f and the proposed user-defined profiles are primarily due to the use of reduced thrust and climb altitude on departure. The sound exposure level results under the flight path from the user-defined departure procedures are shown in **Section C.1.5.1**. Overall, the proposed user-defined profiles show less noise associated with the take-off roll, a different location where aircraft change from take-off thrust to climb thrust, and additional noise under the flight path miles out because of a slower climb.

C.1.3. Concurrence on Aircraft Performance

Preparation of these profiles for the current project and AEDT 3f was done in cooperation with the relevant airline. Airline concurrence documentation accompanies this memorandum for submission to FAA.

C.1.4. Certification of New Parameters

The profiles developed for this study are procedure step profiles created by modifying profiles already included in AEDT 3f. Screenshots from the AEDT user interface (UI) of starting default profiles and the proposed user-defined profiles are presented for comparison as **Figure C-5** through **Figure C-14**. An AEDT study containing the profiles developed for this project is available in electronic form upon request. Altitudes are listed as feet above airfield elevation. Speeds are entered as true airspeed in units of knots. Thrust is in units of pounds which matches the units of thrust settings used in the aircraft's associated noise-power-distance curves.

C.1.4.1. 757PW, Profile Weight 183,200

The "stage length 1" user-defined profile for the 757PW assumes a weight of 183,200 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT 15; PROF_ID2: 1. This user-defined profile was created by copying and editing default AEDT 3f profile MODIFIED_RT15; PROF_ID2: 1 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

MODIFIED_RT15	Procedural	183200	1	Departure		
Procedure Profile						
Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		190.1	50
4	Percent Accelerate	T_01	Max Climb 10% Reduced		206	55
5	Climb	T_00	Max Climb 10% Reduced	3000		
6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-5. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1

SDF_NADP_2_RT15	Procedural	183200	1	Departure		
Procedure Profile						
Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		190.1	50
4	Percent Accelerate	T_01	Max Climb 10% Reduced		206	55
5	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
6	Climb	ZERO	Max Climb 10% Reduced	4500		
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-6. AEDT UI Screenshot of Proposed User-defined Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1

C.1.4.2. 757PW, Profile Weight 190,000

The “stage length 2” user-defined profile for the 757PW assumes a weight of 190,000 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_15; PROF_ID2: 2. This user-defined profile was created by copying and editing default AEDT 3f profile MODIFIED_RT_15; PROF_ID2: 2 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

MODIFIED_RT15	Procedural	190000	2	Departure		
Step Number	**Step Type**	**Flap ID**	**Thrust Level**	**Altitude AFE (ft)**	**Calibrated Airspeed (kt)**	**Accel Energy Share (%)**
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		191.4	50
4	Percent Accelerate	T_01	Max Climb 10% Reduced		208.7	55
5	Climb	T_00	Max Climb 10% Reduced	3000		
6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-7. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2

SDF_NADP_2_RT15	Procedural	190000	2	Departure		
Step Number	**Step Type**	**Flap ID**	**Thrust Level**	**Altitude AFE (ft)**	**Calibrated Airspeed (kt)**	**Accel Energy Share (%)**
Click here to add new item						
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		191.4	50
4	Percent Accelerate	T_01	Max Climb 10% Reduced		208.7	55
5	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
6	Climb	ZERO	Max Climb 10% Reduced	4500		
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-8. AEDT UI Screenshot of Proposed User-defined Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2

C.1.4.3. 757PW, Profile Weight 197,500

The "stage length 3" user-defined profile for the 757PW assumes a weight of 197,500 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_10; PROF_ID2: 3. This user-defined profile was created by copying and editing default AEDT 3f profile MODIFIED_RT_10; PROF_ID2: 3 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

MODIFIED_RT10	Procedural	197500	3	Departure		
Procedure Profile						
Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		193	50
4	Percent Accelerate	T_01	Max Climb 10% Reduced		211.1	50
5	Percent Accelerate	T_00	Max Climb 10% Reduced		211.6	50
6	Climb	T_00	Max Climb 10% Reduced	3000		
7	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
8	Climb	ZERO	Max Climb 10% Reduced	5500		
9	Climb	ZERO	Max Climb 10% Reduced	7500		
10	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-9. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 3

SDF_NADP_2_RT10	Procedural	197500	3	Departure		
Procedure Profile						
Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		193	50
4	Percent Accelerate	T_01	Max Climb 10% Reduced		211.1	50
5	Percent Accelerate	T_00	Max Climb 10% Reduced		211.6	50
6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
7	Climb	ZERO	Max Climb 10% Reduced	4500		
8	Climb	ZERO	Max Climb 10% Reduced	5500		
9	Climb	ZERO	Max Climb 10% Reduced	7500		
10	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-10. AEDT UI Screenshot of User-defined Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 3

C.1.4.4. 757PW, Profile Weight 212,599

The “stage length 4” user-defined profile for the 757PW assumes a weight of 212,599 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT_10; PROF_ID2: 4. This user-defined profile was created by copying and editing default AEDT 3f profile MODIFIED_RT_10; PROF_ID2: 4 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

MODIFIED_RT10	Procedural	212599	4	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		196.4	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		213.7	55
5	Percent Accelerate	T_00	Max Climb 10% Reduced		217.4	55
6	Climb	T_00	Max Climb 10% Reduced	3000		
7	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
8	Climb	ZERO	Max Climb 10% Reduced	5500		
9	Climb	ZERO	Max Climb 10% Reduced	7500		
10	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-11. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 4

SDF_NADP_2_RT10	Procedural	212599	4	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		196.4	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		213.7	55
5	Percent Accelerate	T_00	Max Climb 10% Reduced		217.4	55
6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	55
7	Climb	ZERO	Max Climb 10% Reduced	4500		
8	Climb	ZERO	Max Climb 10% Reduced	5500		
9	Climb	ZERO	Max Climb 10% Reduced	7500		
10	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-12. AEDT UI Screenshot of Proposed User-defined Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 4

C.1.4.5. 757PW, Profile Weight 230,900

The “stage length 5” user-defined profile for the 757PW assumes a weight of 230,900 lbs, and is identified as PROF_ID1: SDF_NADP_2_RT00; PROF_ID2: 4. This user-defined profile was created by copying and editing default AEDT 3f profile MODIFIED_RT05; PROF_ID2: 5 to remove the climb at step 6 and modified to set thrust level to maximum at step 1 and step 2. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

MODIFIED_RT05	Procedural	230900	5	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 5% Reduced		0	
2	Climb	5	Max Takeoff 5% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb		200.8	55
4	Percent Accelerate	T_01	Max Climb		218.5	55
5	Percent Accelerate	T_00	Max Climb		224.3	55
6	Climb	T_00	Max Climb	3000		
7	Percent Accelerate	T_00	Max Climb		250	55
8	Climb	ZERO	Max Climb	5500		
9	Climb	ZERO	Max Climb	7500		
10	Climb	ZERO	Max Climb	10000		

Figure C-13. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 5

SDF_NADP_2_RT00	Procedural	230900	5	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff		0	
2	Climb	5	Max Takeoff	1000		
3	Percent Accelerate	T_05	Max Climb		200.8	55
4	Percent Accelerate	T_01	Max Climb		218.5	55
5	Percent Accelerate	T_00	Max Climb		224.3	55
6	Percent Accelerate	T_00	Max Climb		250	55
7	Climb	ZERO	Max Climb	4500		
8	Climb	ZERO	Max Climb	5500		
9	Climb	ZERO	Max Climb	7500		
10	Climb	ZERO	Max Climb	10000		

Figure C-14. AEDT UI Screenshot of Proposed User-defined Profile PROF_ID1: SDF_NADP_2_RT00; PROF_ID2: 5

C.1.5. Graphical and Tabular Comparison

An MS Excel file containing the profile points as found in the AEDT XML Performance Report Export file is available in electronic form upon request. It was developed for comparison of performance data to the AEDT Standard profiles and was used to generate the following tables and line graphs.

C.1.5.1. Tables and Figures Supporting Analysis Demonstrating Benefit

Table C-1 through **Table C-5** show the Sound Exposure Level (SEL) results under the flight path from the user-defined departure profiles; SEL values resulting from the standard AEDT departure profiles are presented for comparison. **Figure C-15** through **Figure C-19** show the same SEL computations in the form of SEL contours.

Table C-1. SELs for 757PW Departures at 183,200 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757PW Profile Weight: 183,200 lbs. (PROF_ID2 = 1) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	126.0	124.0	-2.0
0.5	114.8	114.2	-0.6
1.0	97.9	99.3	1.4
1.5	90.6	92.8	2.2
2.0	88.1	88.6	0.6
2.5	86.2	86.8	0.6
3.0	84.4	85.2	0.8
3.5	82.4	83.9	1.5
4.0	81.0	82.6	1.7
4.5	79.7	81.5	1.8
5.0	78.7	80.4	1.7
5.5	77.7	79.2	1.5
6.0	76.6	78.2	1.6
6.5	75.8	77.0	1.3
7.0	74.9	76.1	1.2
7.5	74.0	75.2	1.1
8.0	73.3	74.3	1.0
8.5	72.6	73.5	0.9
9.0	71.9	72.8	0.8
9.5	71.3	72.1	0.8
10.0	70.8	71.5	0.7

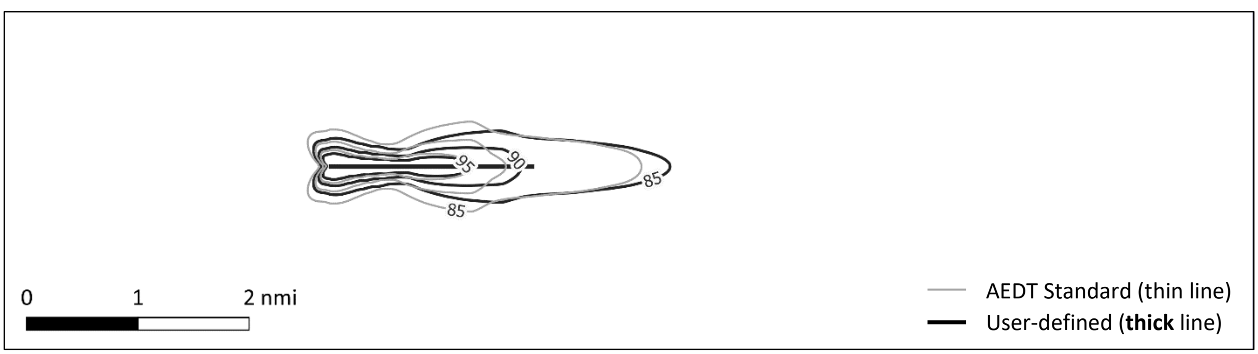

Figure C-15. SEL Contours for 757PW Departures at Take-Off Weight 183,200 Pounds

Table C-2. SELs for 757PW Departures at 190,000 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757PW Profile Weight: 190,000 lbs. (PROF_ID2 = 2) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	125.9	123.9	-2.0
0.5	114.8	114.2	-0.7
1.0	98.9	100.8	1.8
1.5	91.7	93.4	1.8
2.0	88.5	89.0	0.6
2.5	86.6	87.3	0.7
3.0	84.9	85.6	0.8
3.5	83.1	84.4	1.3
4.0	81.5	83.2	1.7
4.5	80.3	82.0	1.8
5.0	79.1	80.9	1.8
5.5	78.2	79.9	1.7
6.0	77.2	78.8	1.6
6.5	76.3	77.8	1.4
7.0	75.4	76.7	1.3
7.5	74.6	75.8	1.2
8.0	73.8	75.0	1.1
8.5	73.1	74.2	1.0
9.0	72.5	73.4	1.0
9.5	71.9	72.7	0.9
10.0	71.3	72.1	0.8

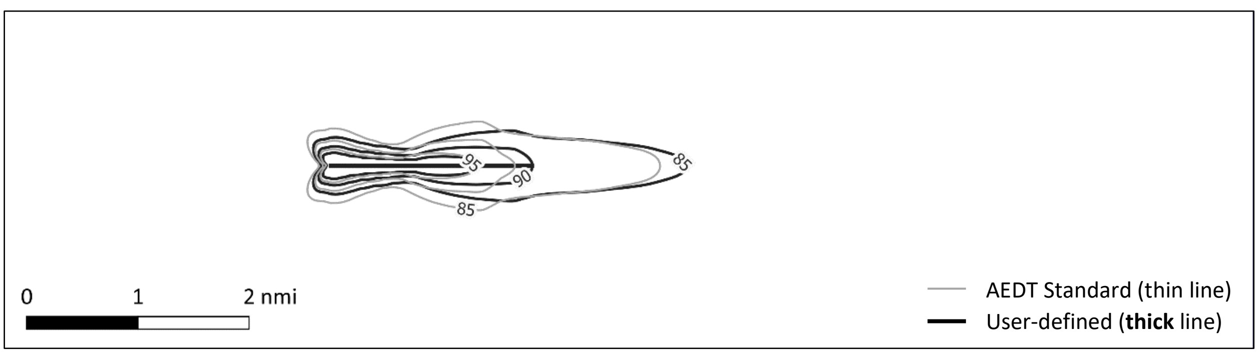

Figure C-16. SEL Contours for 757PW Departures at Take-Off Weight 190,000 Pounds

Table C-3. SELs for 757PW Departures at 197,500 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757PW Profile Weight: 197,500 lbs. (PROF_ID2 = 3) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	125.8	124.5	-1.3
0.5	115.3	114.5	-0.8
1.0	100.1	101.5	1.5
1.5	93.8	94.1	0.2
2.0	88.9	89.0	0.1
2.5	87.0	87.3	0.3
3.0	85.6	85.8	0.2
3.5	83.9	84.5	0.6
4.0	82.1	83.4	1.3
4.5	80.8	82.2	1.4
5.0	79.7	81.2	1.6
5.5	78.8	80.3	1.5
6.0	77.9	79.2	1.3
6.5	76.9	78.2	1.4
7.0	76.1	77.2	1.1
7.5	75.2	76.3	1.1
8.0	74.5	75.5	1.0
8.5	73.7	74.7	0.9
9.0	73.1	73.9	0.9
9.5	72.4	73.3	0.8
10.0	71.9	72.6	0.7

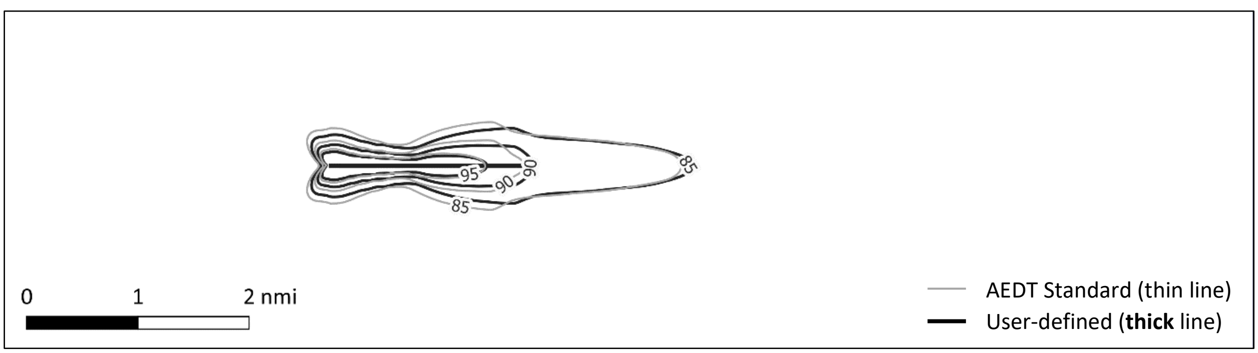

Figure C-17. SEL Contours for 757PW Departures at Take-Off Weight 197,500 Pounds

Table C-4. SELs for 757PW Departures at 212,599 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757PW Profile Weight: 212,599 lbs. (PROF_ID2 = 4) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	126.2	124.9	-1.3
0.5	115.3	114.9	-0.3
1.0	103.1	106.3	3.2
1.5	95.4	95.9	0.5
2.0	89.7	90.9	1.2
2.5	87.9	88.3	0.4
3.0	86.4	86.9	0.4
3.5	85.2	85.6	0.4
4.0	83.6	84.5	0.9
4.5	82.1	83.4	1.4
5.0	80.8	82.6	1.8
5.5	79.8	81.6	1.8
6.0	78.9	80.7	1.8
6.5	78.1	79.6	1.5
7.0	77.2	78.6	1.4
7.5	76.5	77.7	1.2
8.0	75.7	76.8	1.2
8.5	74.9	76.0	1.1
9.0	74.3	75.3	1.0
9.5	73.6	74.6	1.0
10.0	73.0	73.9	0.9

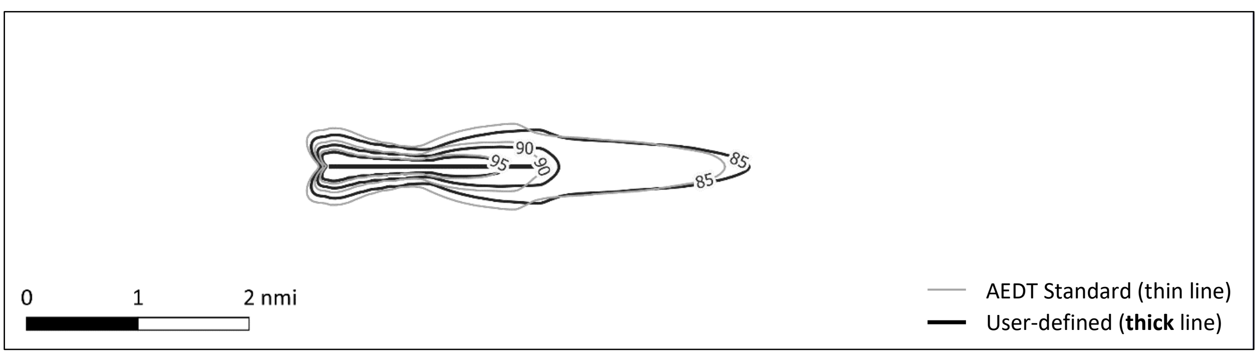

Figure C-18. SEL Contours for 757PW Departures at Take-Off Weight 212,599 Pounds

Table C-5. SELs for 757PW Departures at 230,900 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757PW Profile Weight: 230,900 lbs. (PROF_ID2 = 5) User PROF_ID1: SDF_NADP_2_RT00			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	126.0	126.0	0.0
0.5	115.7	115.7	0.0
1.0	116.3	116.3	0.0
1.5	97.5	97.5	0.0
2.0	92.9	92.9	0.0
2.5	89.0	89.0	0.0
3.0	87.5	87.5	0.0
3.5	86.2	86.2	0.0
4.0	85.1	85.1	0.0
4.5	83.9	84.1	0.2
5.0	82.4	83.1	0.7
5.5	81.2	82.1	1.0
6.0	80.2	81.1	0.9
6.5	79.3	80.0	0.6
7.0	78.6	79.0	0.4
7.5	77.8	78.0	0.2
8.0	77.1	77.2	0.1
8.5	76.4	76.4	0.1
9.0	75.7	75.7	0.0
9.5	75.0	75.0	0.0
10.0	74.4	74.4	0.0

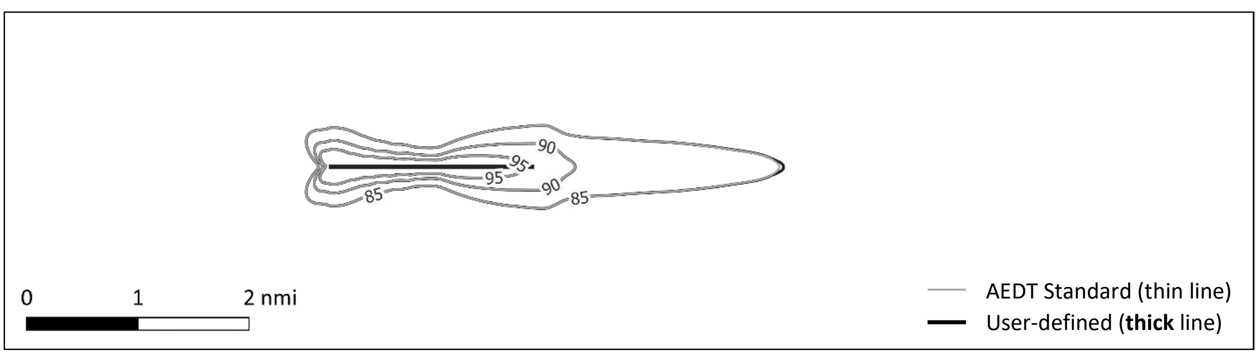

Figure C-19. SEL Contours for 757PW Departures at Take-Off Weight 230,900 Pounds

C.1.5.4. Graphical Comparison of Profiles

Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are included as **Figure C-20**, **Figure C-21**, and **Figure C-22**, respectively.

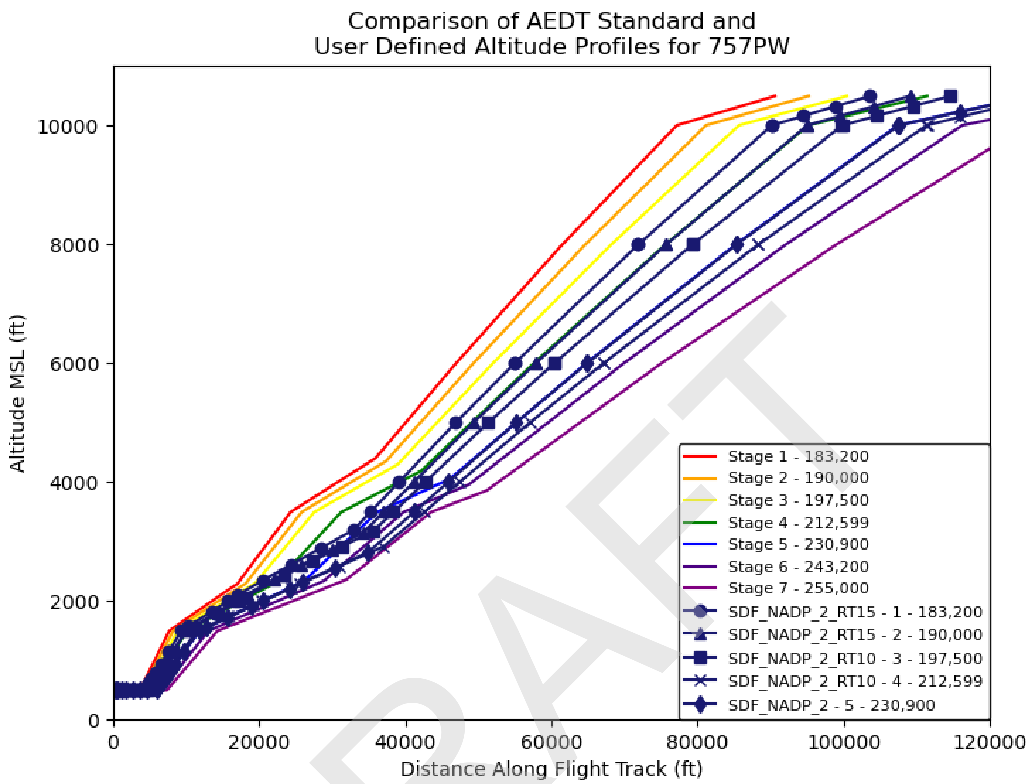

Figure C-20. 757PW AEDT Profiles, Altitude vs. Distance

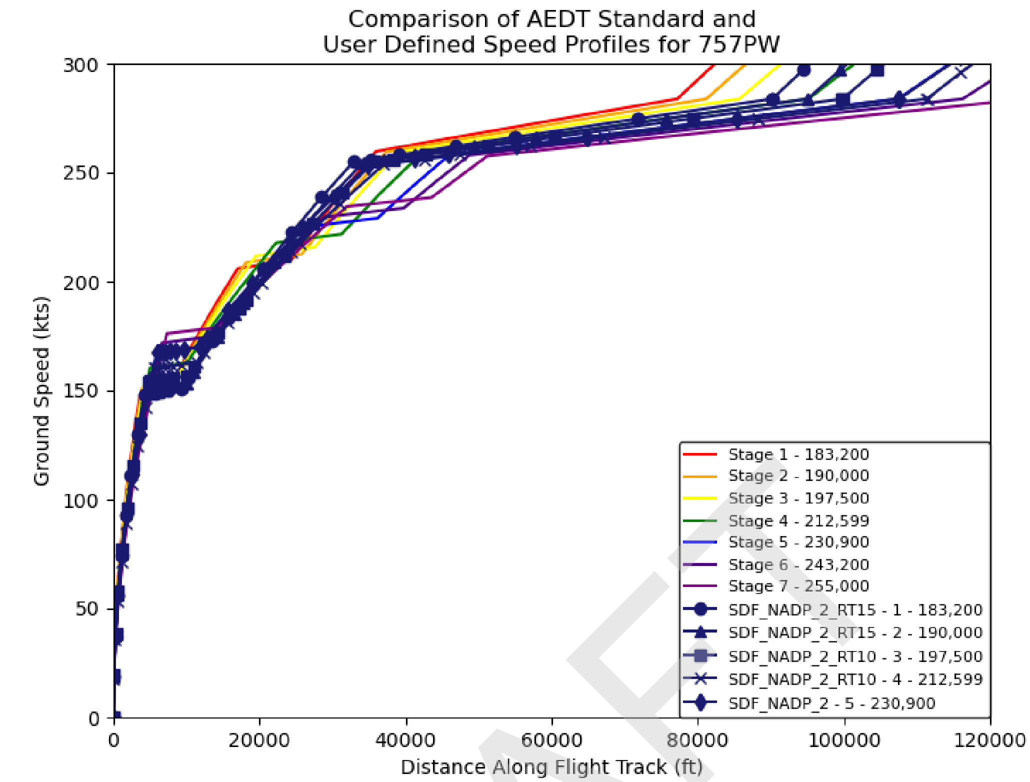

Figure C-21. 757PW AEDT Profiles, Speed vs. Distance

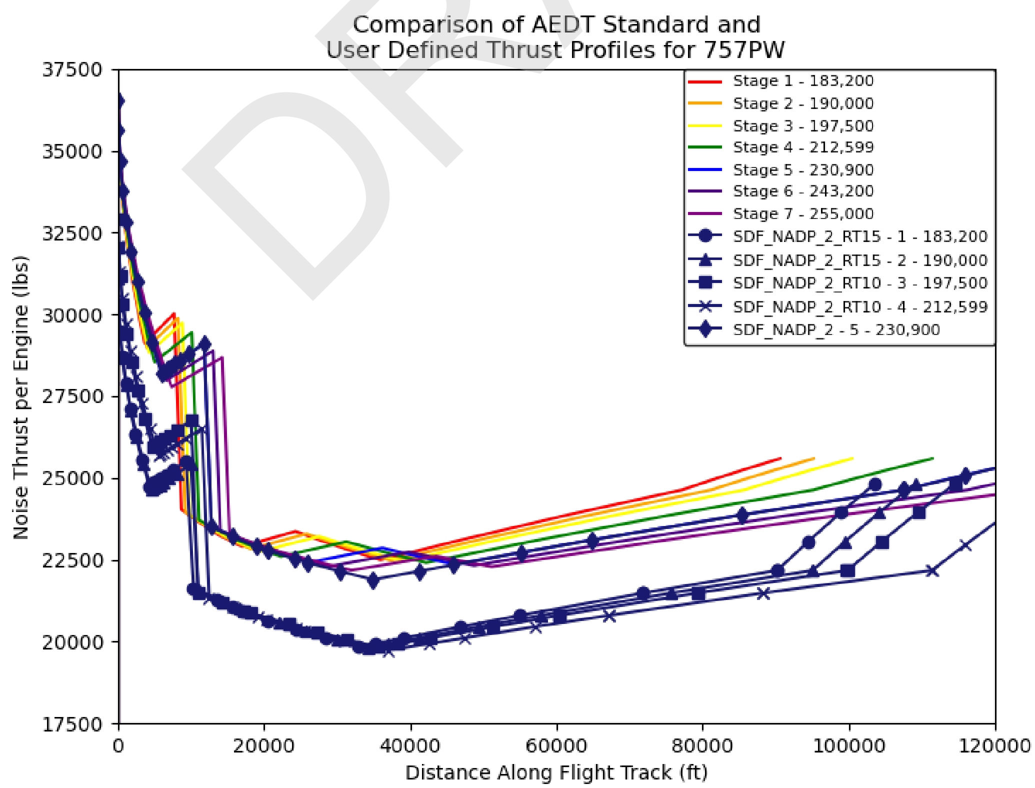

Figure C-22. 757PW AEDT Profiles, Thrust vs. Distance

C.2. Boeing 757-200 (ANP Type 757RR) Profile Review with AEDT 3f

C.2.1. Statement of Benefit

Operators at SDF use a version of "Noise Abatement Departures Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. The proposed 757RR climb profiles and thrust settings during the various stages of flight provide a better representation of what is actually being flown by cargo aircraft at SDF. These profiles were developed from the default (i.e. included) reduced thrust profiles in AEDT.

The proposed user-defined profiles were developed with considerations of SDF runway specific length and minimum climb requirements. Correspondence with the operators has indicated high agreement with their procedures at SDF.

C.2.1.1. Figures Supporting Statement of Benefit

Figure C-23 and **Figure C-25** compare the standard AEDT profiles and Boeing profiles to actual aircraft climb performance at SDF. **Figure C-24** and **Figure C-26** compare the standard AEDT profiles and proposed profiles to actual aircraft speed profiles at SDF. The standard profiles are identified in the figure legends as "Stage length - Weight". The proposed profiles are identified in the figure legends as "Name – Stage length - Weight."

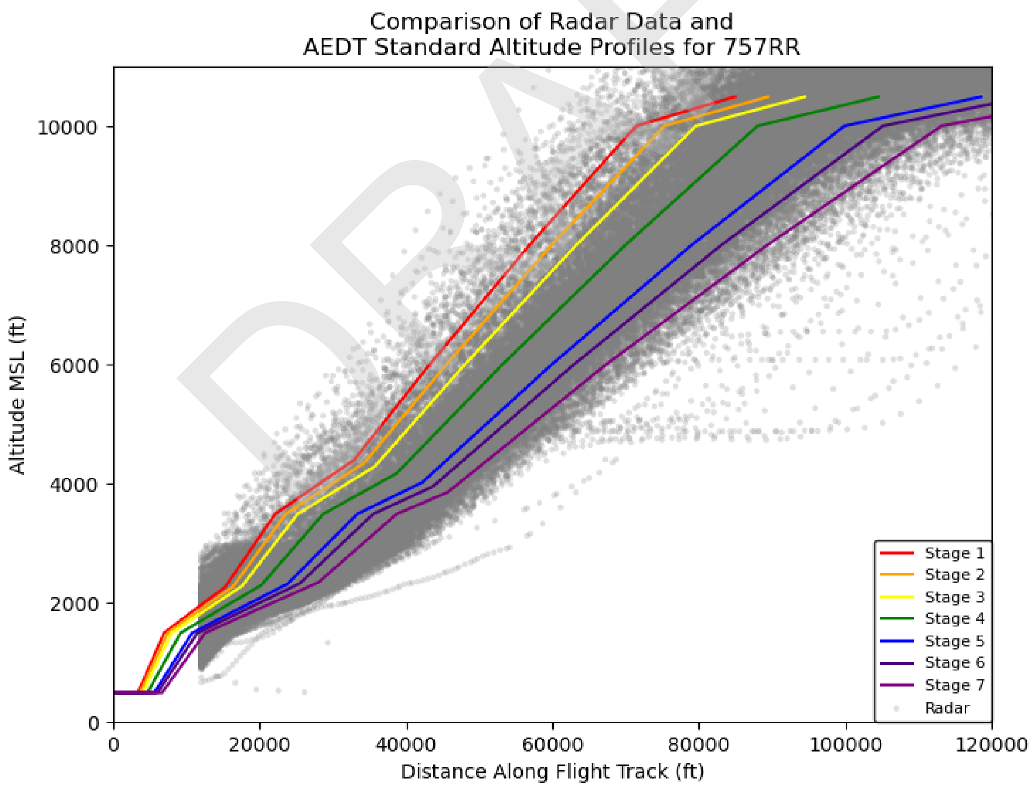

Figure C-23. 757RR AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

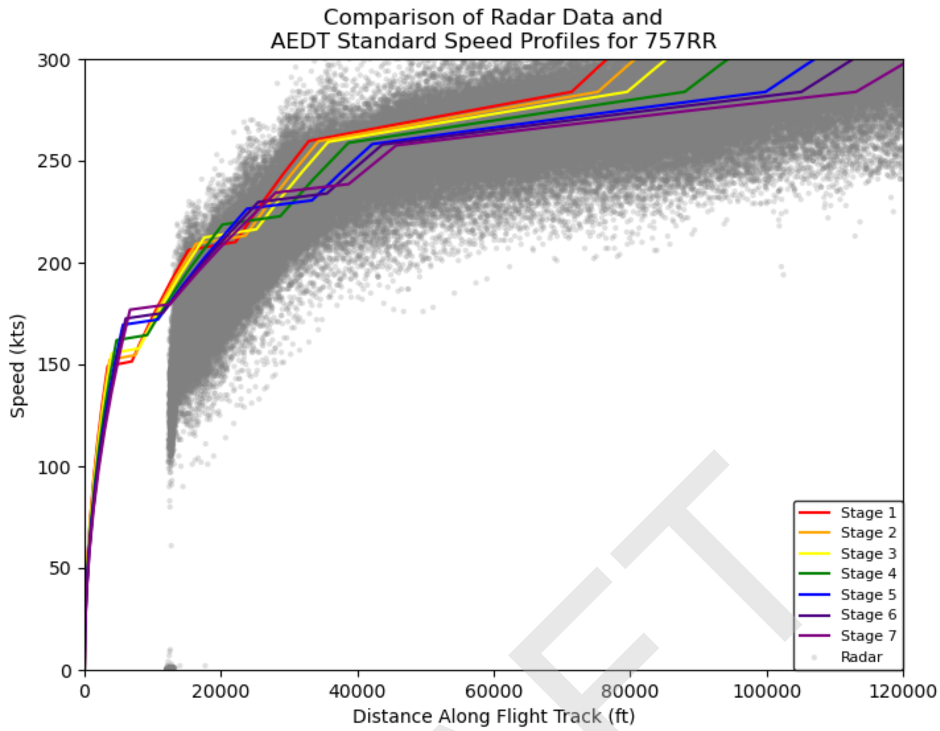

Figure C-24. 757RR AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

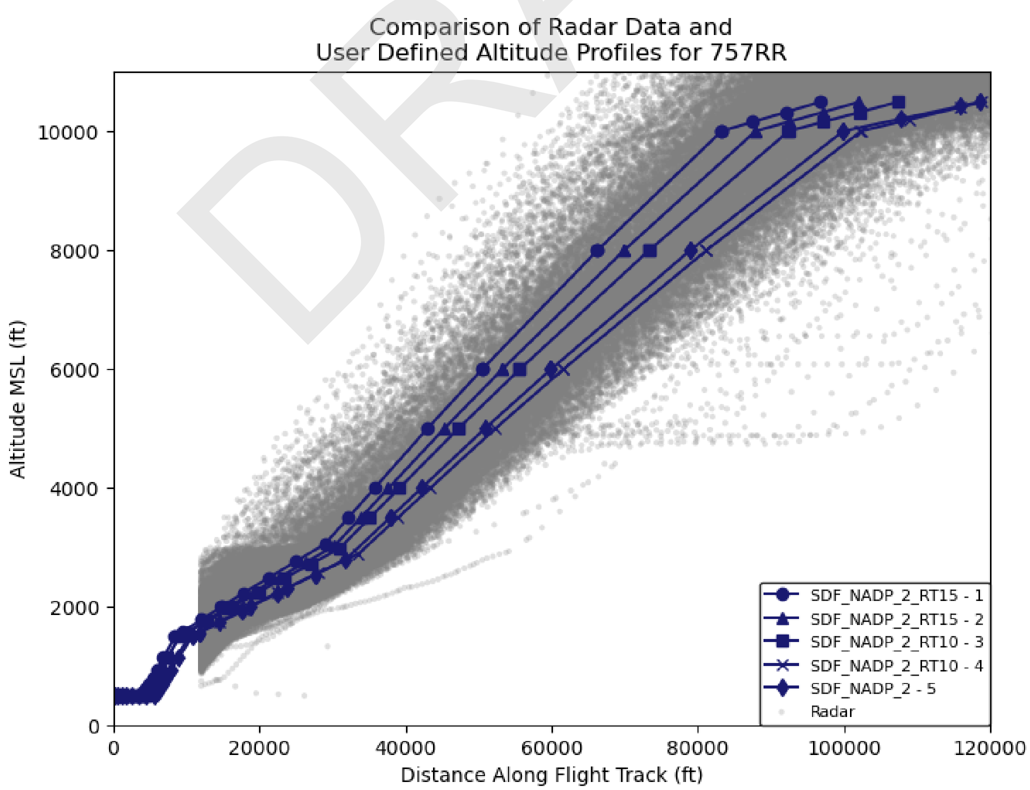

Figure C-25. 757RR User Defined Altitude Profiles Compared to Actual Aircraft Performance

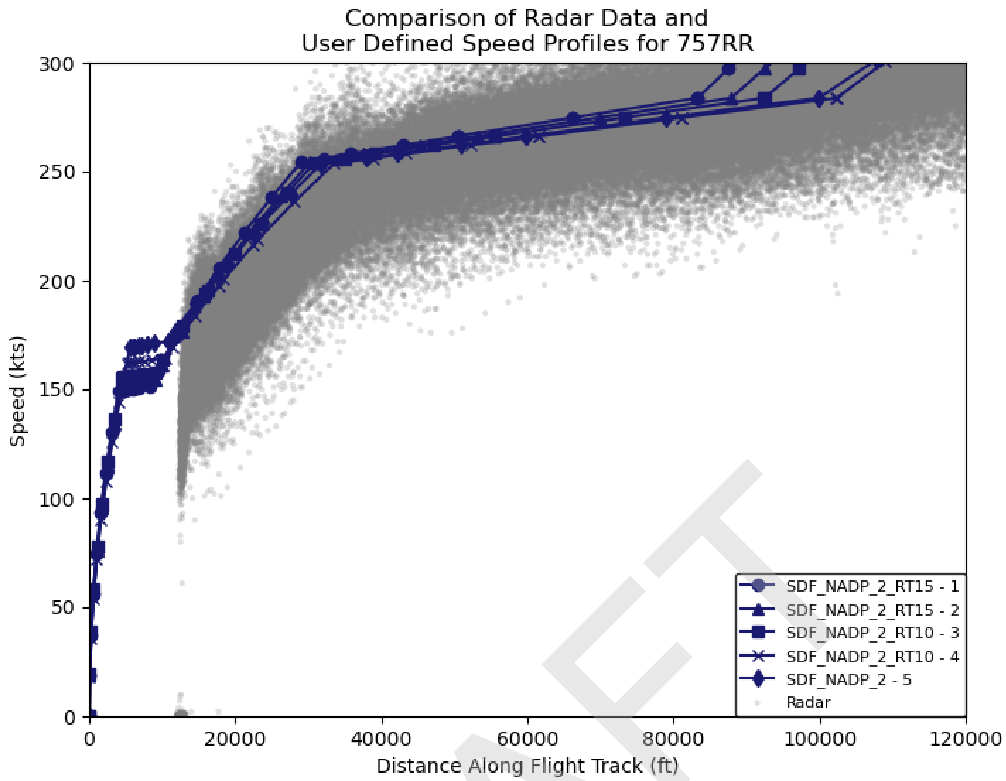

Figure C-26. 757RR User Defined Speed Profiles Compared to Actual Aircraft Performance

C.2.2. Analysis Demonstrating Benefit

The differences between the existing 757RR profiles in AEDT 3f and the proposed user-defined profiles are primarily due to the use of reduced thrust and climb altitude on departure. The sound exposure level results under the flight path from the user-defined departure procedures are shown in **Section C.2.5.1.** Overall, the proposed user-defined profiles show less noise associated with the take-off roll, a different location where aircraft change from take-off thrust to climb thrust, and additional noise under the flight path miles out because of a slower climb.

C.2.3. Concurrence on Aircraft Performance

Preparation of these profiles for the current project and AEDT 3f was done in cooperation with the relevant airline. Airline concurrence documentation accompanies this memorandum for submission to FAA.

C.2.4. Certification of New Parameters

The profiles developed for this study are procedure step profiles created by modifying profiles already included in AEDT 3f. Screenshots from the AEDT UI of starting default profiles and the proposed user-defined profiles are presented for comparison as **Figure C-27** through **Figure C-36**. An AEDT study containing the profiles developed for this project is available in electronic form upon request. Altitudes are listed as feet above airfield elevation. Speeds are true airspeed in knots. Thrust is in pounds which matches the units of thrust settings used in the aircraft's associated noise-power-distance curves.

C.2.4.1. 757RR, Profile Weight 183,900

The "stage length 1" user-defined profile for the 757RR assumes a weight of 183,900, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

MODIFIED_RT15	Procedural	183900	1	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		192.4	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		206.3	55
5	Climb	ZERO	Max Climb 10% Reduced	3000		
6	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-27. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT_15; PROF_ID2: 1

SDF_NADP_2_RT15	Procedural	183900	1	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		192.4	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		206.3	55
5	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
6	Climb	ZERO	Max Climb 10% Reduced	4500		
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-28. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1

C.2.4.2. 757RR, Profile Weight 191,200

The "stage length 2" user-defined profile for the 757RR assumes a weight of 191,200, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

MODIFIED_RT15	Procedural	191200	2	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		193.9	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		209.2	55
5	Climb	ZERO	Max Climb 10% Reduced	3000		
6	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-29. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT_15; PROF_ID2: 2

SDF_NADP_2_RT15	Procedural	191200	2	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff 15% Reduced		0	
2	Climb	5	Max Takeoff 15% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		193.9	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		209.2	55
5	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
6	Climb	ZERO	Max Climb 10% Reduced	4500		
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-30. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2

C.2.4.3. 757RR, Profile Weight 199,100

The “stage length 3” user-defined profile for the 757RR assumes a weight of 199,100, and is identified as PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 3. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 3 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

MODIFIED_RT10	Procedural	199100	3	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		195.5	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		212.2	55
5	Climb	ZERO	Max Climb 10% Reduced	3000		
6	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-31. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT_10; PROF_ID2: 3

SDF_NADP_2_RT10	Procedural	199100	3	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		195.5	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		212.2	55
5	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
6	Climb	ZERO	Max Climb 10% Reduced	4500		
7	Climb	ZERO	Max Climb 10% Reduced	5500		
8	Climb	ZERO	Max Climb 10% Reduced	7500		
9	Climb	ZERO	Max Climb 10% Reduced	10000		

Figure C-32. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 3

C.2.4.4. 757RR, Profile Weight 215,200

The "stage length 4" user-defined profile for the 757RR assumes a weight of 215,200, and is identified as PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 4. This user-defined profile was created by copying and editing standard AEDT 3f profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 4 to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

MODIFIED_RT10	Procedural	215200	4	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		199	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		216.4	55
5	Percent Accelerate	ZERO	Max Climb 10% Reduced		218.3	55
6	Climb	ZERO	Max Climb 10% Reduced	3000		
7	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
8	Climb	T_00	Max Climb 10% Reduced	5500		
9	Climb	T_00	Max Climb 10% Reduced	7500		
10	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-33. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT_10; PROF_ID2: 4

SDF_NADP_2_RT10	Procedural	215200	4	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff 10% Reduced		0	
2	Climb	5	Max Takeoff 10% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb 10% Reduced		199	55
4	Percent Accelerate	T_01	Max Climb 10% Reduced		216.4	55
5	Percent Accelerate	ZERO	Max Climb 10% Reduced		218.3	55
6	Percent Accelerate	ZERO	Max Climb 10% Reduced		250	55
7	Climb	T_00	Max Climb 10% Reduced	4500		
8	Climb	T_00	Max Climb 10% Reduced	5500		
9	Climb	T_00	Max Climb 10% Reduced	7500		
10	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-34. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 4

C.2.4.5. 757RR, Profile Weight 234,800

The "stage length 5" user-defined profile for the 757RR assumes a weight of 234,800, and is identified as PROF_ID1: SDF_NADP_2_RT00; PROF_ID2: 5. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 5 to change the thrust level to "Max Takeoff" in Steps 1 and 2, and to remove the climb at 3,000 AFE in step 6. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

MODIFIED_RT05	Procedural	234800	5	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
1	Takeoff	5	Max Takeoff 5% Reduced		0	
2	Climb	5	Max Takeoff 5% Reduced	1000		
3	Percent Accelerate	T_05	Max Climb		203.7	55
4	Percent Accelerate	T_01	Max Climb		221.1	55
5	Percent Accelerate	T_00	Max Climb		225.7	55
6	Climb	ZERO	Max Climb	3000		
7	Percent Accelerate	ZERO	Max Climb		250	55
8	Climb	T_00	Max Climb	5500		
9	Climb	T_00	Max Climb	7500		
10	Climb	ZERO	Max Climb	10000		

Figure C-35. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 5

SDF_NADP_2_RT00	Procedural	234800	5	Departure

Procedure Profile

Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
Click here to add new item						
1	Takeoff	5	Max Takeoff		0	
2	Climb	5	Max Takeoff	1000		
3	Percent Accelerate	T_05	Max Climb		203.7	55
4	Percent Accelerate	T_01	Max Climb		221.1	55
5	Percent Accelerate	T_00	Max Climb		225.7	55
6	Percent Accelerate	ZERO	Max Climb		250	55
7	Climb	T_00	Max Climb	4500		
8	Climb	T_00	Max Climb	5500		
9	Climb	T_00	Max Climb	7500		
10	Climb	ZERO	Max Climb	10000		

Figure C-36. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT00; PROF_ID2: 5

C.2.5. Graphical and Tabular Comparison

An MS Excel file containing the profile points as found in the AEDT XML Performance Report Export file is available in electronic form upon request. It was developed for comparison of performance data to the AEDT Standard profiles and was used to generate the following tables and line graphs.

C.2.5.1. Tables and Figures Supporting Analysis Demonstrating Benefit

Table C-6 through **Table C-10** show the SEL results under the flight path from the user-defined departure profiles; SEL values resulting from the standard AEDT departure profiles are presented for comparison. **Figure C-38** through **Figure C-41** show the same SEL computations in the form of SEL contours.

Table C-6. SELs for 757RR Departures at 183,900 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757RR Profile Weight: 183,900 lbs. (PROF_ID2 = 1) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	130.0	127.3	-2.6
0.5	118.7	117.8	-0.8
1.0	100.4	100.5	0.1
1.5	93.1	94.1	1.0
2.0	90.6	90.6	0.0
2.5	88.6	88.8	0.2
3.0	86.8	87.2	0.5
3.5	85.2	85.9	0.6
4.0	84.1	84.7	0.6
4.5	83.0	83.6	0.6
5.0	82.0	82.5	0.5
5.5	80.8	81.3	0.5
6.0	80.0	80.3	0.3
6.5	79.2	79.5	0.3
7.0	78.4	78.6	0.2
7.5	77.8	78.0	0.1
8.0	77.2	77.2	0.0
8.5	76.7	76.6	-0.1
9.0	76.1	76.1	0.0
9.5	75.6	75.5	0.0
10.0	75.2	75.1	-0.1

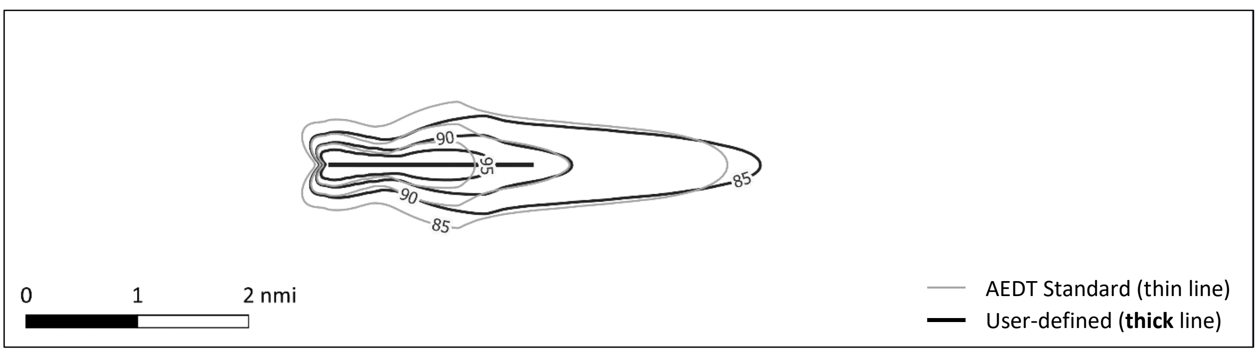

Figure C-37. SEL Contours for 757RR Departures at Take-Off Weight 183,900 Pounds

Table C-7. SELs for 757RR Departures at 191,200 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757RR Profile Weight: 191,200 lbs. (PROF_ID2 = 2) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	129.9	127.3	-2.6
0.5	118.6	117.3	-1.3
1.0	101.0	101.9	0.9
1.5	93.6	95.5	1.9
2.0	91.1	91.1	0.0
2.5	89.2	89.2	0.1
3.0	87.4	87.7	0.3
3.5	85.7	86.4	0.7
4.0	84.5	85.2	0.8
4.5	83.4	84.1	0.7
5.0	82.3	82.9	0.5
5.5	81.4	81.9	0.4
6.0	80.6	80.9	0.4
6.5	79.7	80.0	0.4
7.0	79.0	79.2	0.3
7.5	78.3	78.4	0.2
8.0	77.7	77.9	0.1
8.5	77.1	77.1	0.0
9.0	76.6	76.6	0.0
9.5	76.1	76.1	0.0
10.0	75.6	75.5	0.0

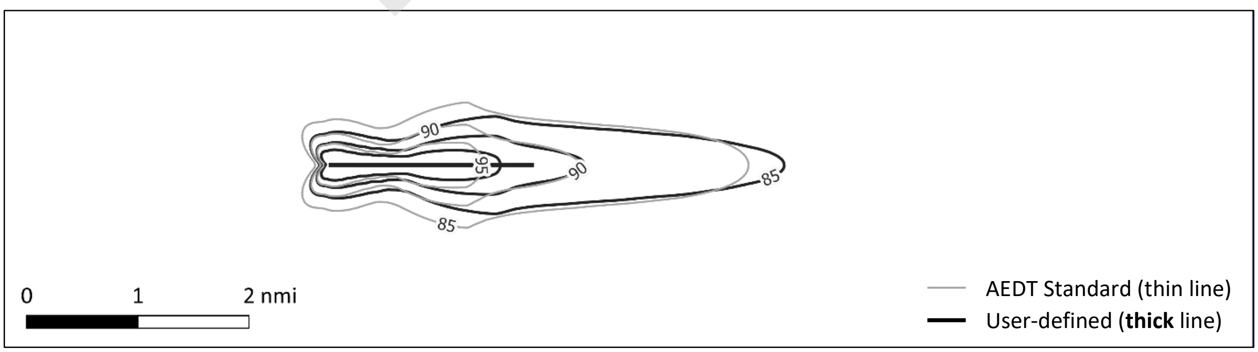

Figure C-38. SEL Contours for 757RR Departures at Take-Off Weight 191,200 Pounds

Table C-8. SELs for 757RR Departures at 199,100 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757RR Profile Weight: 199,100 lbs. (PROF_ID2 = 3) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	129.8	128.0	-1.8
0.5	119.2	117.8	-1.3
1.0	102.1	102.8	0.6
1.5	94.4	96.2	1.8
2.0	91.5	91.2	-0.3
2.5	89.6	89.4	-0.2
3.0	88.0	87.8	-0.1
3.5	86.3	86.7	0.4
4.0	84.9	85.5	0.6
4.5	83.9	84.3	0.4
5.0	82.9	83.3	0.4
5.5	82.0	82.3	0.3
6.0	81.0	81.4	0.3
6.5	80.2	80.4	0.1
7.0	79.5	79.7	0.2
7.5	78.8	78.9	0.1
8.0	78.2	78.2	0.1
8.5	77.6	77.6	0.0
9.0	77.1	77.0	-0.1
9.5	76.6	76.5	-0.1
10.0	76.1	76.0	-0.1

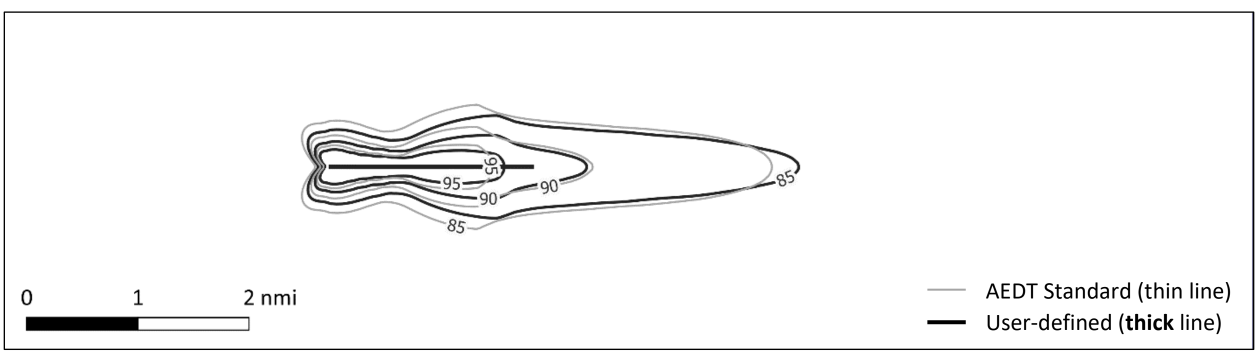

Figure C-39. SEL Contours for 757RR Departures at Take-Off Weight 199,100 Pounds

Table C-9. SELs for 757RR Departures at 215,200 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757RR Profile Weight: 215,200 lbs. (PROF_ID2 = 4) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	User-Defined Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.1	128.4	-1.8
0.5	119.0	118.2	-0.8
1.0	104.7	106.7	1.9
1.5	98.2	97.8	-0.4
2.0	92.3	92.1	-0.2
2.5	90.4	90.2	-0.2
3.0	88.9	88.8	-0.1
3.5	87.6	87.5	-0.1
4.0	86.0	86.4	0.4
4.5	84.8	85.4	0.6
5.0	83.9	84.4	0.5
5.5	82.9	83.4	0.5
6.0	82.2	82.5	0.3
6.5	81.3	81.5	0.3
7.0	80.5	80.7	0.2
7.5	79.8	80.0	0.2
8.0	79.2	79.3	0.1
8.5	78.6	78.6	0.0
9.0	78.0	78.1	0.1
9.5	77.5	77.5	0.0
10.0	77.0	76.9	-0.1

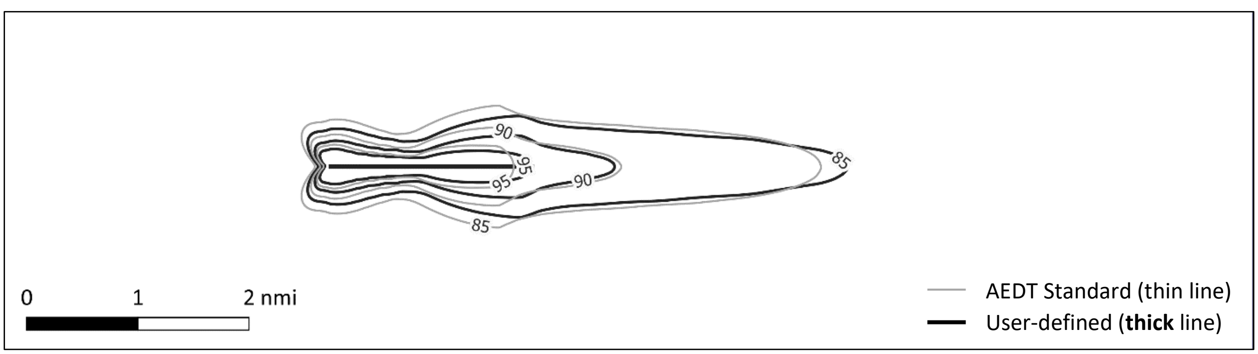

Figure C-40. SEL Contours for 757RR Departures at Take-Off Weight 215,200 Pounds

Table C-10. SELs for 757RR Departures at 234,800 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 757RR Profile Weight: 234,800 lbs. (PROF_ID2 = 5) User PROF_ID1: SDF_NADP_2_RT00			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	129.9	129.9	0.0
0.5	119.5	119.5	0.0
1.0	110.8	110.8	0.0
1.5	99.7	99.7	0.0
2.0	93.5	93.5	0.0
2.5	91.4	91.4	0.0
3.0	90.0	90.0	0.0
3.5	88.6	88.6	0.0
4.0	87.5	87.5	0.1
4.5	86.1	86.4	0.4
5.0	85.0	85.5	0.6
5.5	84.0	84.5	0.5
6.0	83.2	83.5	0.2
6.5	82.5	82.7	0.1
7.0	81.7	81.7	0.1
7.5	81.0	81.1	0.1
8.0	80.3	80.4	0.1
8.5	79.7	79.7	0.0
9.0	79.2	79.2	0.0
9.5	78.7	78.6	0.0
10.0	78.1	78.1	0.0

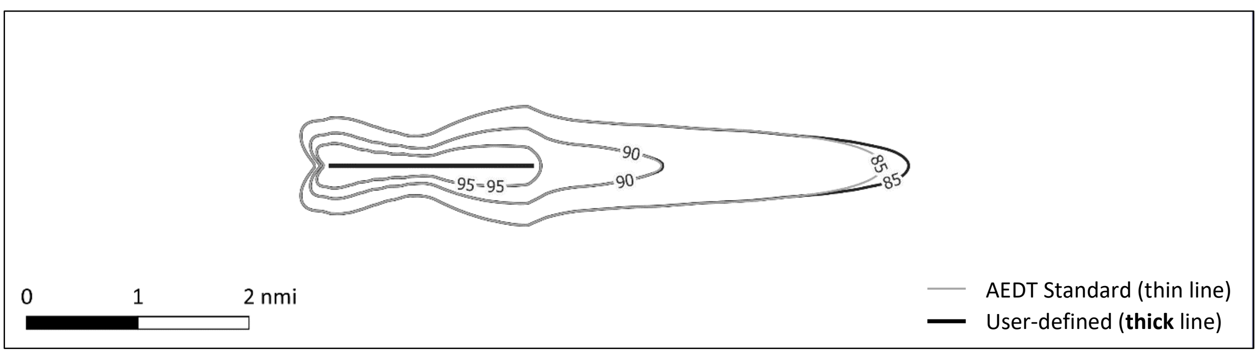

Figure C-41. SEL Contours for 757RR Departures at Take-Off Weight 234,800 Pounds

C.2.6.1. Graphical Comparison of Profiles

Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are included as **Figure C-42**, **Figure C-43**, and **Figure C-44**, respectively.

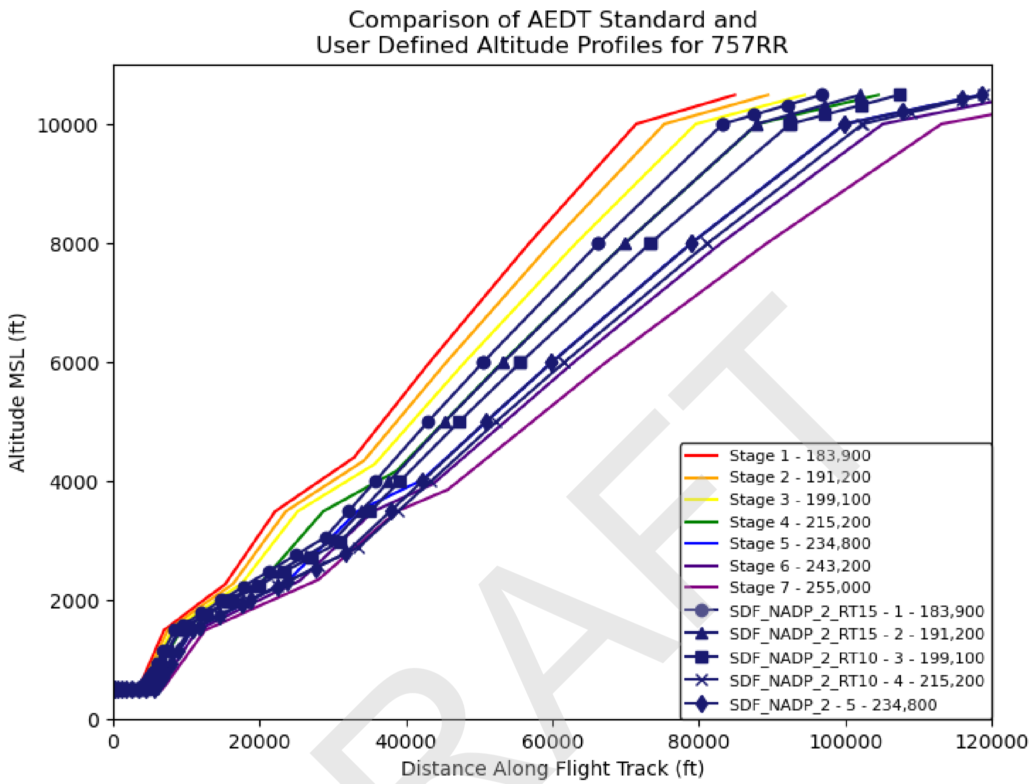

Figure C-42. 757RR AEDT Profiles, Altitude vs. Distance

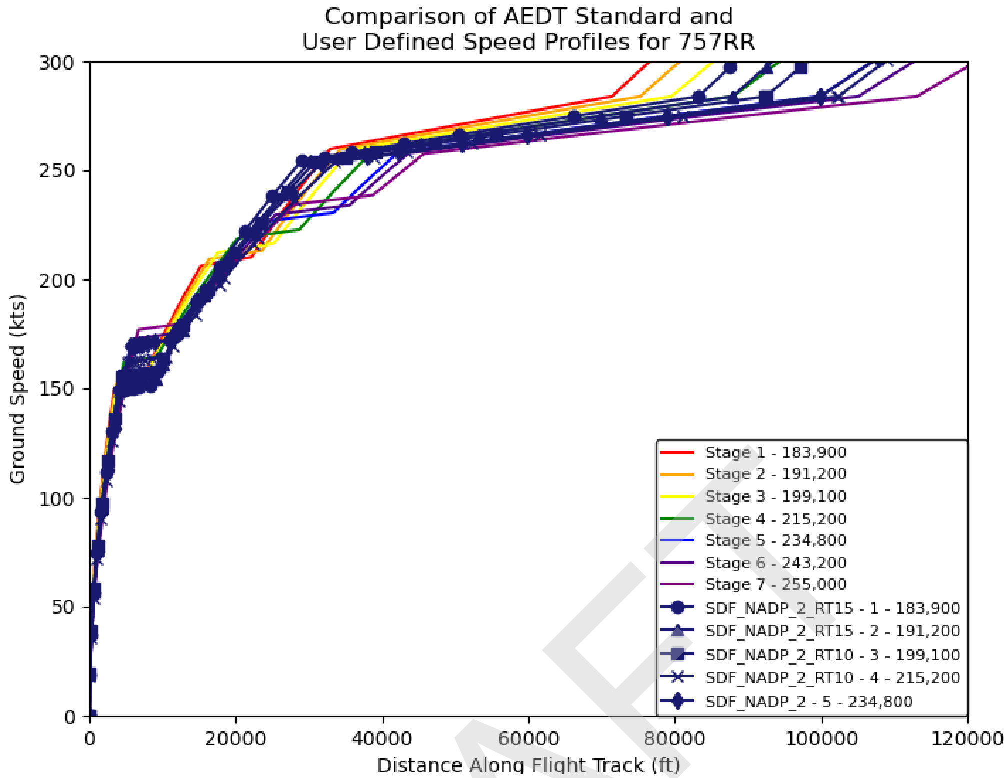

Figure C-43. 757RR AEDT Profiles, Speed vs. Distance

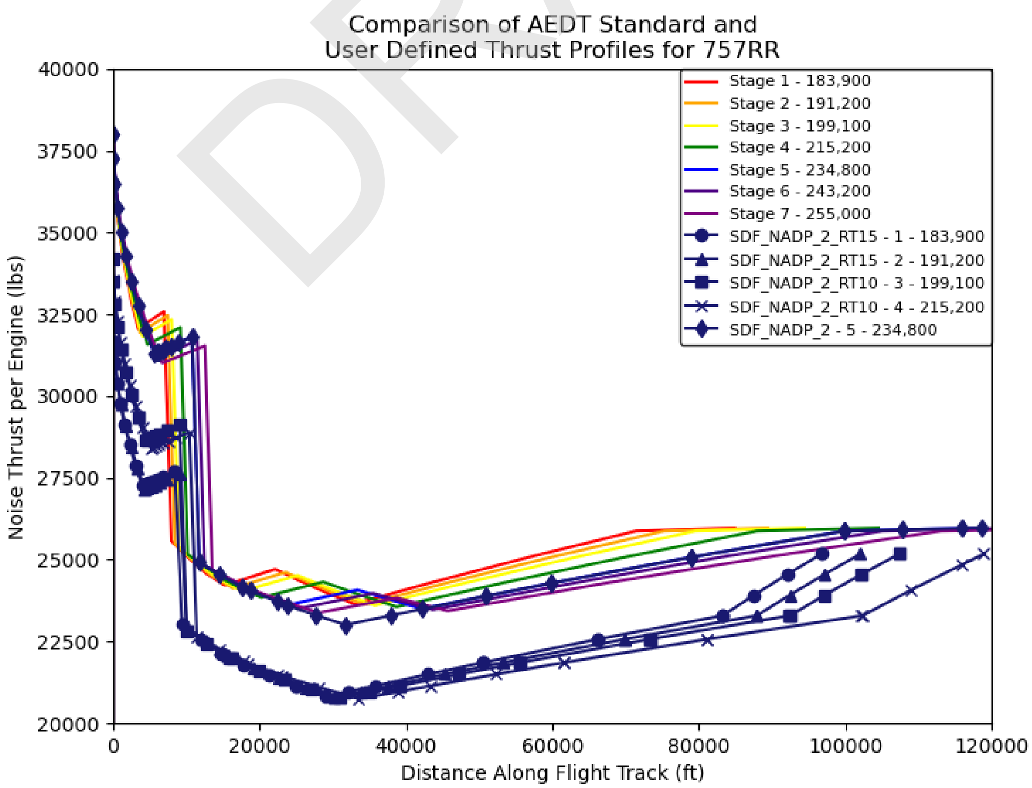

Figure C-44. 757RR AEDT Profiles, Thrust vs. Distance

C.3. Boeing 767-300 (ANP Type 7673ER) Profile Review with AEDT 3f

C.3.1. Statement of Benefit

Operators at SDF use a version of "Noise Abatement Departures Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. The proposed 7673ER climb profiles and thrust settings during the various stages of flight provide a better representation of what is actually being flown by cargo aircraft at SDF. These profiles were developed from the default (i.e. included) reduced thrust profiles in AEDT.

The proposed user-defined profiles were developed with considerations of SDF runway specific length and minimum climb requirements. Correspondence with the operators has indicated high agreement with their procedures at SDF.

C.3.1.1. Figures Supporting Statement of Benefit

Figure C-45 and **Figure C-47** compare the standard AEDT profiles and Boeing profiles to actual aircraft climb performance at SDF. **Figure C-46** and **Figure C-48** compare the standard AEDT profiles and proposed profiles to actual aircraft speed profiles at SDF. The standard profiles are identified in the figure legends as "Stage length - Weight". The proposed profiles are identified in the figure legends as "Name – Stage length - Weight."

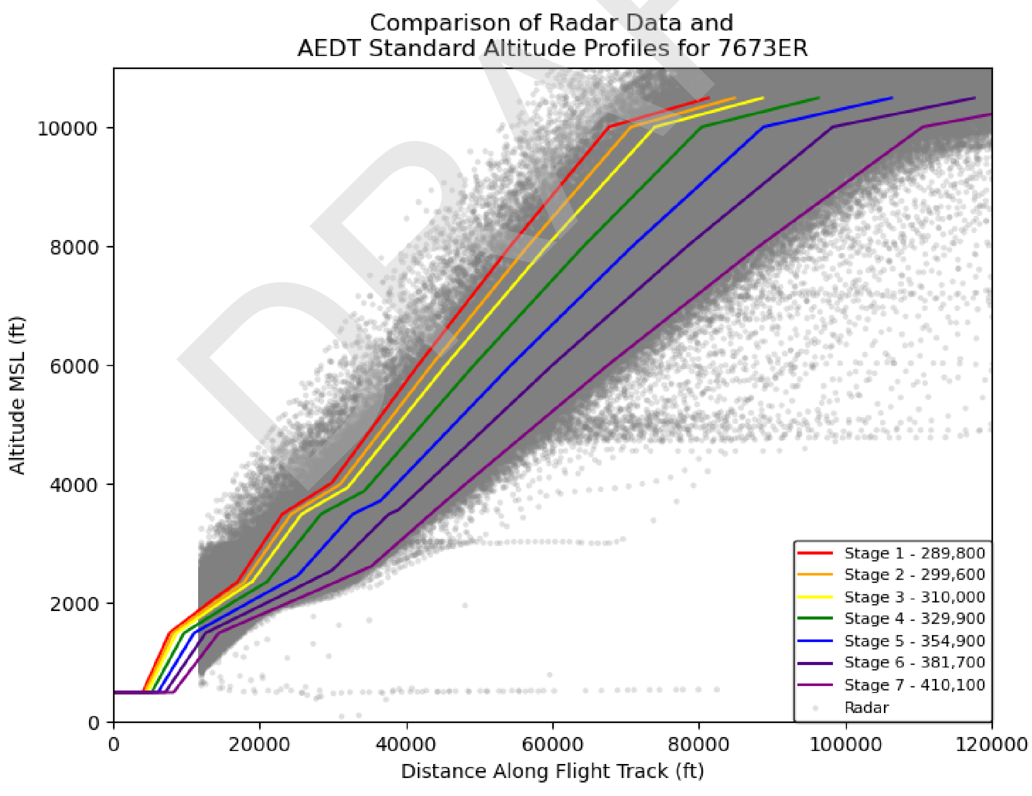

Figure C-45. 7673ER AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

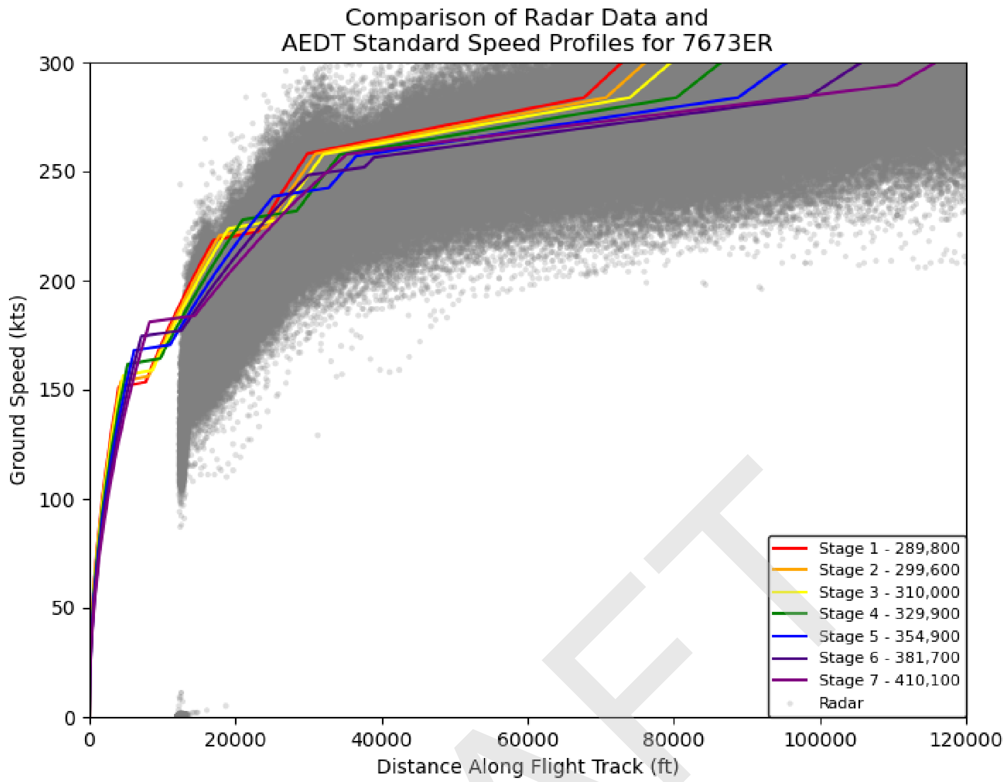

Figure C-46. 7673ER AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

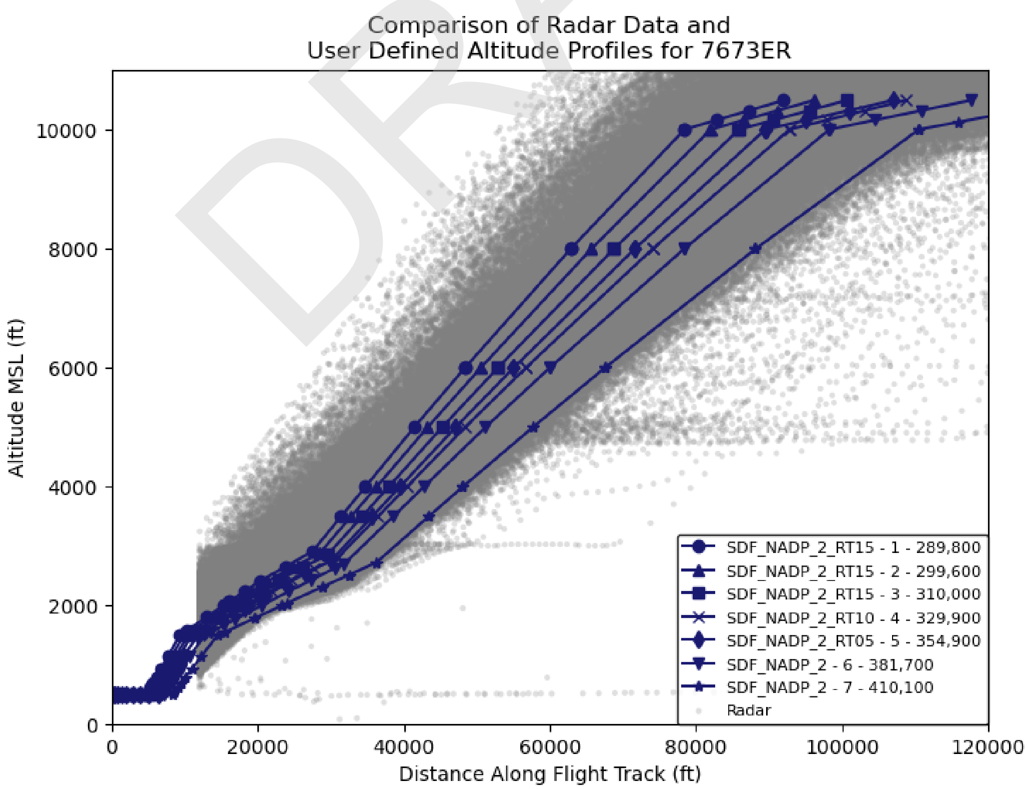

Figure C-47. 7673ER User Defined Altitude Profiles Compared to Actual Aircraft Performance

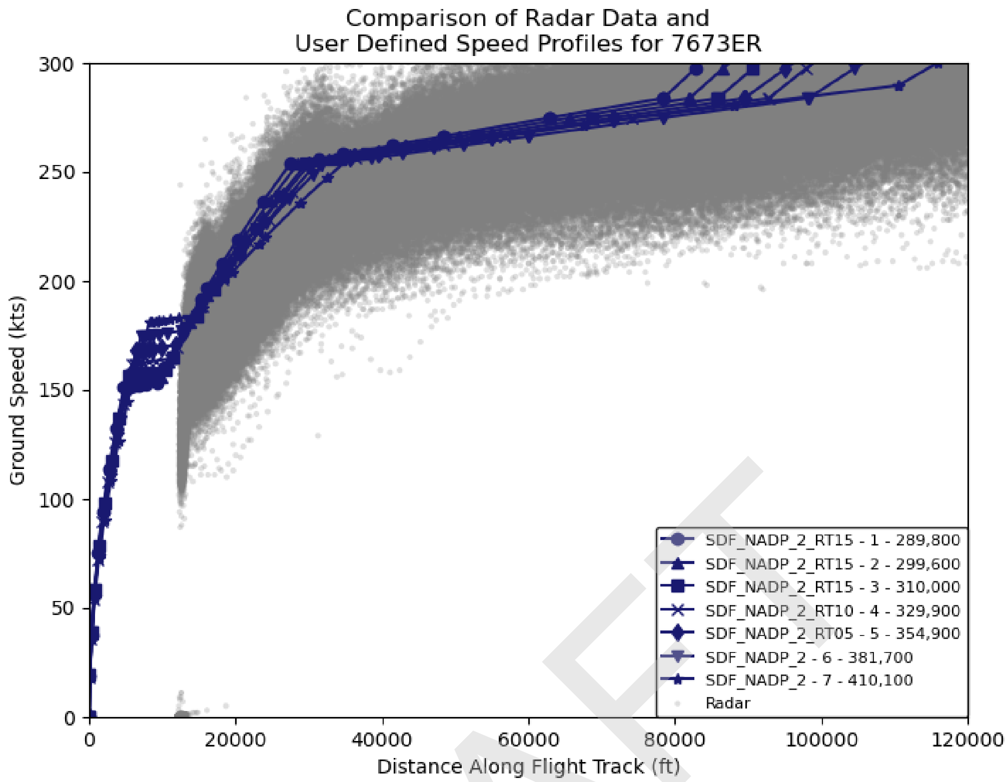

Figure C-48. 7673ER User Defined Speed Profiles Compared to Actual Aircraft Performance

C.3.2. Analysis Demonstrating Benefit

The differences between the existing 7673ER profiles in AEDT 3f and the proposed user-defined profiles are primarily due to the use of reduced thrust and climb altitude on departure. The sound exposure level results under the flight path from the user-defined departure procedures are shown in **Section C.3.5.1**. Overall, the proposed user-defined profiles show less noise associated with the take-off roll, a different location where aircraft change from take-off thrust to climb thrust, and additional noise under the flight path miles out because of a slower climb.

C.3.3. Concurrence on Aircraft Performance

Preparation of these profiles for the current project and AEDT 3f was done in cooperation with the relevant airline. Airline concurrence documentation accompanies this memorandum for submission to FAA.

C.3.4. Certification of New Parameters

The profiles developed for this study are procedure step profiles created by modifying profiles already included in AEDT 3f. Screenshots from the AEDT UI of starting default profiles and the proposed user-defined profiles are presented for comparison as **Figure C-49** through **Figure C-62**. An AEDT study containing the profiles developed for this project is available in electronic form upon request. Altitudes are listed as feet above airfield elevation. Speeds are entered as true airspeed in knots. Thrust is in pounds which matches the units of thrust settings used in the aircraft's associated noise-power-distance curves.

C.3.4.1. 7673ER, Profile Weight 289,800

The “stage length 1” user-defined profile for the 7673ER assumes a weight of 289,800, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

5812	MODIFIED_RT15	Procedural	289800	1	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT151	1	Takeoff	T_05	Max Takeoff 15% Reduced			
MODIFIED_RT151	2	Climb	T_05U	Max Takeoff 15% Reduced	1000		
MODIFIED_RT151	3	Percent Accelerate	T_01	Max Climb 10% Reduced		198	55
MODIFIED_RT151	4	Percent Accelerate	T_00	Max Climb 10% Reduced		218	55
MODIFIED_RT151	5	Climb	T_00	Max Climb 10% Reduced	3000		
MODIFIED_RT151	6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
MODIFIED_RT151	7	Climb	T_00	Max Climb 10% Reduced	5500		
MODIFIED_RT151	8	Climb	T_00	Max Climb 10% Reduced	7500		
MODIFIED_RT151	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-49. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 1

100000	SDF_NADP_2_RT15	Procedural	289800	1	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT151	1	Takeoff	T_05	Max Takeoff 15% Reduced			
SDF_NADP_2_RT151	2	Climb	T_05U	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT151	3	Percent Accelerate	T_01	Max Climb 10% Reduced		198	55
SDF_NADP_2_RT151	4	Percent Accelerate	T_00	Max Climb 10% Reduced		218	55
SDF_NADP_2_RT151	5	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
SDF_NADP_2_RT151	6	Climb	T_00	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT151	7	Climb	T_00	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT151	8	Climb	T_00	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT151	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-50. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 1

C.3.4.2. 7673ER, Profile Weight 299,600

The “stage length 2” user-defined profile for the 7673ER assumes a weight of 299,600, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

5813	MODIFIED_RT15	Procedural	299600	2	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT152	1	Takeoff	T_05	Max Takeoff 15% Reduced			
MODIFIED_RT152	2	Climb	T_05U	Max Takeoff 15% Reduced	1000		
MODIFIED_RT152	3	Percent Accelerate	T_01	Max Climb 10% Reduced		200	55
MODIFIED_RT152	4	Percent Accelerate	T_00	Max Climb 10% Reduced		220	55
MODIFIED_RT152	5	Climb	T_00	Max Climb 10% Reduced	3000		
MODIFIED_RT152	6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
MODIFIED_RT152	7	Climb	T_00	Max Climb 10% Reduced	5500		
MODIFIED_RT152	8	Climb	T_00	Max Climb 10% Reduced	7500		
MODIFIED_RT152	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-51. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 2

100001	SDF_NADP_2_RT15	Procedural	299600	2	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT152	1	Takeoff	T_05	Max Takeoff 15% Reduced			
SDF_NADP_2_RT152	2	Climb	T_05U	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT152	3	Percent Accelerate	T_01	Max Climb 10% Reduced		200	55
SDF_NADP_2_RT152	4	Percent Accelerate	T_00	Max Climb 10% Reduced		220	55
SDF_NADP_2_RT152	5	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
SDF_NADP_2_RT152	6	Climb	T_00	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT152	7	Climb	T_00	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT152	8	Climb	T_00	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT152	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-52. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 2

C.3.4.3. 7673ER, Profile Weight 310,000

The “stage length 3” user-defined profile for the 7673ER assumes a weight of 310,000, and is identified as PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 3. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 3 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

5814	MODIFIED_RT15	Procedural	310000	3	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT153	1	Takeoff	T_05	Max Takeoff 15% Reduced			
MODIFIED_RT153	2	Climb	T_05U	Max Takeoff 15% Reduced	1000		
MODIFIED_RT153	3	Percent Accelerate	T_01	Max Climb 10% Reduced		203	55
MODIFIED_RT153	4	Percent Accelerate	T_00	Max Climb 10% Reduced		223	55
MODIFIED_RT153	5	Climb	T_00	Max Climb 10% Reduced	3000		
MODIFIED_RT153	6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
MODIFIED_RT153	7	Climb	T_00	Max Climb 10% Reduced	5500		
MODIFIED_RT153	8	Climb	T_00	Max Climb 10% Reduced	7500		
MODIFIED_RT153	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-53. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT15; PROF_ID2: 3

100002	SDF_NADP_2_RT15	Procedural	310000	3	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT153	1	Takeoff	T_05	Max Takeoff 15% Reduced			
SDF_NADP_2_RT153	2	Climb	T_05U	Max Takeoff 15% Reduced	1000		
SDF_NADP_2_RT153	3	Percent Accelerate	T_01	Max Climb 10% Reduced		203	55
SDF_NADP_2_RT153	4	Percent Accelerate	T_00	Max Climb 10% Reduced		223	55
SDF_NADP_2_RT153	5	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
SDF_NADP_2_RT153	6	Climb	T_00	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT153	7	Climb	T_00	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT153	8	Climb	T_00	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT153	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-54. AEDT UI Screenshot of Proposed profile PROF_ID1: SDF_NADP_2_RT15; PROF_ID2: 3

C.3.4.4. 7673ER, Profile Weight 329,900

The “stage length 4” user-defined profile for the 7673ER assumes a weight of 329,900, and is identified as PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 4. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 4 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

5807	MODIFIED_RT10	Procedural	329900	4	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT104	1	Takeoff	T_05	Max Takeoff 10% Reduced			
MODIFIED_RT104	2	Climb	T_05U	Max Takeoff 10% Reduced	1000		
MODIFIED_RT104	3	Percent Accelerate	T_01	Max Climb 10% Reduced		207	55
MODIFIED_RT104	4	Percent Accelerate	T_00	Max Climb 10% Reduced		227	55
MODIFIED_RT104	5	Climb	T_00	Max Climb 10% Reduced	3000		
MODIFIED_RT104	6	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
MODIFIED_RT104	7	Climb	T_00	Max Climb 10% Reduced	5500		
MODIFIED_RT104	8	Climb	T_00	Max Climb 10% Reduced	7500		
MODIFIED_RT104	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-55. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT10; PROF_ID2: 4

100003	SDF_NADP_2_RT10	Procedural	329900	4	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT104	1	Takeoff	T_05	Max Takeoff 10% Reduced			
SDF_NADP_2_RT104	2	Climb	T_05U	Max Takeoff 10% Reduced	1000		
SDF_NADP_2_RT104	3	Percent Accelerate	T_01	Max Climb 10% Reduced		207	55
SDF_NADP_2_RT104	4	Percent Accelerate	T_00	Max Climb 10% Reduced		227	55
SDF_NADP_2_RT104	5	Percent Accelerate	T_00	Max Climb 10% Reduced		250	60
SDF_NADP_2_RT104	6	Climb	T_00	Max Climb 10% Reduced	4500		
SDF_NADP_2_RT104	7	Climb	T_00	Max Climb 10% Reduced	5500		
SDF_NADP_2_RT104	8	Climb	T_00	Max Climb 10% Reduced	7500		
SDF_NADP_2_RT104	9	Climb	T_00	Max Climb 10% Reduced	10000		

Figure C-56. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT10; PROF_ID2: 4

C.3.4.5. 7673ER, Profile Weight 354,900

The "stage length 5" user-defined profile for the 7673ER assumes a weight of 354,900, and is identified as PROF_ID1: SDF_NADP_2_RT05; PROF_ID2: 5. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 5 to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

5800	MODIFIED_RT05	Procedural	354900	5	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT055	1	Takeoff	T_05	Max Takeoff 5% Reduced			
MODIFIED_RT055	2	Climb	T_05U	Max Takeoff 5% Reduced	1000		
MODIFIED_RT055	3	Percent Accelerate	T_01	Max Climb		217	55
MODIFIED_RT055	4	Percent Accelerate	T_00	Max Climb		237	55
MODIFIED_RT055	5	Climb	T_00	Max Climb	3000		
MODIFIED_RT055	6	Percent Accelerate	T_00	Max Climb		250	60
MODIFIED_RT055	7	Climb	T_00	Max Climb	5500		
MODIFIED_RT055	8	Climb	T_00	Max Climb	7500		
MODIFIED_RT055	9	Climb	T_00	Max Climb	10000		

Figure C-57. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 5

100004	SDF_NADP_2_RT05	Procedural	354900	5	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_2_RT055	1	Takeoff	T_05	Max Takeoff 5% Reduced			
SDF_NADP_2_RT055	2	Climb	T_05U	Max Takeoff 5% Reduced	1000		
SDF_NADP_2_RT055	3	Percent Accelerate	T_01	Max Climb		217	55
SDF_NADP_2_RT055	4	Percent Accelerate	T_00	Max Climb		237	55
SDF_NADP_2_RT055	5	Percent Accelerate	T_00	Max Climb		250	60
SDF_NADP_2_RT055	6	Climb	T_00	Max Climb	4500		
SDF_NADP_2_RT055	7	Climb	T_00	Max Climb	5500		
SDF_NADP_2_RT055	8	Climb	T_00	Max Climb	7500		
SDF_NADP_2_RT055	9	Climb	T_00	Max Climb	10000		

Figure C-58. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2_RT05; PROF_ID2: 5

C.3.4.6. 7673ER, Profile Weight 381,700

The “stage length 6” user-defined profile for the 7673ER assumes a weight of 381,700, and is identified as PROF_ID1: SDF_NADP_2; PROF_ID2: 6. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 6 to change the thrust level to “Max Takeoff” in steps 1 and 2, and to remove the climb at 3,000 AFE in step 5. To assist AEDT, a climb was introduced at 4,500 AFE in step 6.

⊟	5801	MODIFIED_RT05	Procedural	381700	6	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT056	1	Takeoff	T_05	Max Takeoff 5% Reduced			
MODIFIED_RT056	2	Climb	T_05U	Max Takeoff 5% Reduced	1000		
MODIFIED_RT056	3	Percent Accelerate	T_01	Max Climb		226	55
MODIFIED_RT056	4	Percent Accelerate	T_00	Max Climb		246	55
MODIFIED_RT056	5	Climb	T_00	Max Climb	3000		
MODIFIED_RT056	6	Percent Accelerate	T_00	Max Climb		250	60
MODIFIED_RT056	7	Climb	T_00	Max Climb	5500		
MODIFIED_RT056	8	Climb	T_00	Max Climb	7500		
MODIFIED_RT056	9	Climb	T_00	Max Climb	10000		

Figure C-59. AEDT UI Screenshot of Starting Default Profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 6

⊟	100005	SDF_NADP_2	Procedural	381700	6	Departure

Procedure ANP Profile

Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_26	1	Takeoff	T_05	Max Takeoff			
SDF_NADP_26	2	Climb	T_05U	Max Takeoff	1000		
SDF_NADP_26	3	Percent Accelerate	T_01	Max Climb		226	55
SDF_NADP_26	4	Percent Accelerate	T_00	Max Climb		246	55
SDF_NADP_26	5	Percent Accelerate	T_00	Max Climb		250	60
SDF_NADP_26	6	Climb	T_00	Max Climb	4500		
SDF_NADP_26	7	Climb	T_00	Max Climb	5500		
SDF_NADP_26	8	Climb	T_00	Max Climb	7500		
SDF_NADP_26	9	Climb	T_00	Max Climb	10000		

Figure C-60. AEDT UI Screenshot of Proposed Profile PROF_ID1: SDF_NADP_2; PROF_ID2: 6

C.3.4.7. 7673ER, Profile Weight 410,100

The "stage length 7" user-defined profile for the 7673ER assumes a weight of 410,100, and is identified as PROF_ID1: SDF_NADP_2; PROF_ID2: 7. This user-defined profile was created by copying and editing default AEDT 3f profile PROF_ID1: MODIFIED_RT05; PROF_ID2: 7 a to change the thrust level to "Max Takeoff" in steps 1 and 2. To assist AEDT, a climb was introduced at 4,500 AFE in step 7.

5802	MODIFIED_RT05	Procedural	410100	7	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
MODIFIED_RT057	1	Takeoff	T_05	Max Takeoff 5% Reduced			
MODIFIED_RT057	2	Climb	T_05U	Max Takeoff 5% Reduced	1000		
MODIFIED_RT057	3	Percent Accelerate	T_01	Max Climb		235	55
MODIFIED_RT057	4	Percent Accelerate	T_00	Max Climb		255	55
MODIFIED_RT057	5	Climb	T_00	Max Climb	3000		
MODIFIED_RT057	6	Climb	T_00	Max Climb	3500		
MODIFIED_RT057	7	Climb	T_00	Max Climb	5500		
MODIFIED_RT057	8	Climb	T_00	Max Climb	7500		
MODIFIED_RT057	9	Climb	T_00	Max Climb	10000		

Figure C-61. AEDT UI Screenshot of Starting Default Profile Profile1: MODIFIED_RT05; PROF_ID2: 7

100006	SDF_NADP_2	Procedural	410100	7	Departure		
Procedure ANP Profile							
Profile ID	Step Number	Step Type	Flap ID	Thrust Level	Altitude AFE (ft)	Calibrated Airspeed (kt)	Accel Energy Share (%)
SDF_NADP_27	1	Takeoff	T_05	Max Takeoff			
SDF_NADP_27	2	Climb	T_05U	Max Takeoff	1000		
SDF_NADP_27	3	Percent Accelerate	T_01	Max Climb		235	55
SDF_NADP_27	4	Percent Accelerate	T_00	Max Climb		255	55
SDF_NADP_27	5	Climb	T_00	Max Climb	3000		
SDF_NADP_27	6	Climb	T_00	Max Climb	3500		
SDF_NADP_27	7	Climb	T_00	Max Climb	4500		
SDF_NADP_27	8	Climb	T_00	Max Climb	5500		
SDF_NADP_27	9	Climb	T_00	Max Climb	7500		
SDF_NADP_27	10	Climb	T_00	Max Climb	10000		

Figure C-62. AEDT UI Screenshot of Proposed Profile1: SDF_NADP_2; PROF_ID2: 7

C.3.5. Graphical and Tabular Comparison

An MS Excel file containing the profile points as found in the AEDT XML Performance Report Export file is available in electronic form upon request. It was developed for comparison of performance data to the AEDT Standard profiles and was used to generate the following tables and line graphs.

C.3.5.1. Tables and Figures Supporting Analysis Demonstrating Benefit

Table C-11 through **Table C-16** show the SEL results under the flight path from the user-defined departure profiles; SEL values resulting from the standard AEDT departure profiles are presented for comparison. **Figure C-63** through **Figure C-69** show the same SEL computations in the form of SEL contours.

Table C-11. SELs for 7673ER Departures at 289,800 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7673ER Profile Weight: 289,800 lbs. (PROF_ID2 = 1) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.3	127.3	-5.1
0.5	119.8	116.9	-2.9
1.0	102.5	102.9	0.4
1.5	94.4	96.2	1.8
2.0	91.8	92.0	0.2
2.5	89.7	90.0	0.3
3.0	88.0	88.3	0.3
3.5	86.4	87.0	0.5
4.0	85.3	85.7	0.4
4.5	84.1	84.5	0.4
5.0	82.9	83.4	0.5
5.5	82.1	82.4	0.3
6.0	81.3	81.4	0.1
6.5	80.6	80.6	0.0
7.0	79.9	79.8	-0.1
7.5	79.4	79.2	-0.2
8.0	78.8	78.5	-0.3
8.5	78.3	78.0	-0.3
9.0	77.8	77.5	-0.3
9.5	77.4	77.0	-0.4
10.0	77.0	76.5	-0.5

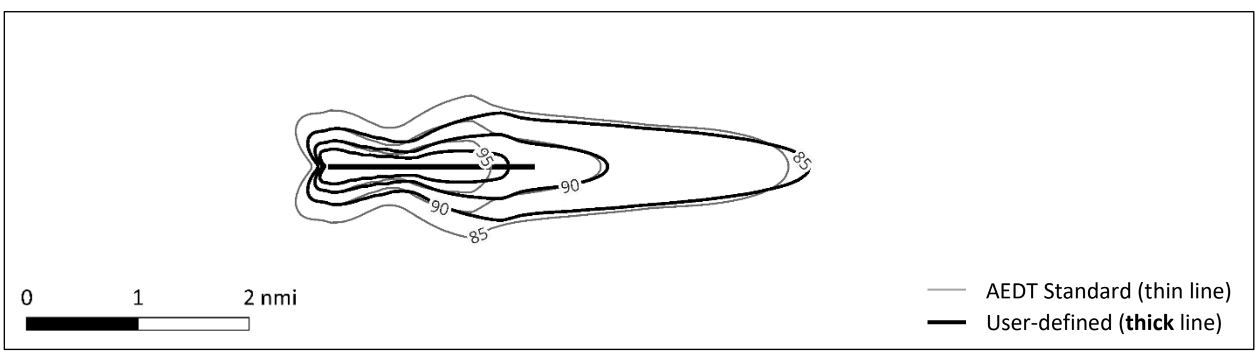

Figure C-63. SEL Contours for 7673ER Departures at Take-Off Weight 289,800 Pounds

Table C-12. SELs for 7673ER Departures at 299,600 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7673ER Profile Weight: 299,600 lbs. (PROF_ID2 = 2) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.3	127.2	-5.1
0.5	119.8	116.8	-3.0
1.0	103.4	104.7	1.3
1.5	95.3	96.8	1.4
2.0	92.1	92.3	0.2
2.5	90.2	90.4	0.2
3.0	88.4	88.8	0.4
3.5	86.8	87.3	0.5
4.0	85.6	86.1	0.5
4.5	84.5	85.0	0.6
5.0	83.4	83.9	0.5
5.5	82.5	82.8	0.3
6.0	81.7	81.8	0.1
6.5	81.0	81.0	0.1
7.0	80.3	80.2	-0.1
7.5	79.7	79.6	-0.1
8.0	79.1	79.0	-0.2
8.5	78.6	78.3	-0.3
9.0	78.2	77.9	-0.3
9.5	77.7	77.4	-0.3
10.0	77.3	76.9	-0.4

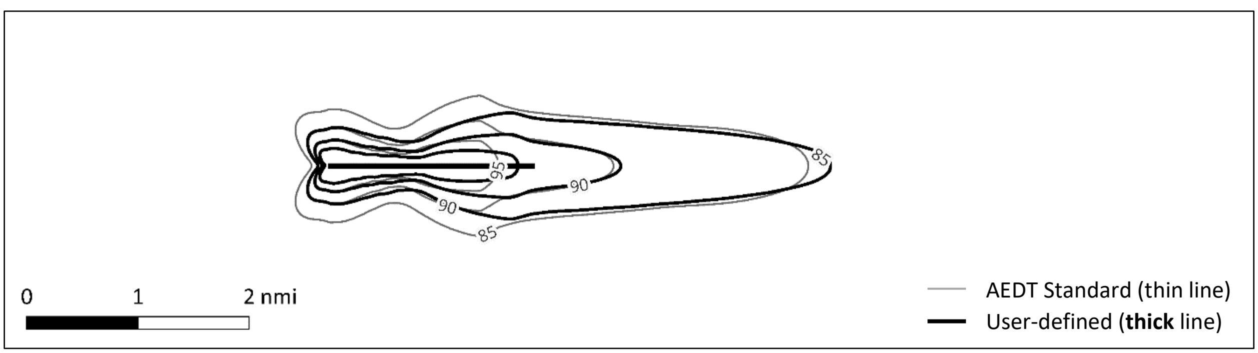

Figure C-64. SEL Contours for 7673ER Departures at Take-Off Weight 299,600 Pounds

Table C-13. SELs for 7673ER Departures at 310,000 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7673ER Profile Weight: 310,000 lbs. (PROF_ID2 = 3) User PROF_ID1: SDF_NADP_2_RT15			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**Used-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.2	127.1	-5.1
0.5	119.8	118.5	-1.4
1.0	104.6	106.9	2.3
1.5	97.4	97.5	0.1
2.0	92.5	92.8	0.3
2.5	90.6	90.9	0.3
3.0	88.9	89.2	0.2
3.5	87.3	87.8	0.5
4.0	86.0	86.6	0.6
4.5	85.0	85.5	0.5
5.0	83.9	84.3	0.4
5.5	82.9	83.3	0.4
6.0	82.1	82.4	0.3
6.5	81.4	81.5	0.1
7.0	80.7	80.7	0.0
7.5	80.1	80.0	-0.1
8.0	79.5	79.4	-0.1
8.5	79.0	78.8	-0.2
9.0	78.5	78.2	-0.3
9.5	78.1	77.8	-0.3
10.0	77.6	77.3	-0.3

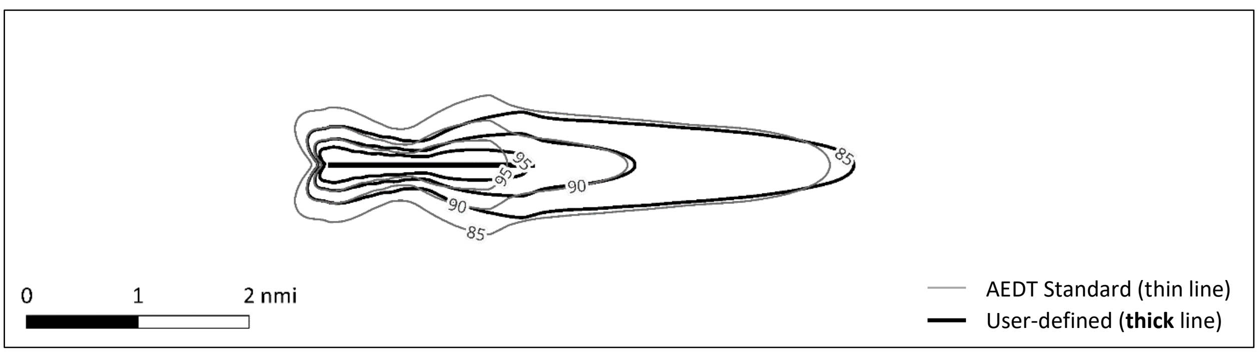

Figure C-65. SEL Contours for 7673ER Departures at Take-Off Weight 310,000 Pounds

Table C-14. SELs for 7673ER Departures at 329,900 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7673ER Profile Weight: 329,900 lbs. (PROF_ID2 = 4) User PROF_ID1: SDF_NADP_2_RT10			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.6	129.2	-3.4
0.5	120.3	117.9	-2.4
1.0	107.6	112.4	4.8
1.5	99.3	98.8	-0.5
2.0	93.2	93.2	0.0
2.5	91.3	91.2	-0.1
3.0	89.7	89.6	-0.1
3.5	88.1	88.2	0.1
4.0	86.8	87.0	0.3
4.5	85.7	86.0	0.3
5.0	84.7	85.0	0.2
5.5	83.7	84.0	0.2
6.0	82.9	83.0	0.1
6.5	82.1	82.2	0.1
7.0	81.4	81.4	0.0
7.5	80.8	80.7	-0.1
8.0	80.2	80.0	-0.2
8.5	79.7	79.5	-0.2
9.0	79.2	78.9	-0.3
9.5	78.7	78.4	-0.3
10.0	78.3	77.9	-0.4

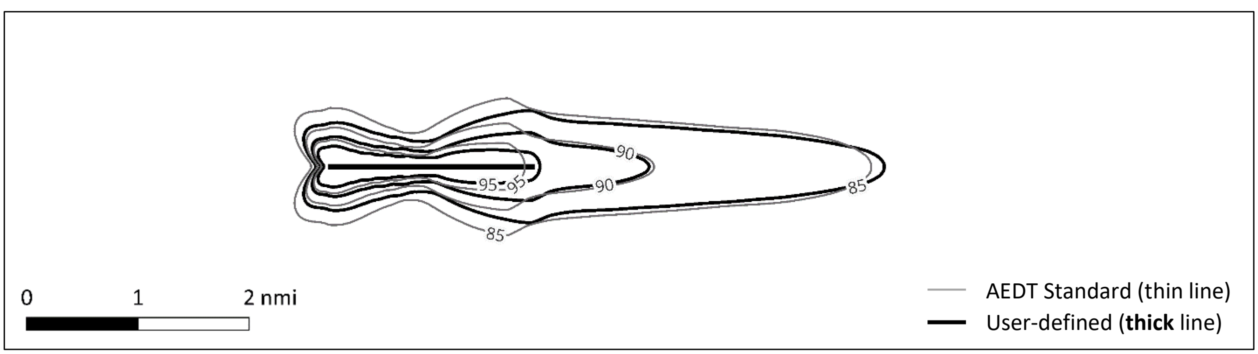

Figure C-66. SEL Contours for 7673ER Departures at Take-Off Weight 329,900 Pounds

Table C-15. SELs for 7673ER Departures at 354,900 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7673ER Profile Weight: 354,900 lbs. (PROF_ID2 = 5) User PROF_ID1: SDF_NADP_2_RT05			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**Used-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.4	130.7	-1.7
0.5	120.3	118.9	-1.4
1.0	117.5	116.6	-0.9
1.5	100.9	100.8	0.0
2.0	94.3	96.1	1.7
2.5	92.2	92.4	0.3
3.0	90.6	90.9	0.2
3.5	89.3	89.4	0.1
4.0	88.0	88.3	0.2
4.5	86.7	87.2	0.4
5.0	85.6	86.0	0.4
5.5	84.8	85.0	0.3
6.0	83.8	84.1	0.4
6.5	83.0	83.2	0.2
7.0	82.3	82.5	0.2
7.5	81.7	81.9	0.2
8.0	81.1	81.2	0.2
8.5	80.6	80.7	0.1
9.0	80.0	80.1	0.1
9.5	79.6	79.6	0.1
10.0	79.1	79.2	0.1

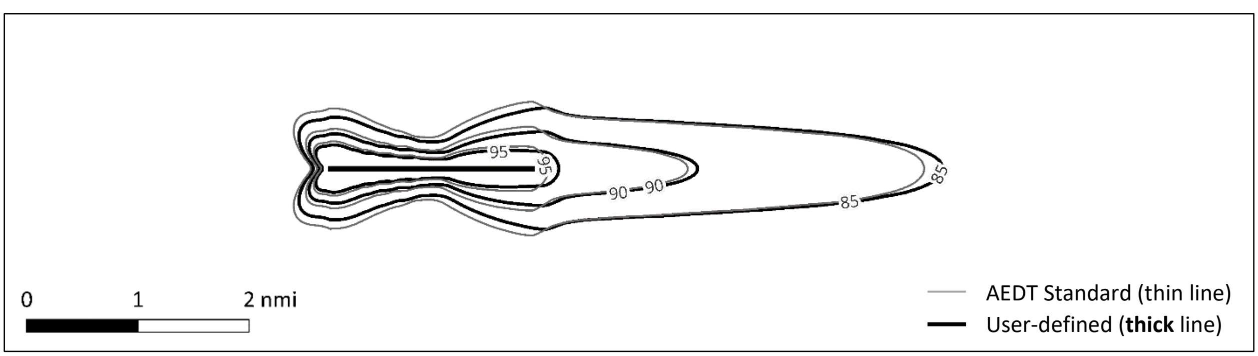

Figure C-67. SEL Contours for 7673ER Departures at Take-Off Weight 354,900 Pounds

Table C-16. SELs for 7673ER Departures at 381,700 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7673ER Profile Weight: 381,700 lbs. (PROF_ID2 = 6) User PROF_ID1: SDF_NADP_2			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.2	132.2	0.0
0.5	121.0	121.0	0.0
1.0	117.6	117.6	0.0
1.5	103.3	103.3	0.0
2.0	98.2	98.2	0.0
2.5	92.9	92.9	0.0
3.0	91.4	91.4	0.0
3.5	90.2	90.1	-0.1
4.0	89.0	88.9	-0.1
4.5	87.9	87.8	-0.1
5.0	86.8	86.9	0.1
5.5	85.7	85.9	0.1
6.0	84.9	84.9	0.0
6.5	84.1	84.1	0.0
7.0	83.2	83.3	0.0
7.5	82.6	82.6	0.0
8.0	82.0	82.0	0.1
8.5	81.4	81.4	0.0
9.0	80.9	80.9	0.0
9.5	80.5	80.4	0.0
10.0	79.9	79.9	0.0

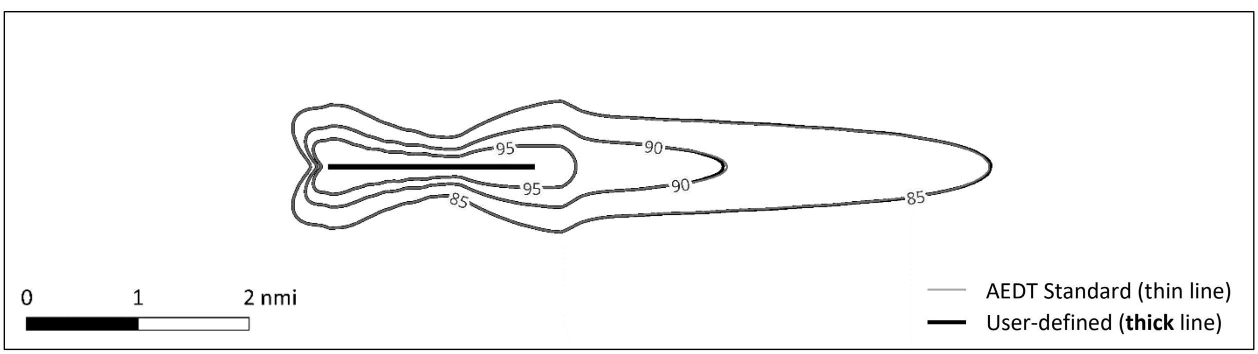

Figure C-68. SEL Contours for 7673ER Departures at Take-Off Weight 381,700 Pounds

Table C-17. SELs for 7673ER Departures at 410,100 Pounds: AEDT Standard and User-defined Profiles

AEDT Aircraft Model: 7673ER Profile Weight: 410,100 lbs. (PROF_ID2 = 7) User PROF_ID1: SDF_NADP_2			
Distance from Brake Release (nmi)	**AEDT Standard, SEL (dBA)**	**User-Defined Profile, SEL (dBA)**	**Difference SEL (dBA)**
0.0	132.5	132.5	0.0
0.5	120.7	120.7	0.0
1.0	118.0	118.0	0.0
1.5	107.7	107.7	0.0
2.0	99.8	99.8	0.0
2.5	94.9	94.9	0.0
3.0	92.4	92.3	-0.1
3.5	91.0	90.9	-0.1
4.0	90.0	89.8	-0.1
4.5	88.9	88.8	-0.1
5.0	88.0	87.9	-0.1
5.5	87.1	87.0	-0.1
6.0	86.1	86.0	-0.1
6.5	85.2	85.2	0.0
7.0	84.4	84.4	0.0
7.5	83.7	83.7	0.0
8.0	82.9	82.9	0.0
8.5	82.4	82.4	0.0
9.0	81.8	81.8	0.0
9.5	81.3	81.3	0.0
10.0	80.8	80.8	0.0

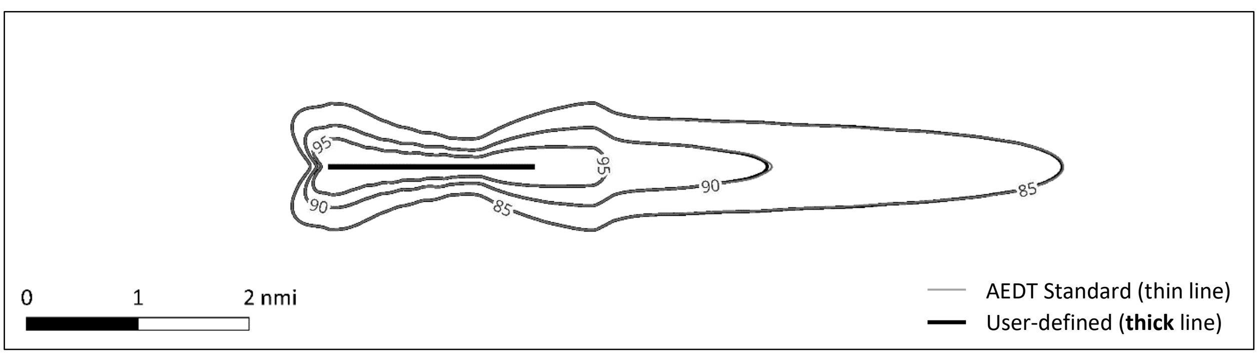

Figure C-69. SEL Contours for 7673ER Departures at Take-Off Weight 410,100 Pounds

C.3.5.2. Graphical Comparison of Profiles

Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are included as **Figure C-70**, **Figure C-71**, and **Figure C-72,** respectively.

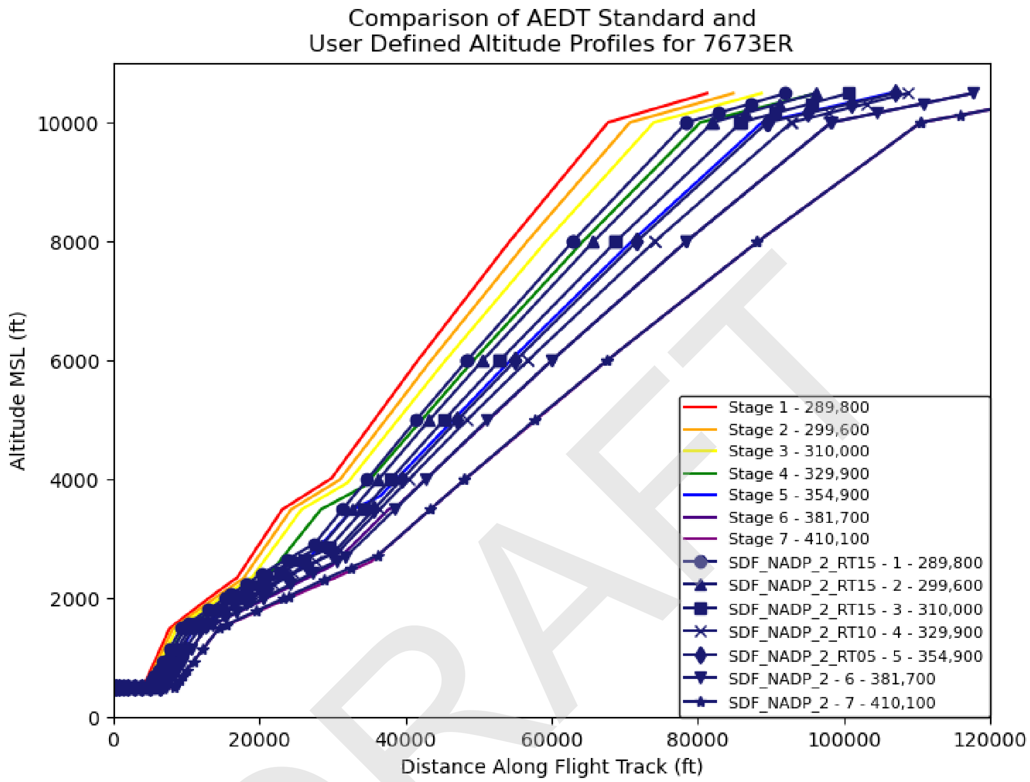

Figure C-70. 7673ER AEDT Profiles, Altitude vs. Distance

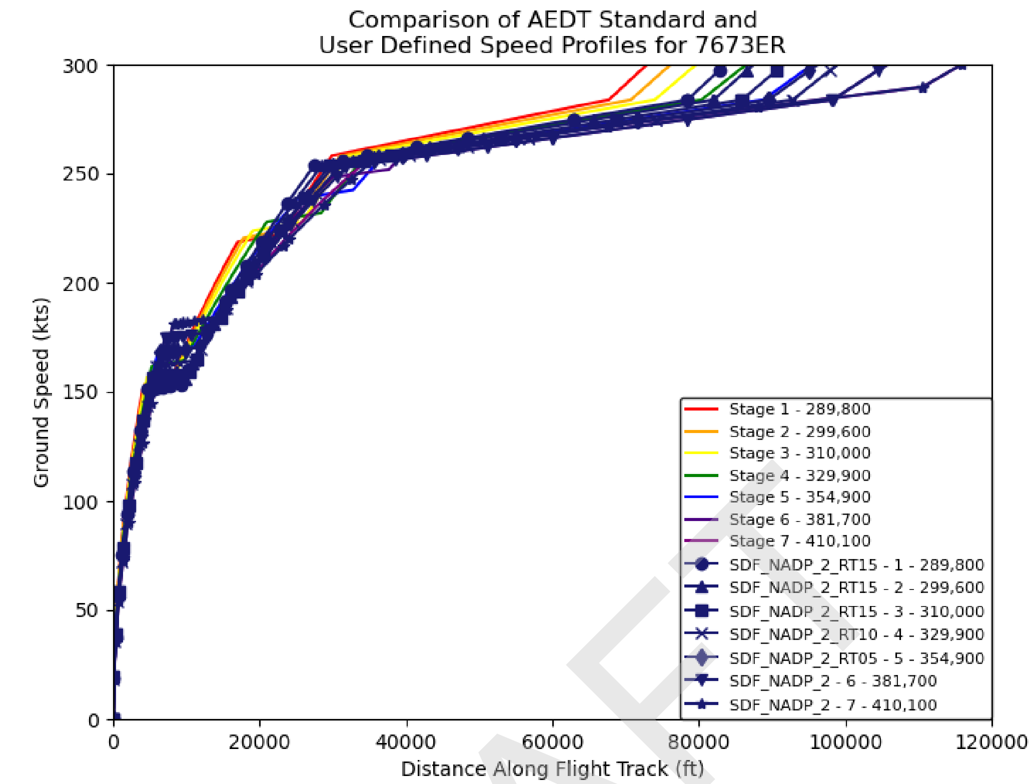

Figure C-71. 7673ER AEDT Profiles, Speed vs. Distance

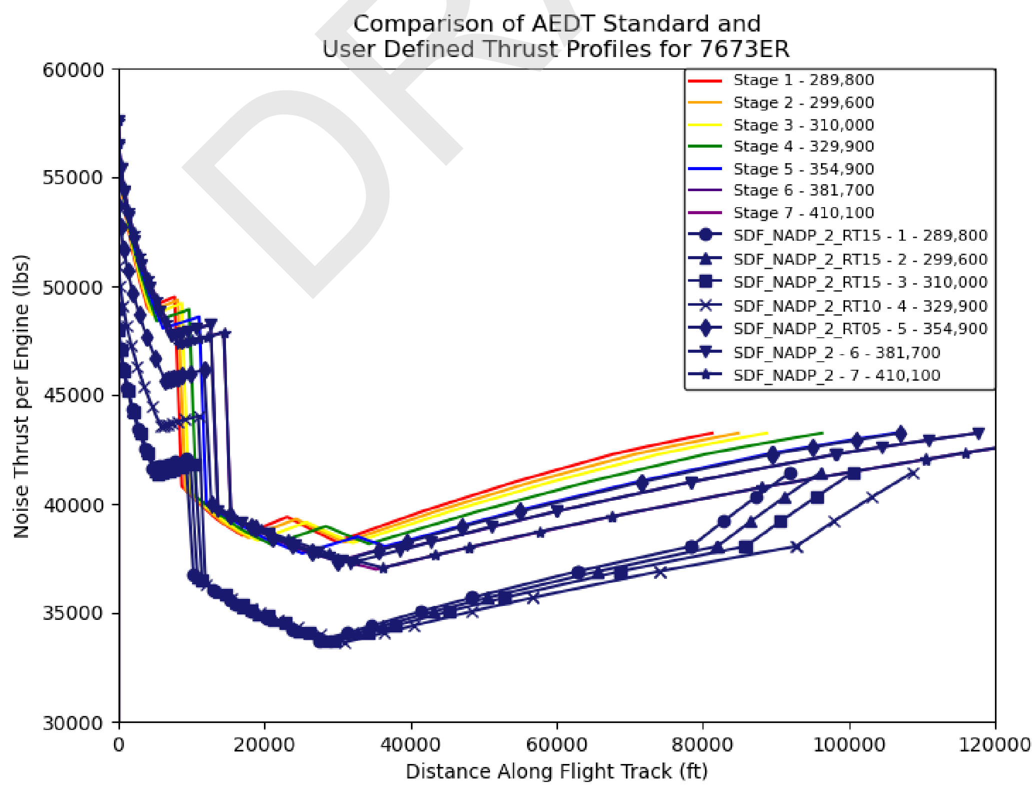

Figure C-72. 7673ER AEDT Profiles, Thrust vs. Distance

C.4. Additional Graphs: Comparison of Altitude and Speed Profiles by Stage Length

The additional graphs of altitude vs. distance and speed vs. distance, organized by stage length, are included in this section in response to FAA's request in the feedback dated May 29, 2024. The following figures are complementary to Figures C-1 through C-4 in the original memorandum dated April 18, 2024 and show the same data. **Figures C-73** through **C-106** reorganize the data by specific profile weights and respective stage lengths.

The distribution of departures by stage length (as derived by an analysis of the city-pair data in the 12-month NOMS sample) show that:

- 30% of the 757PW departures are in stage length 1, 43% in stage length 2, 11% in stage length 3, and 15% in stage length 4. The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Boeing 757PW operations will be represented with AEDT ANP stage lengths 1 – 4. Although 757PW stage length 5 (PROF_ID2 = 5, with representative profile weight of 230,900 pounds) did not appear in the 12-month flight track sample, we include that departure profiles in this documentation in case the forecast data indicate that such operations should be included in the forecast NEM.
- 28% of the 757RR departures are in stage length 1, 46% in stage length 2, 11% in stage length 3, and 15% in stage length 4. The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Boeing 757RR operations will be represented with AEDT ANP stage lengths 1 – 4. Although 757RR stage length 5 (PROF_ID2 = 5, with representative profile weight of 234,800 pounds) did not appear in the 12-month flight track sample, we include that departure profile in this documentation in case the forecast data indicate that such operations should be included in the forecast NEM.
- 20% of the 7673ER departures are in stage length 1, 32% in stage length 2, 19% in stage length 3, 26% in stage length 4, 2% in stage length 5, and less than 1% in stage length 6. The stage length distribution which will be applied to the cargo aircraft for noise modeling is based upon forecasted weight information provided by the cargo operator. While the exact distribution is still in development, the majority of Boeing 7673ER operations will be represented with AEDT ANP stage lengths 1 – 4. Although 7673ER stage length 7 (PROF_ID2 = 7, with representative profile weight of 410,100 pounds) did not appear in the 12-month flight track sample, we include that departure profile in this documentation in case the forecast data indicate that such operations should be included in the forecast NEM.

As noted in the "Statement of Benefit" (section C.1.1), operators at SDF use a version of "Noise Abatement Departure Procedures" (NADP 2) at a reduced thrust instead of standard departure procedures at max thrust. Operators did not provide the exact reduced thrust. Therefore, we used the thrust-to-weight ratio of the AEDT maximum thrust profile associated with current and historical 757RR operations at SDF. The similar thrust-to-weight ratio should maintain a similar acceleration rate during the take-off roll and, combined with the lower rotation speed needed for a lower weight aircraft, should have a shorter take-off roll. Therefore, all of the proposed procedures follow the NADP 2 described on page C-1, although they may use various thrust settings based on weight. This should not be confused with AEDT's definition of a single procedure (PROF_ID1 and PROF_ID2), which combines both the altitude and flap retractation speeds along with the power settings. It also should be noted that our efforts to develop the proposed profiles were limited to the selection of thrust coefficients already available in AEDT. In other words, we did not attempt to define new thrust coefficients to represent power levels not already represented in AEDT. We did not modify the flap retraction speed schedule relative to that in AEDT, and we also kept all clean climbs (i.e. flaps fully retracted) at a speed of 250 knots calibrated airspeed, which matches both the AEDT standard profiles and the indicated airspeed listed in the procedures provided by the operator. In addition, the comparison of the AEDT profiles is done at the SDF annual average day conditions documented in the AEDT database, which will be used in the calculation of the NEM contours. As such, the ground speeds reported by AEDT compared to the flight track data do not match precisely; therefore, we recommend viewing the general speed patterns rather than comparing absolute values.

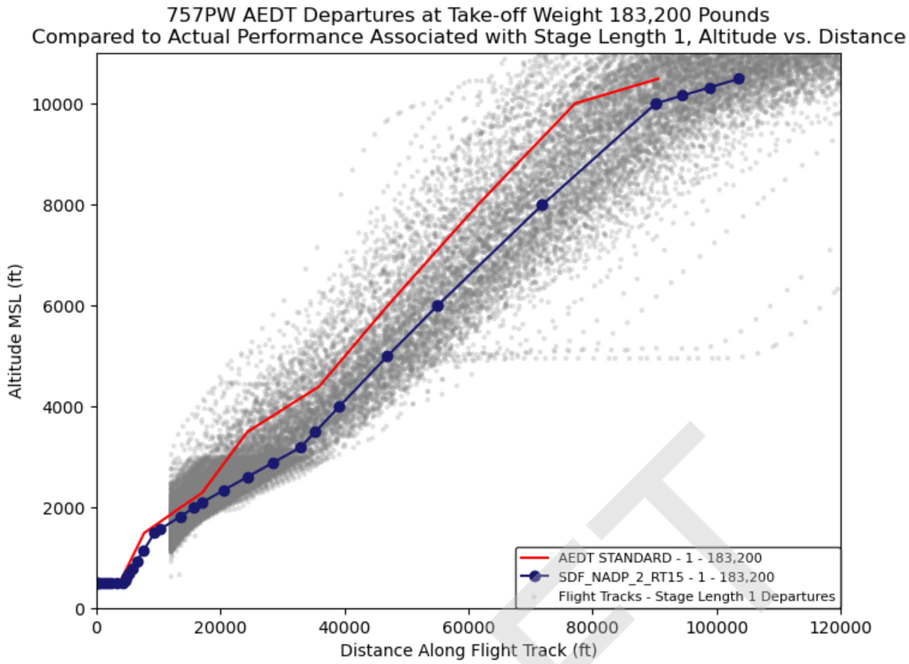

Figure C-73. 757PW Departures, Stage Length 1, Altitude vs. Distance

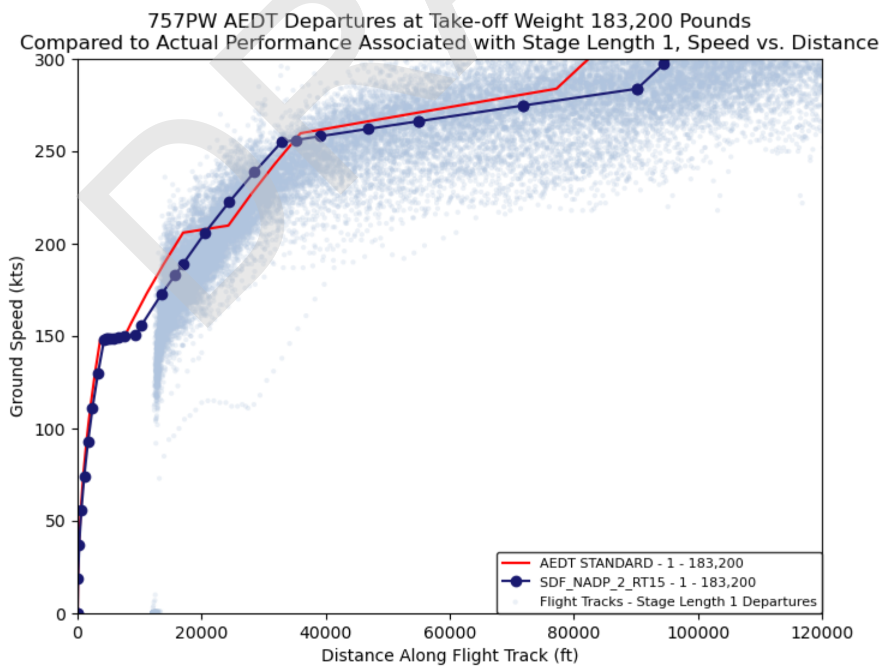

Figure C-74. 757PW Departures, Stage Length 1, Speed vs. Distance

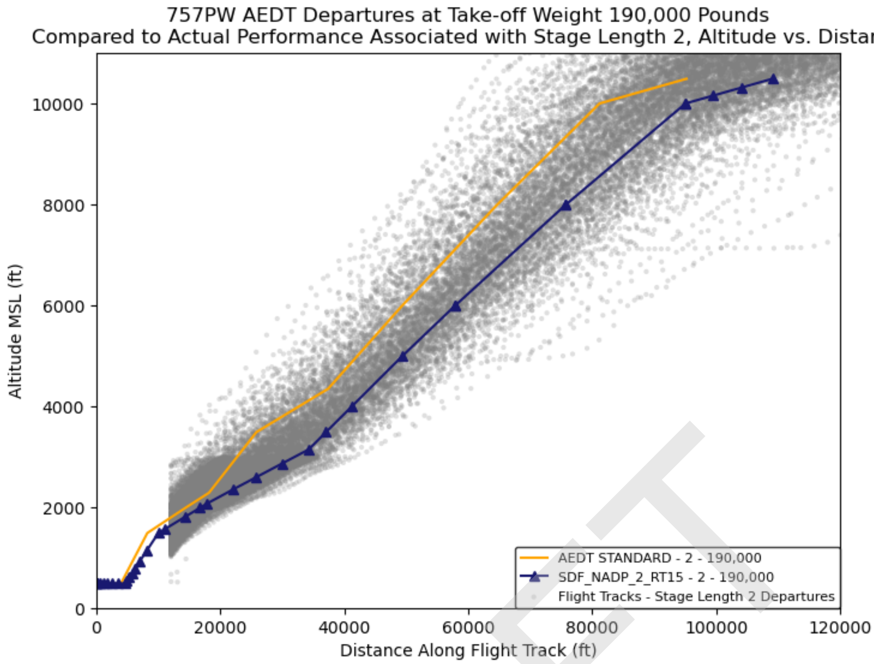

Figure C-75. 757PW Departures, Stage Length 2, Altitude vs. Distance

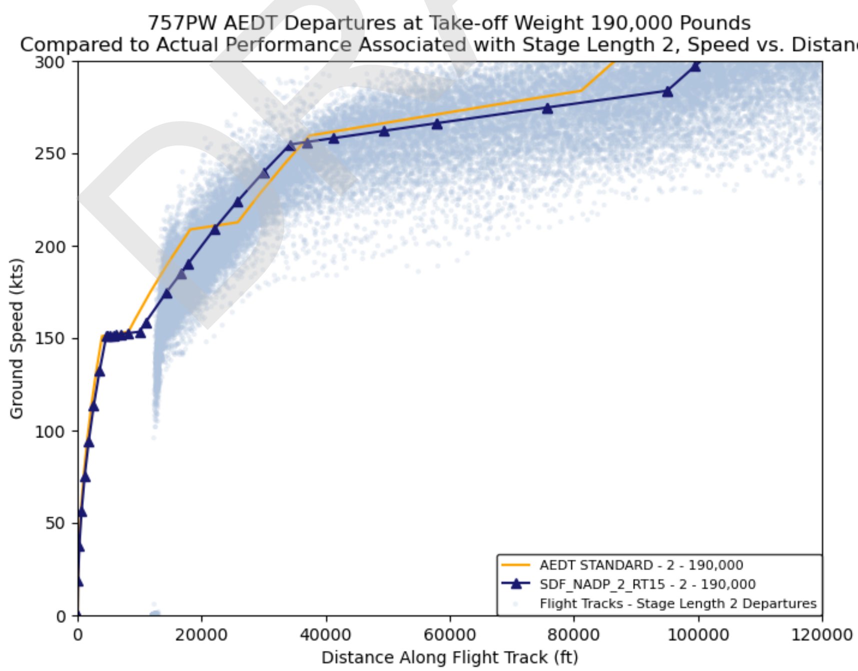

Figure C-76. 757PW Departures, Stage Length 2, Speed vs. Distance

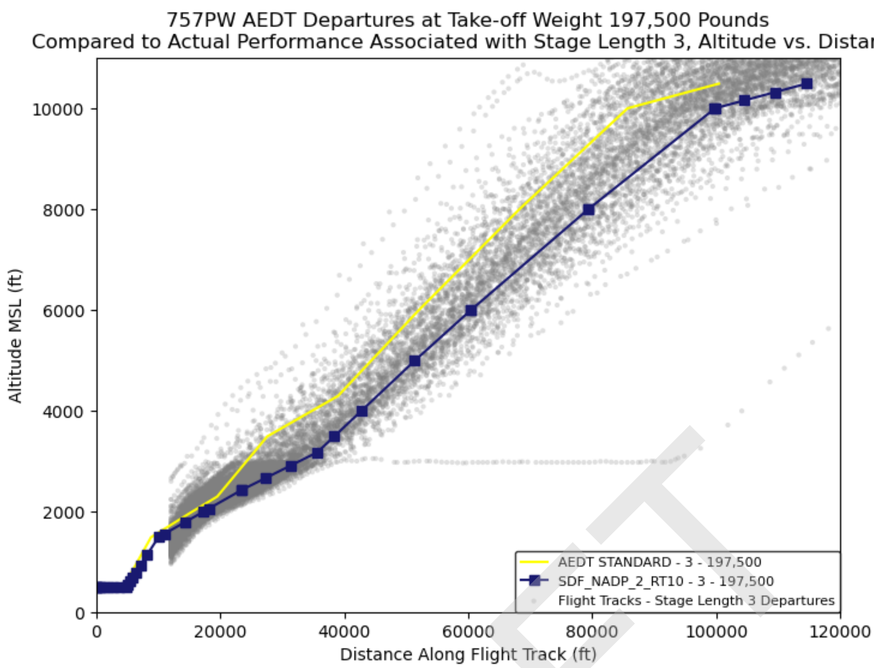

Figure C-77. 757PW Departures, Stage Length 3, Altitude vs. Distance

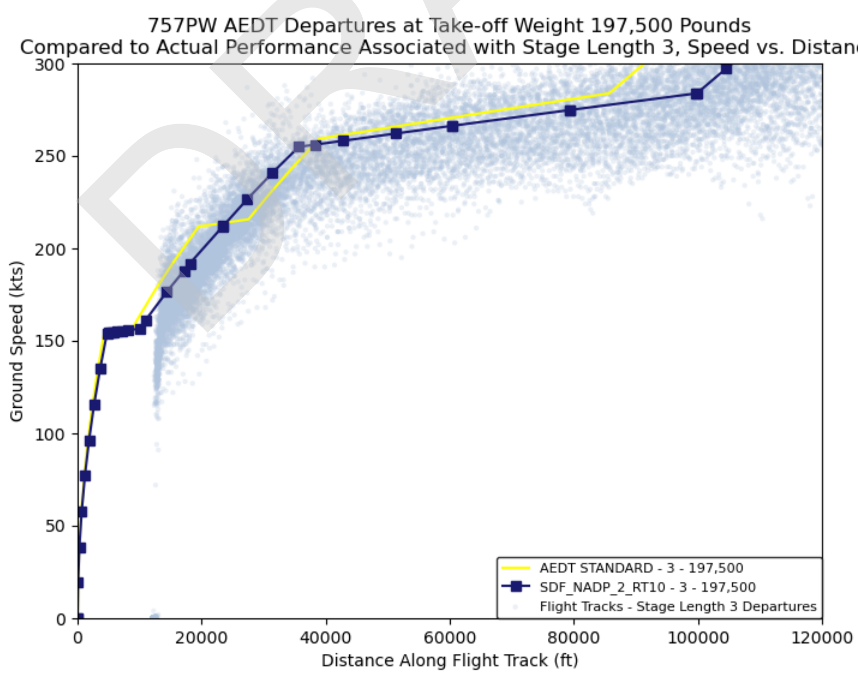

Figure C-78. 757PW Departures, Stage Length 3, Speed vs. Distance

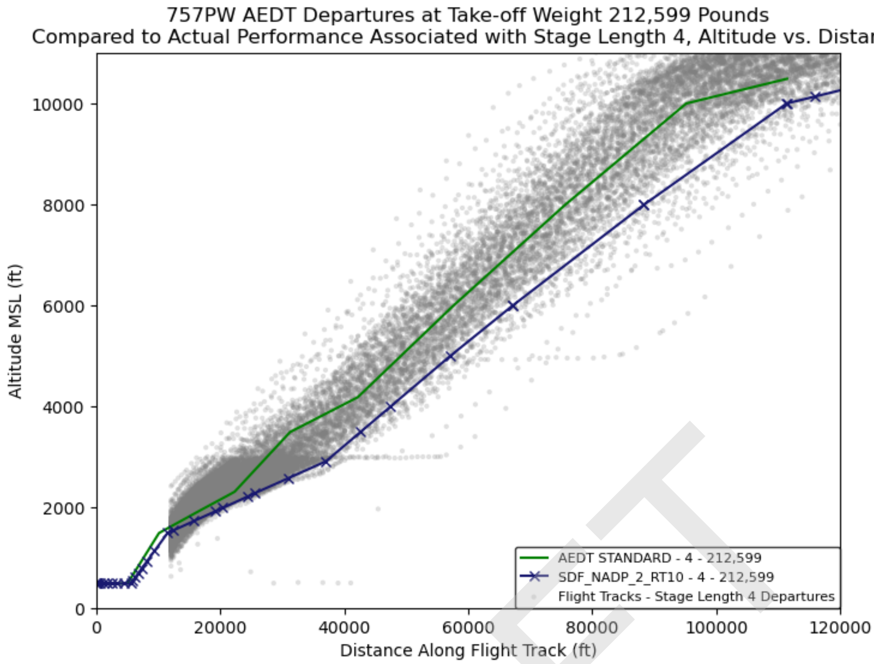

Figure C-79. 757PW Departures, Stage Length 4, Altitude vs. Distance

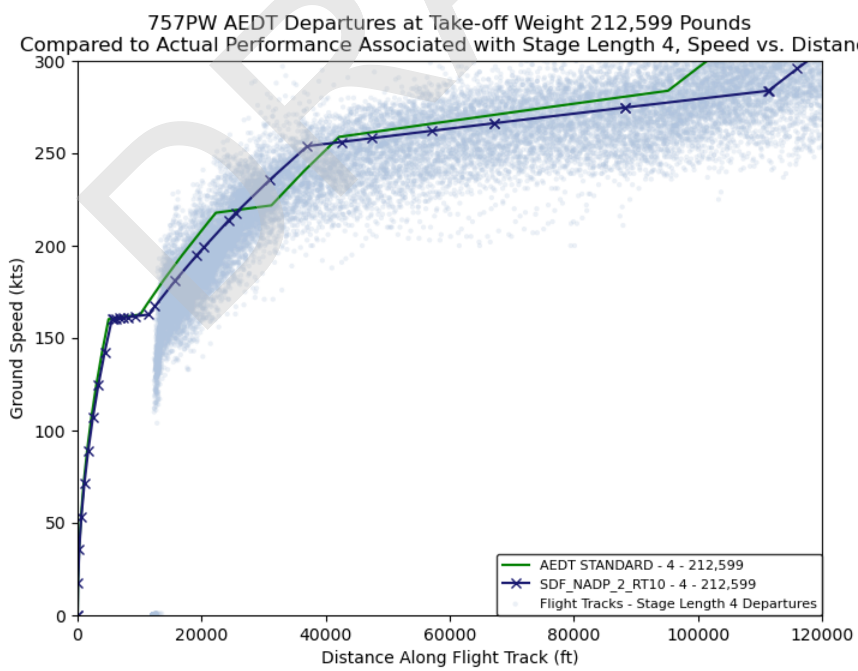

Figure C-80. 757PW Departures, Stage Length 4, Speed vs. Distance

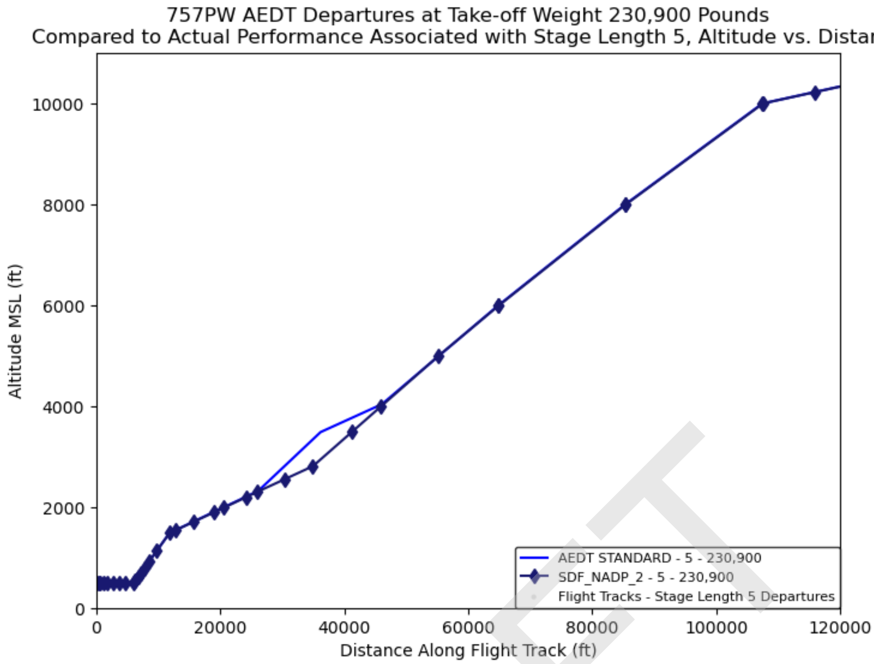

Figure C-81. 757PW Departures, Stage Length 5, Altitude vs. Distance

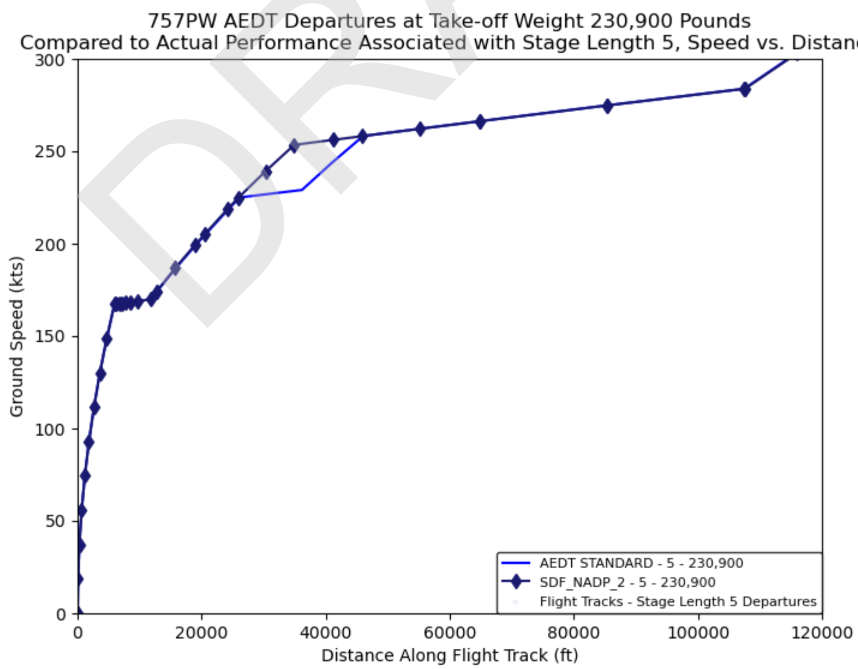

Figure C-82. 757PW Departures, Stage Length 5, Speed vs. Distance

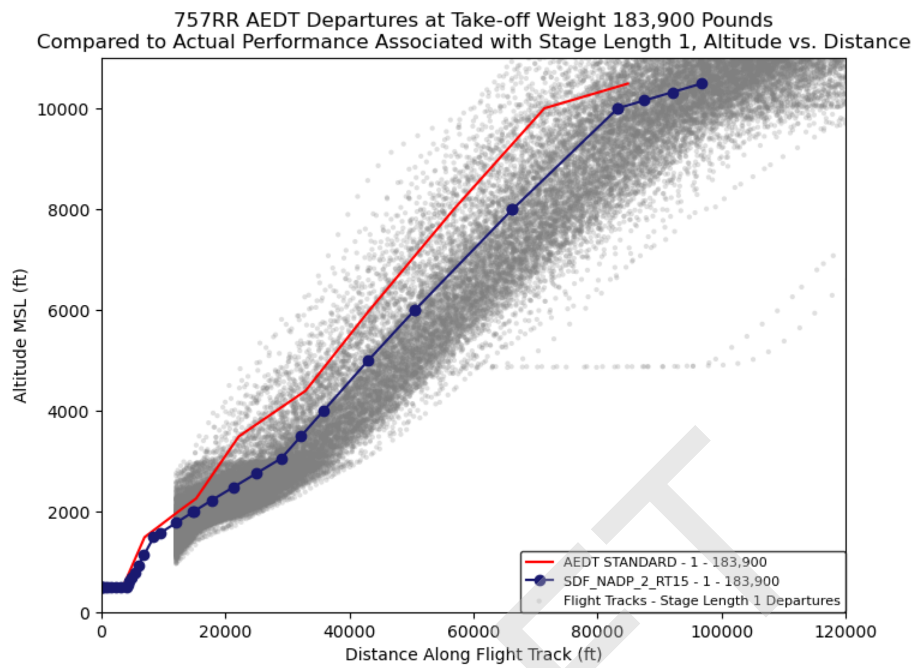

Figure C-83. 757RR Departures, Stage Length 1, Altitude vs. Distance

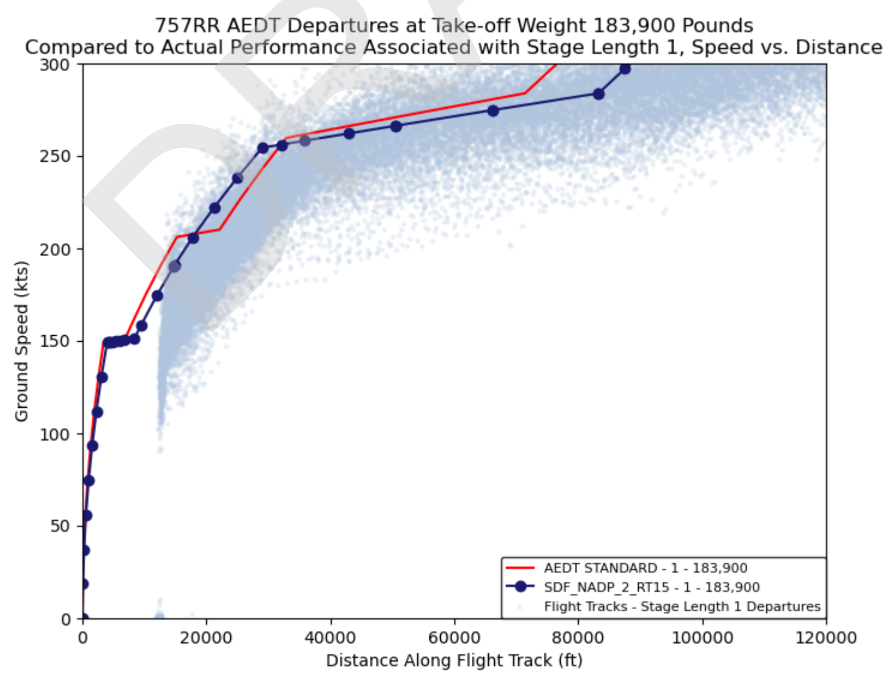

Figure C-84. 757RR Departures, Stage Length 1, Speed vs. Distance

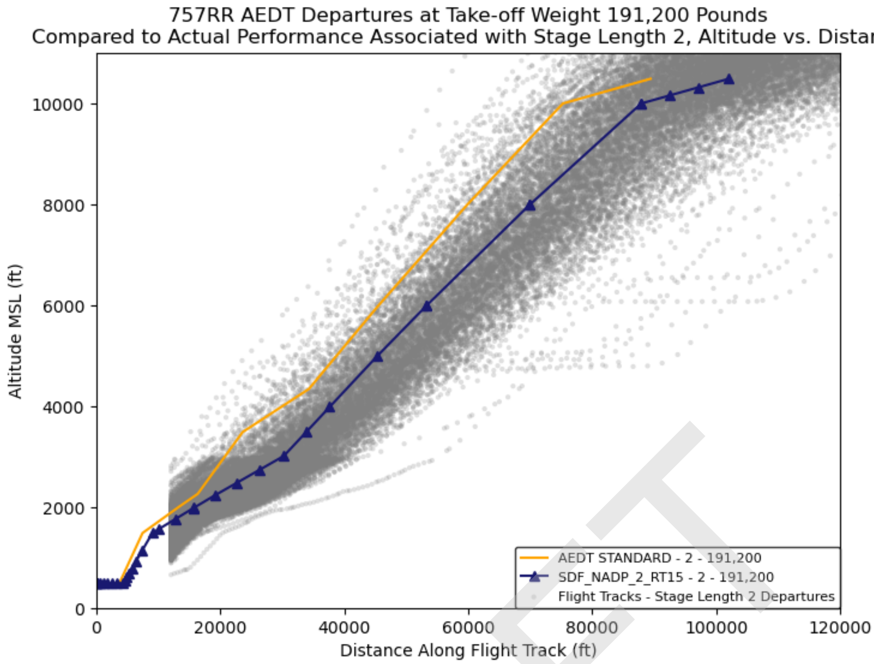

Figure C-85. 757RR Departures, Stage Length 2, Altitude vs. Distance

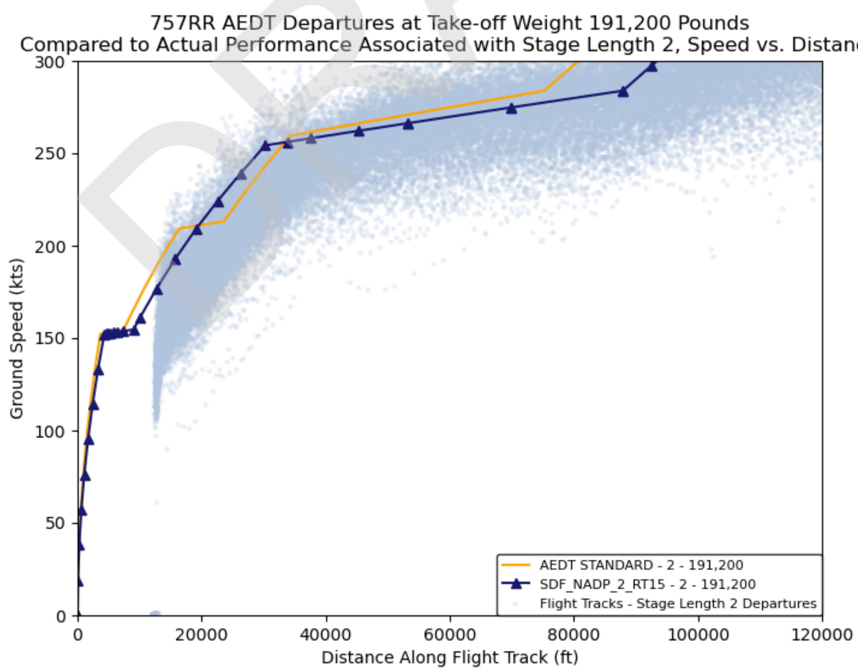

Figure C-86. 757RR Departures, Stage Length 2, Speed vs. Distance

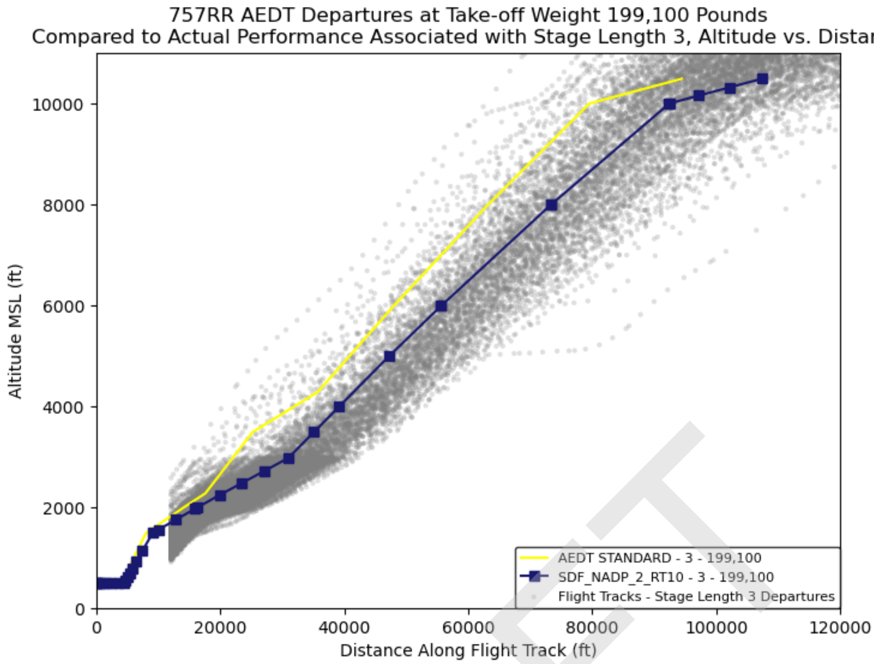

Figure C-87. 757RR Departures, Stage Length 3, Altitude vs. Distance

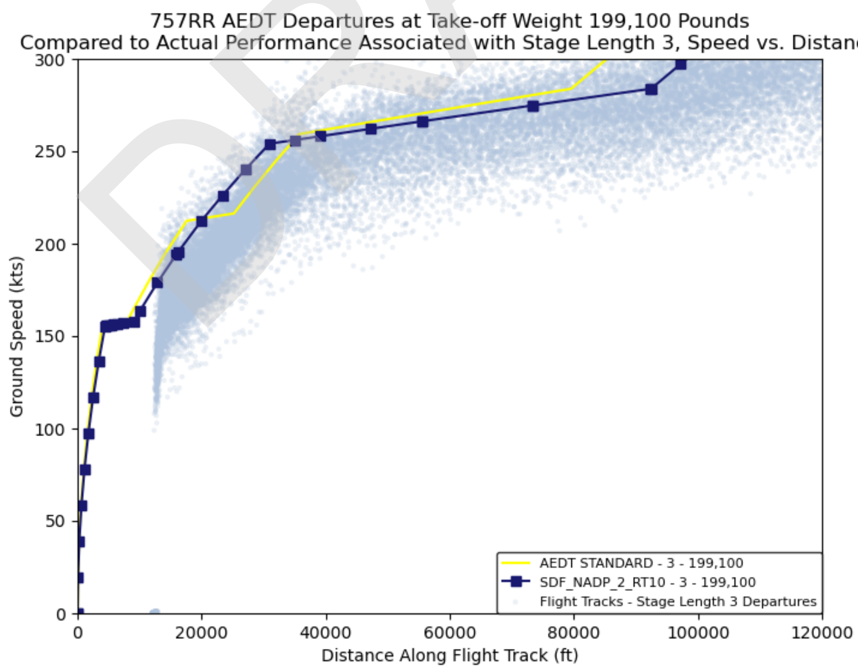

Figure C-88. 757RR Departures, Stage Length 3, Speed vs. Distance

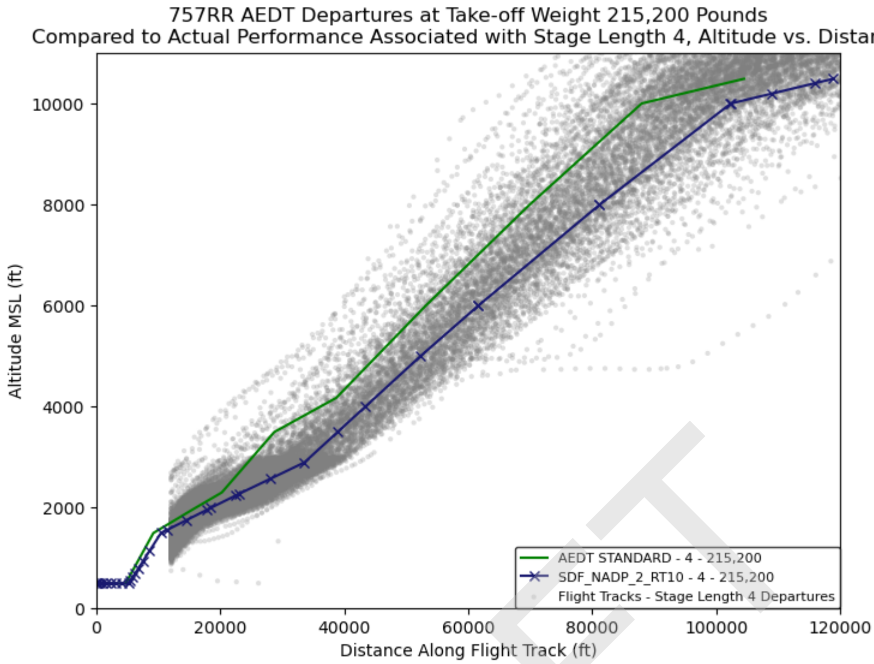

Figure C-89. 757RR Departures, Stage Length 4, Altitude vs. Distance

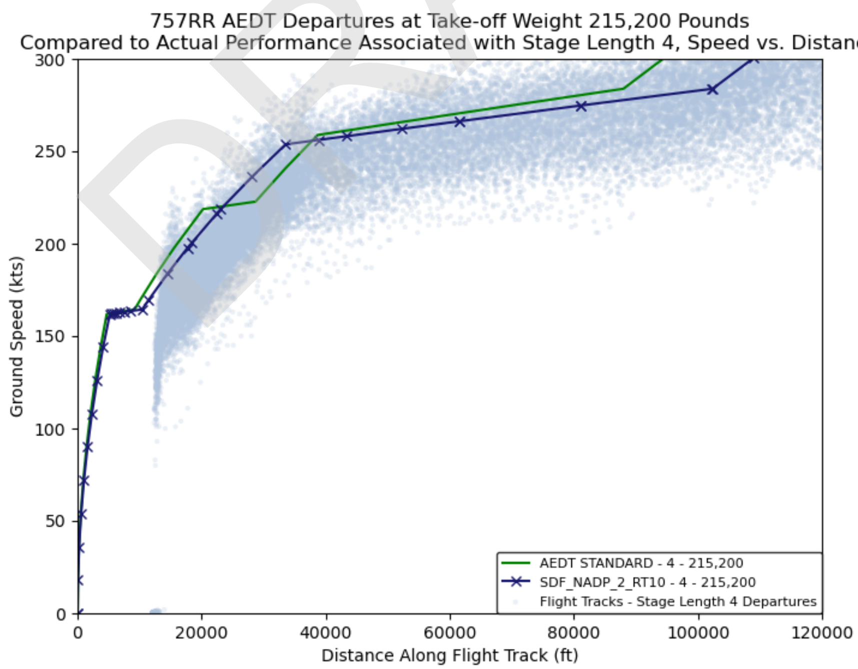

Figure C-90. 757RR Departures, Stage Length 4, Speed vs. Distance

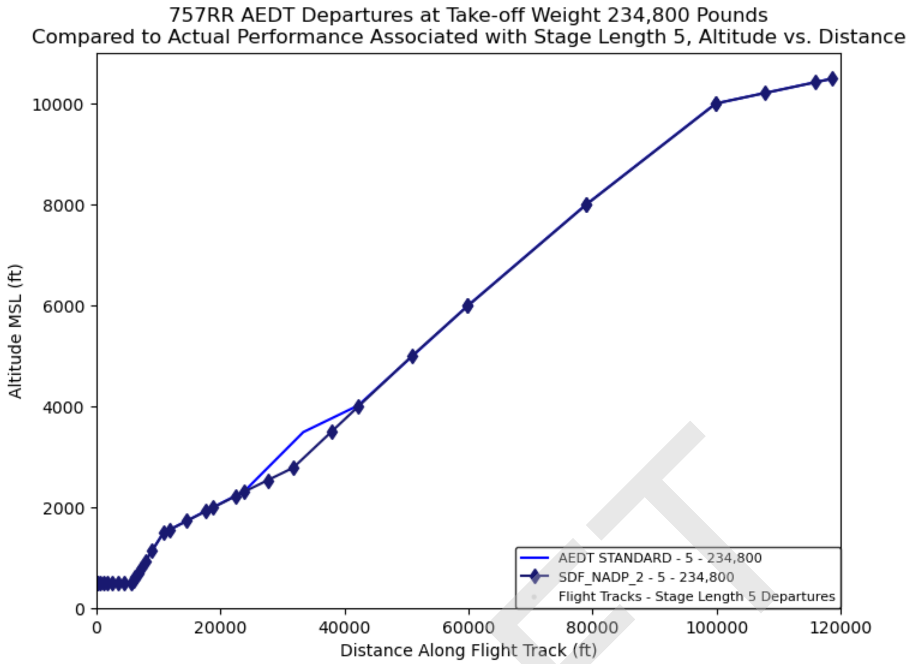

Figure C-91. 757RR Departures, Stage Length 5, Altitude vs. Distance

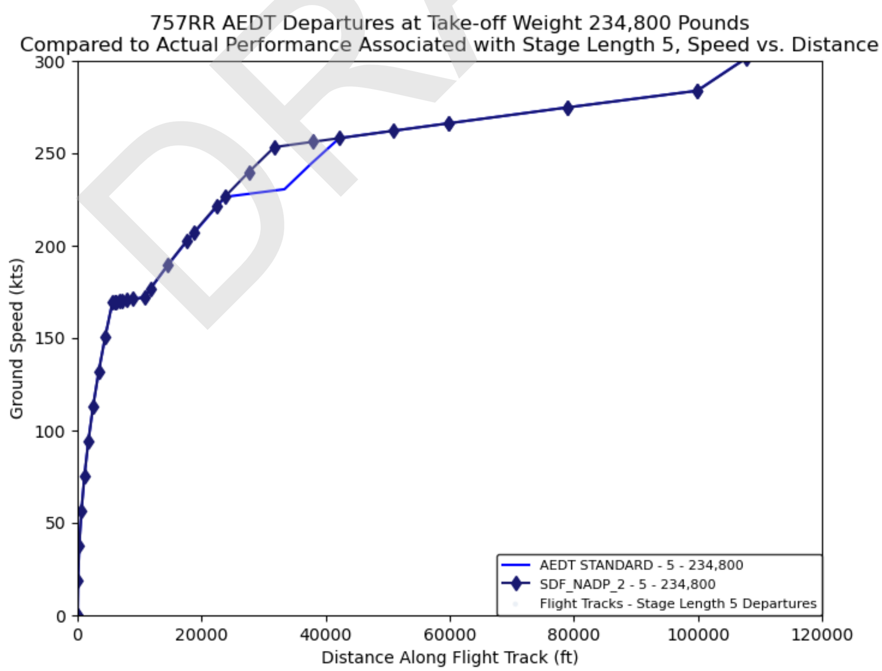

Figure C-92. 757RR Departures, Stage Length 5, Speed vs. Distance

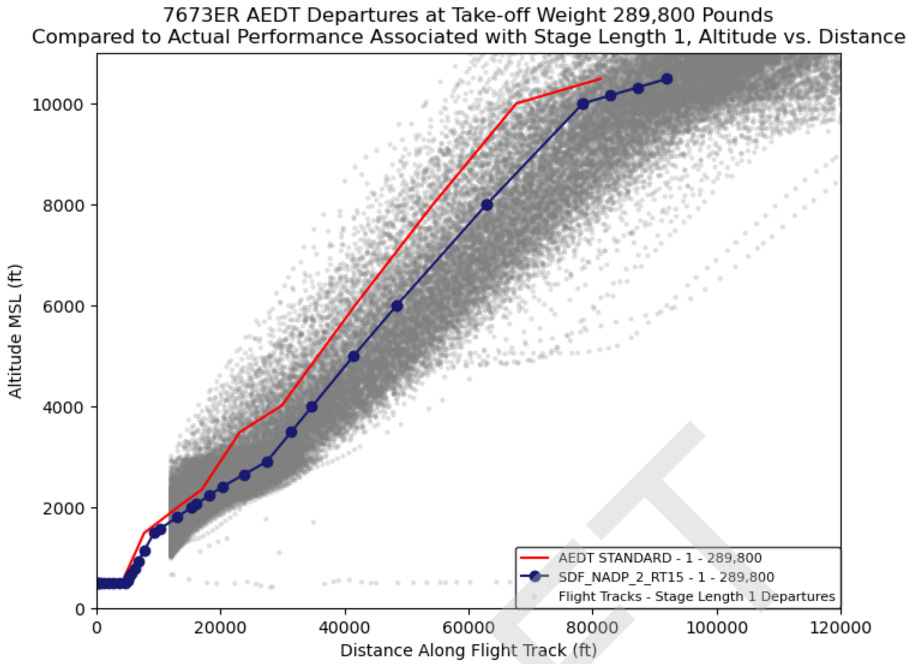

Figure C-93. 7673ER Departures, Stage Length 1, Altitude vs. Distance

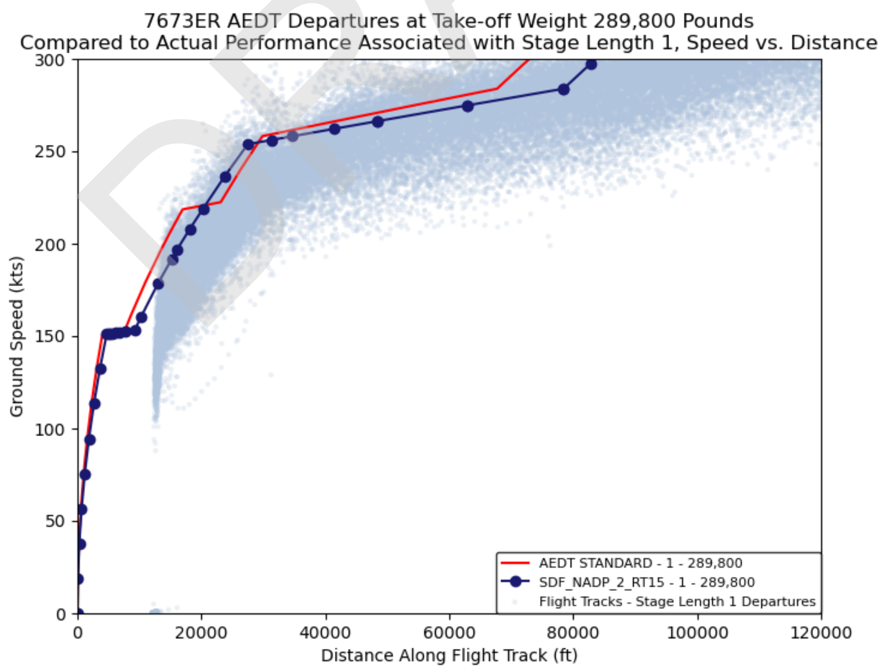

Figure C-94. 7673ER Departures, Stage Length 1, Speed vs. Distance

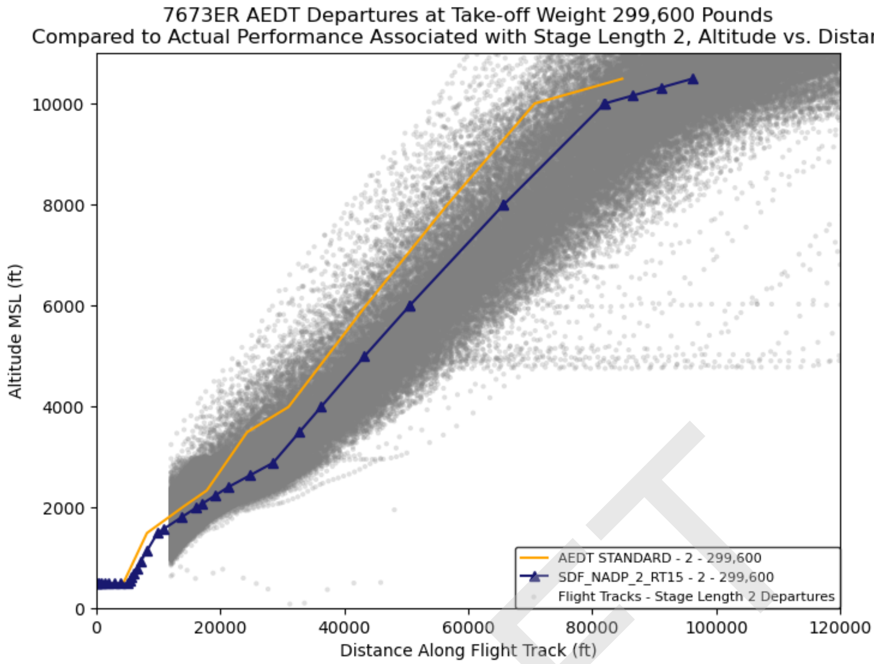

Figure C-95. 7673ER Departures, Stage Length 2, Altitude vs. Distance

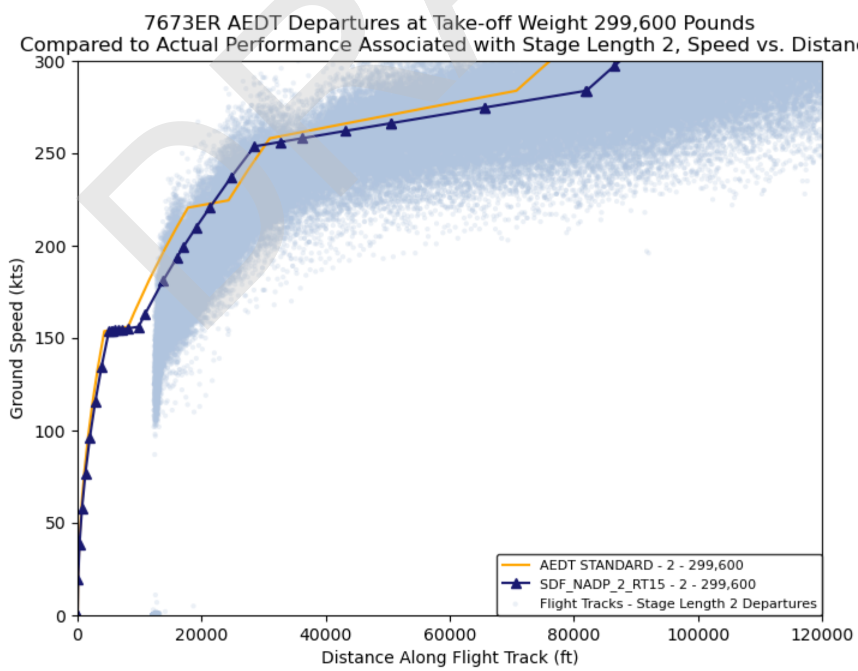

Figure C-96. 7673ER Departures, Stage Length 2, Speed vs. Distance

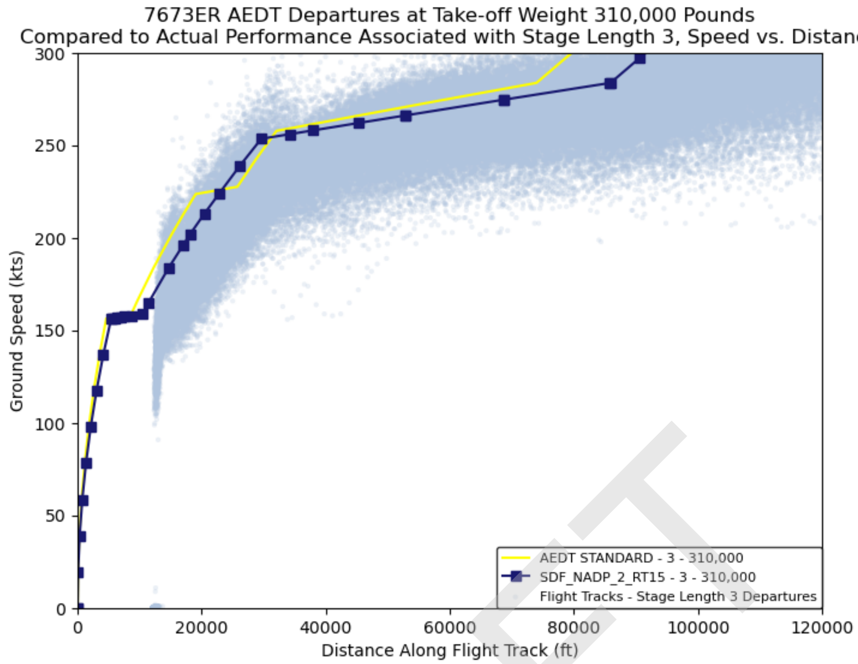

Figure C-97. 7673ER Departures, Stage Length 3, Altitude vs. Distance

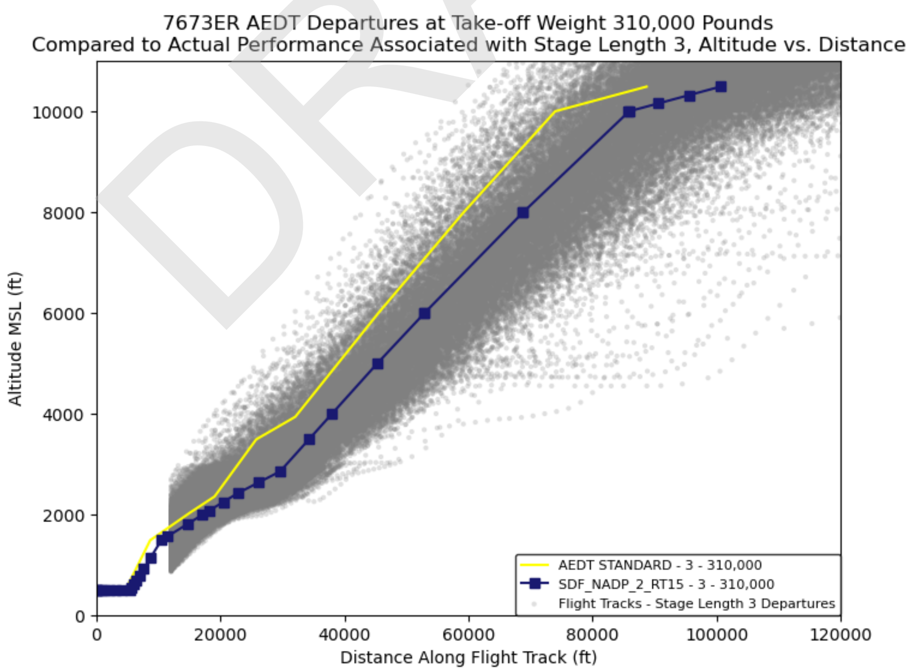

Figure C-98. 7673ER Departures, Stage Length 3, Speed vs. Distance

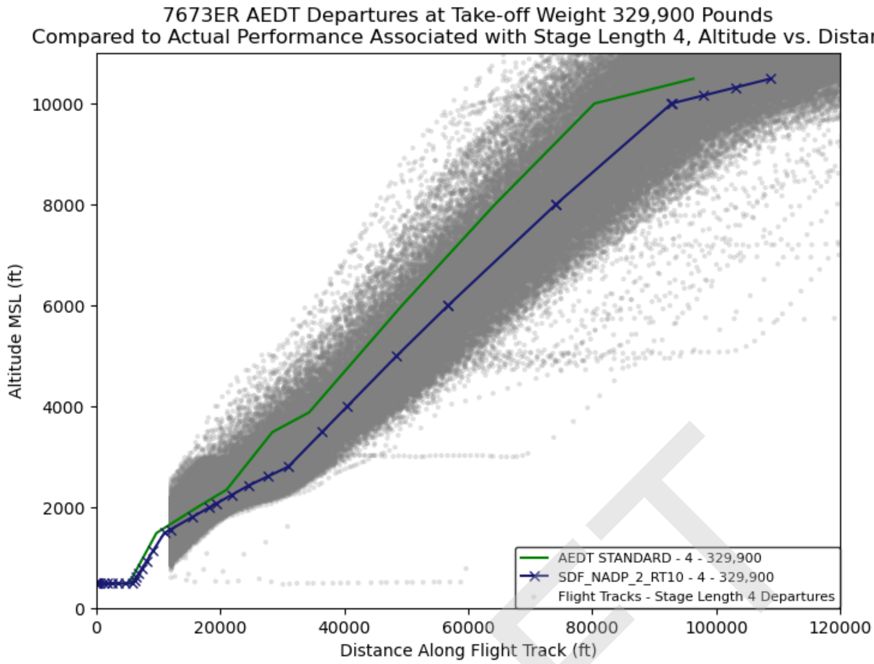

Figure C-99. 7673ER Departures, Stage Length 4, Altitude vs. Distance

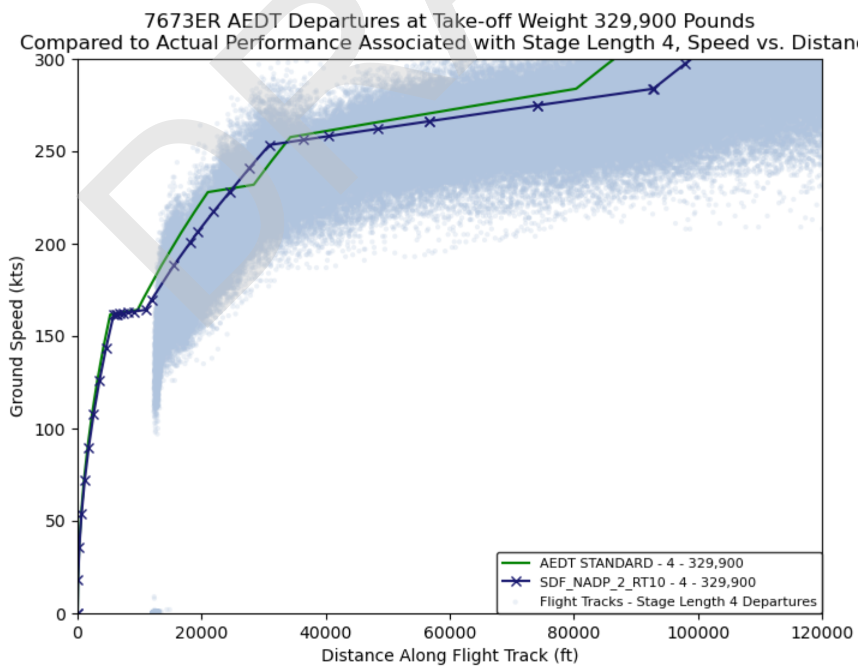

Figure C-100. 7673ER Departures, Stage Length 4, Speed vs. Distance

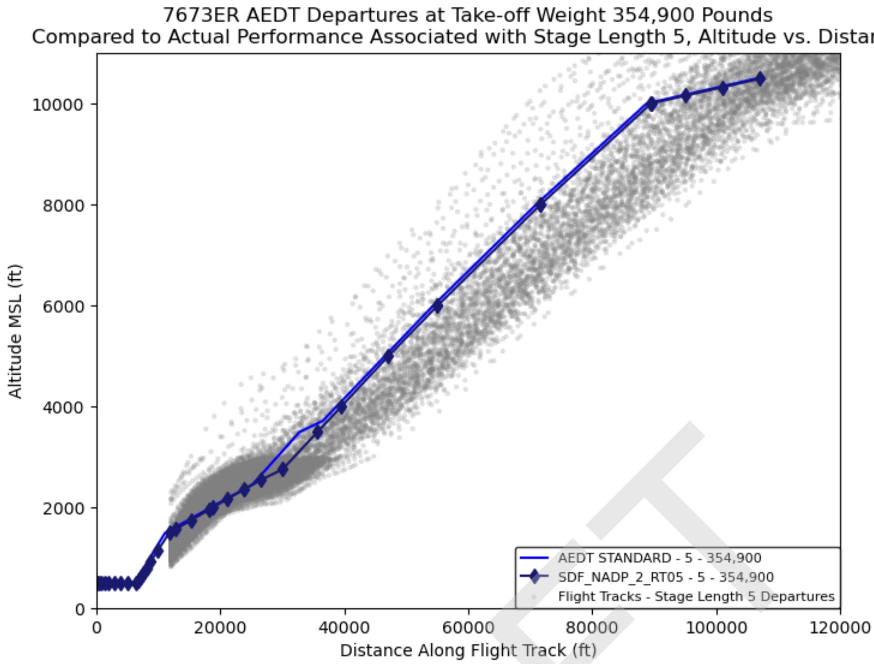

Figure C-101. 7673ER Departures, Stage Length 5, Altitude vs. Distance

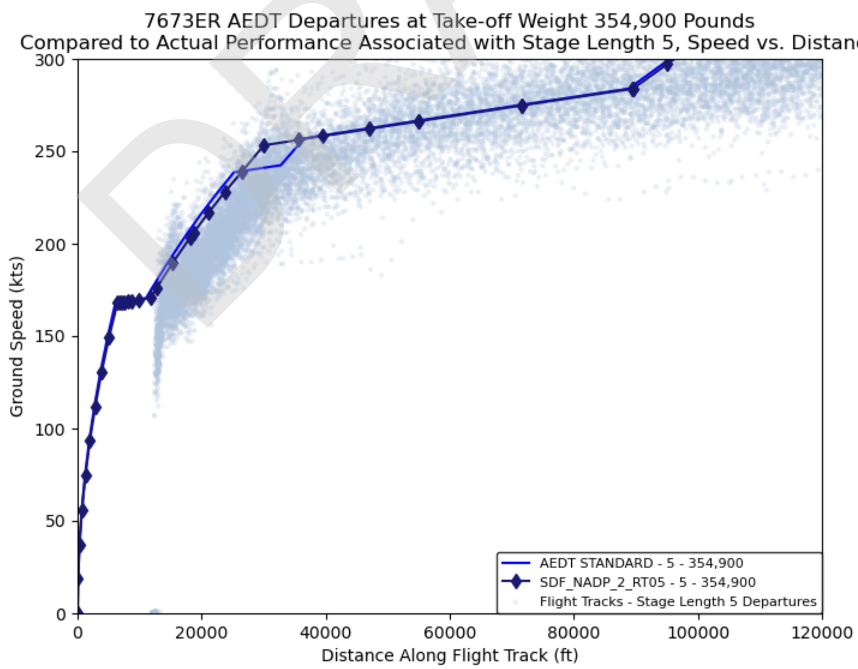

Figure C-102. 7673ER Departures, Stage Length 5, Speed vs. Distance

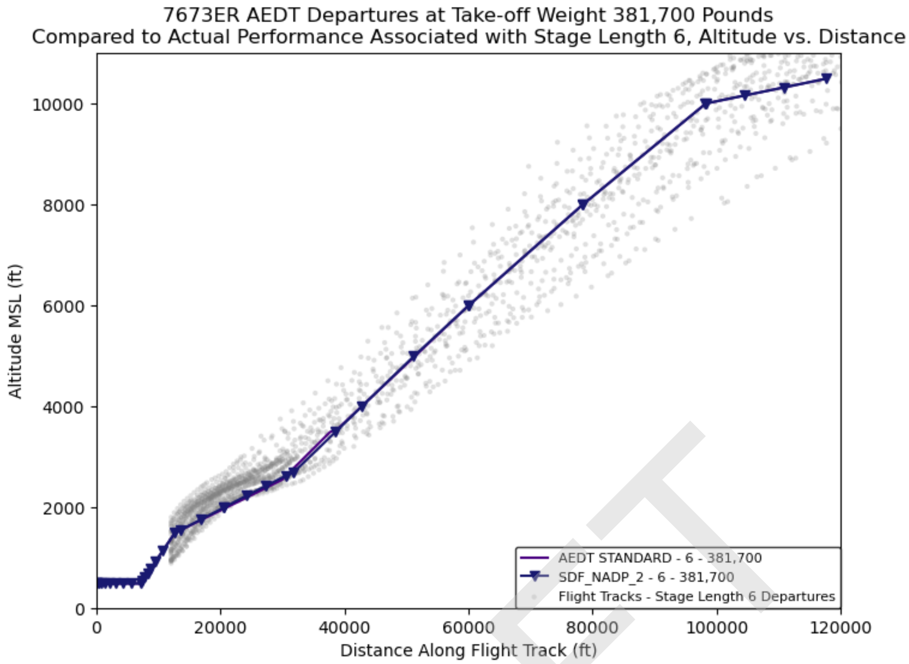

Figure C-103. 7673ER Departures, Stage Length 6, Altitude vs. Distance

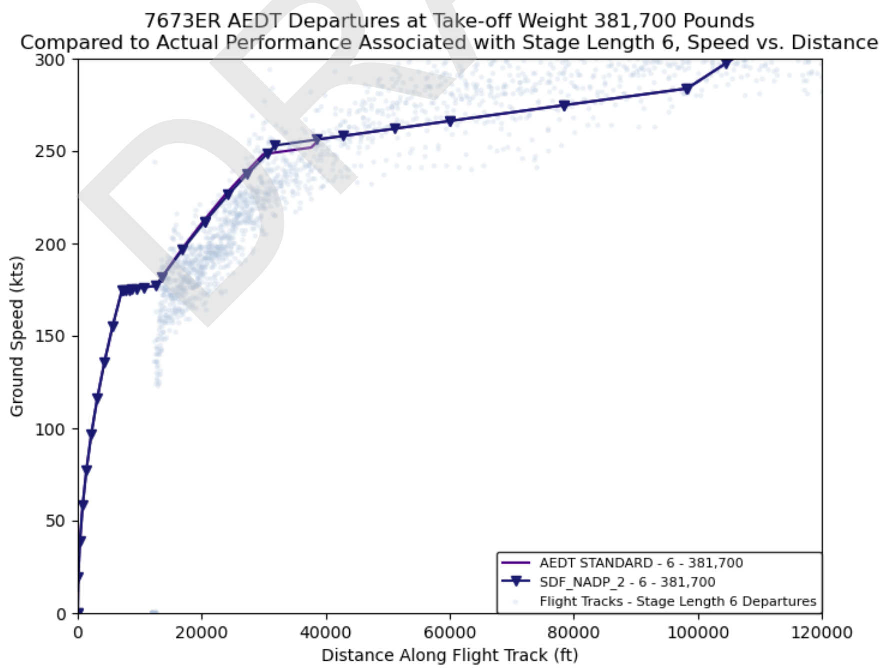

Figure C-104. 7673ER Departures, Stage Length 6, Speed vs. Distance

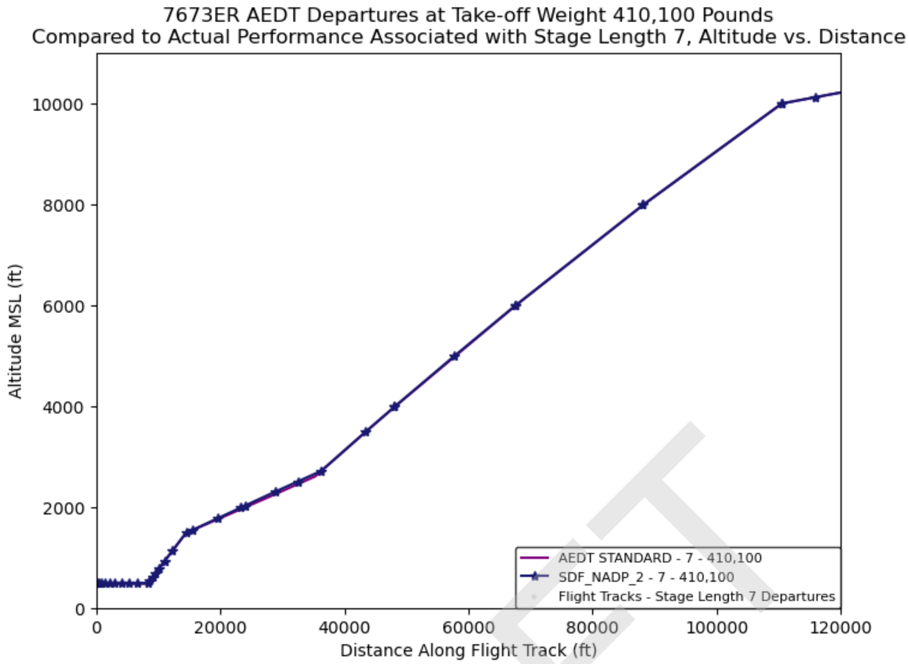

Figure C-105. 7673ER Departures, Stage Length 7, Altitude vs. Distance

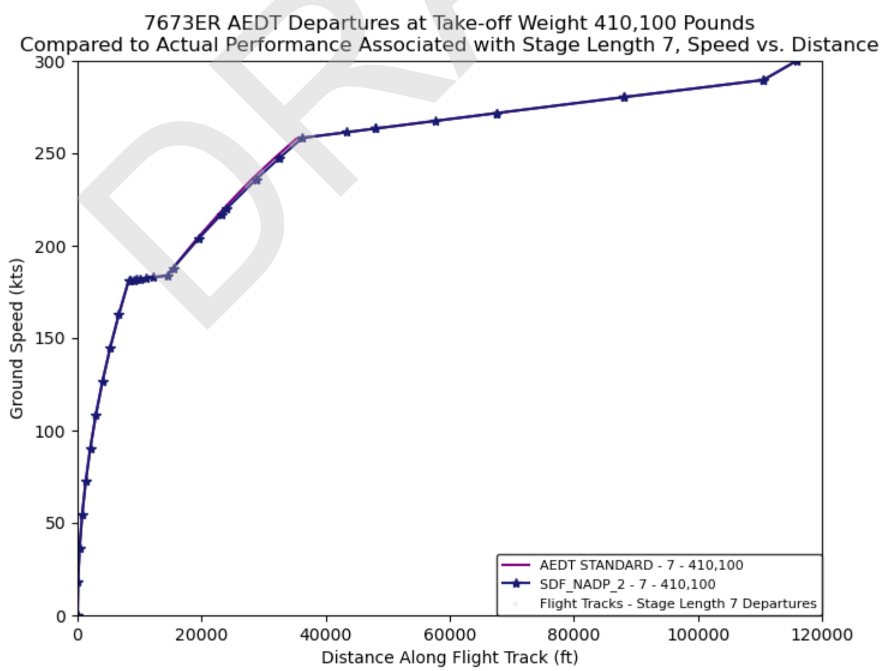

Figure C-106. 7673ER Departures, Stage Length 7, Speed vs. Distance

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U.S. Department of Transportation
Federal Aviation Administration

Office of Environment and Energy

800 Independence Ave., S.W.
Washington, D.C. 20591

8/23/2024

Peggy Kelley
Environmental Protection Specialist
Memphis Airports District
2600 Thousand Oaks Blvd
Memphis TN 38118-2462

Dear Peggy,

The Office of Environment and Energy (AEE) has received the memo from HMMH on behalf of Louisville Regional Airport Authority, dated August 14, 2024 proposing use of non-standard departure profiles in AEDT 3f to be used by United Parcel Service (UPS). This request is in support of a Noise Exposure Map (NEM) update for Louisville International Airport (SDF).

UPS uses the distant noise abatement departure procedure referred to as NADP2 with the reduced thrust settings. HMMH's memo includes Aircraft and Noise Performance (ANP) aircraft types of A300-622R, 747400, 7478, 757PW, 757RR, and 7673ER.

In accordance with FAA guidance as detailed in the document "Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA"[1], use of non-default methods or data for environmental analysis of FAA actions within AEDT must be approved by AEE.

As provided in the request, UPS has certified their intended use of the user-defined profiles. AEE therefore approves the proposed user-defined profiles for this project. Please understand that this approval is limited to this particular NEM update for SDF and for use with AEDT 3f only. Further non-standard AEDT inputs or methodologies for additional projects at this or any other site will require separate approval.

Sincerely,

Donald Scata
Deputy Director
Office of Environment and Energy

cc: APP-400 Susan Staehle, ASO-610 Peter Green

[1] Federal Aviation Administration, *Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA*, Retrieved from https://aedt.faa.gov/Documents/guidance_aedt_nepa.pdf on January 31, 2022

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Appendix D: Stakeholder Consultation

Table of Contents

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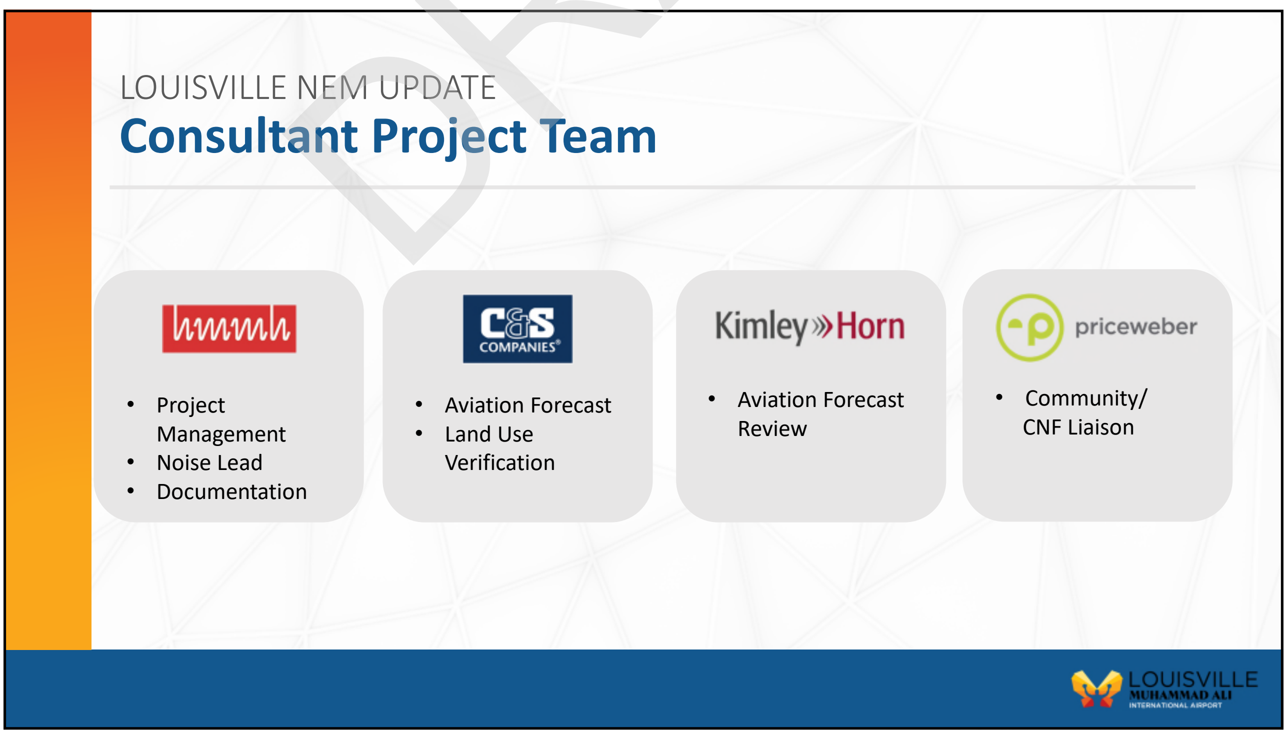
LOUISVILLE
MUHAMMAD ALI
INTERNATIONAL AIRPORT
Louisville International Airport
Noise Exposure Map Update
Community Noise Forum Meeting
September 25, 2023
hmmh

1


LOUISVILLE NEM UPDATE
Consultant Project Team
hmmh
• Project Management
• Noise Lead
• Documentation
C&S COMPANIES
• Aviation Forecast
• Land Use Verification
Kimley»Horn
• Aviation Forecast Review
priceweber
• Community/ CNF Liaison
LOUISVILLE
MUHAMMAD ALI
INTERNATIONAL AIRPORT

2


LOUISVILLE NEM UPDATE
Meeting Agenda
1 What is an NEM Update?
2 NEM Update Goals
3 Roles and Responsibilities
4 History of Part 150 at SDF
5 Public Participation Process
6 Aircraft Noise Terminology
7 Supplemental Analysis
8 Noise Modeling Overview
9 Process Summary
10 Schedule
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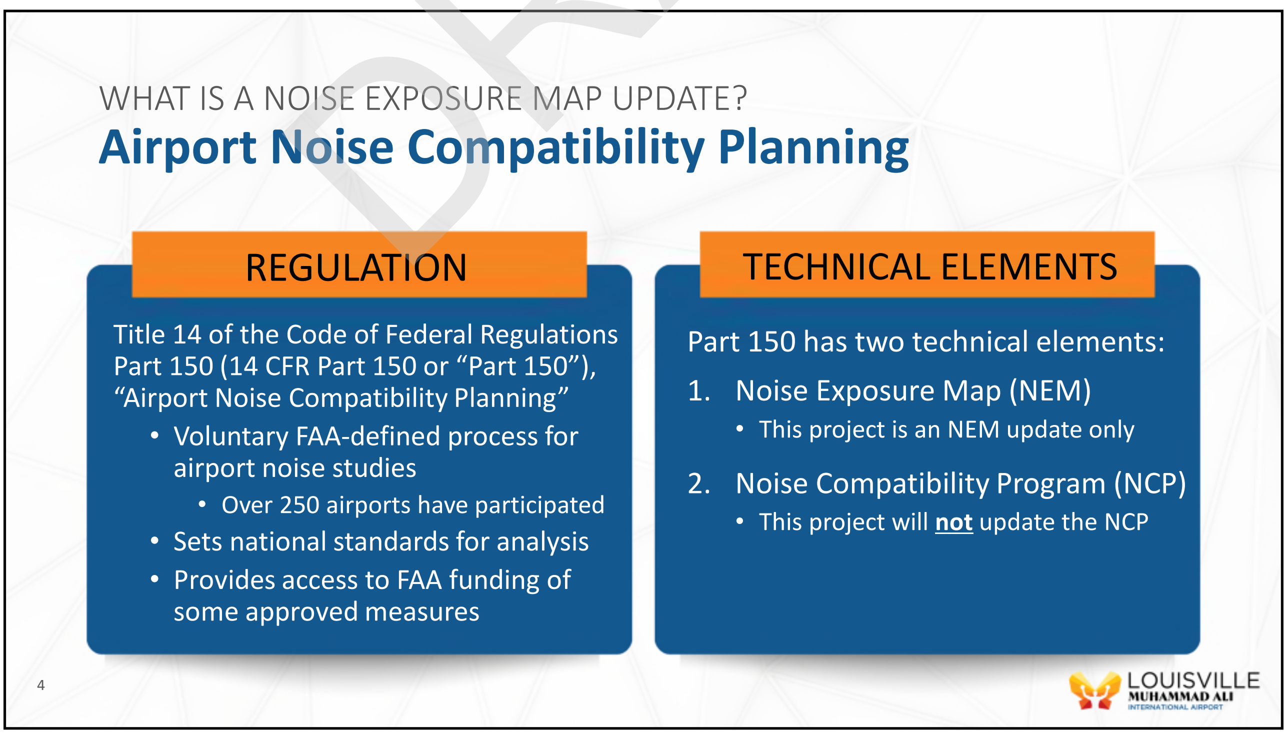
WHAT IS A NOISE EXPOSURE MAP UPDATE?
Airport Noise Compatibility Planning
REGULATION
Title 14 of the Code of Federal Regulations Part 150 (14 CFR Part 150 or "Part 150"), "Airport Noise Compatibility Planning"
• Voluntary FAA-defined process for airport noise studies
• Over 250 airports have participated
• 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 not update the NCP
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WHAT IS A NOISE EXPOSURE MAP UPDATE?

Noise Exposure Map (NEM)

The NEM describes:

- 01 Airport layout and operation
- 02 Aircraft-related noise exposure
- 03 Land uses in the airport environs
- 04 Noise/land use compatibility situation

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

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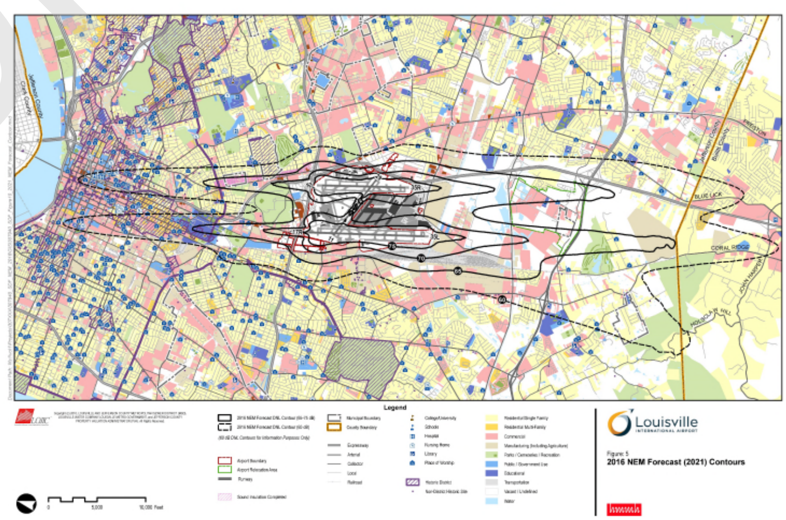
FAA-Accepted 2021 Forecast NEM for Louisville International Airport (prepared in 2016)



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LOUISVILLE NEM UPDATE

NEM Update Goals

Goals

- Identify incompatible land uses potentially eligible for noise mitigation
- Review implementation of the Noise Compatibility Program
- Share pertinent data and information with the public

Note: *FAA requires that Noise Exposure Maps reflect existing and/or forecast conditions at all times – thus the need to update them on a regular basis.*

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ROLES AND RESPONSIBILITIES

Airport Noise Compatibility

Stakeholder	Responsibilities
Federal government (FAA)	Regulate source noise emissions, air traffic control, funding, and safety oversight
Airport operators	Plan and implement noise compatibility measures
State and local government	Compatible land use planning and control
Aircraft operators	Develop noise-sensitive schedules, cockpit procedures, and fleet improvements
Air travelers and shippers	Bear the costs (through ticket tax)
Current and potential residents	Seek to act in an informed manner

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ROLES AND RESPONSIBILITIES

Louisville NEM 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

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- 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

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LOUISVILLE NEM UPDATE

History of Part 150 at SDF

- Original NEM/NCP with 1991 base case and 1997 future conditions
- NEM accepted in October 1993
- NCP approved in November 1994
- Supplemental NCP approved in November 1995
- NEM/NCP update conducted in 2003, for 2003 base case and 2008 future conditions
- NEM accepted in November 2003
- NCP approved in May 2004 for 20 measures in full and 8 measures in part (out of 42 recommended)
- Record of Action issued August 2009 approving 3 additional measures
- NEM updated in 2011, for 2011 base case and 2016 future conditions
- NEM accepted in April 2011
- NEM updated in 2016, for 2016 base case and 2021 future conditions
- Current NEM Update

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LOUISVILLE NEM UPDATE

Public Participation Process

Provide public with an opportunity for review of the Draft NEM Update and associated documentation

Request comments from public on Draft NEM Update

Hold a public workshop:

- Provide overview of Draft NEM Update
- One-on-one time with NEM Update project team
- Information sharing
- Education

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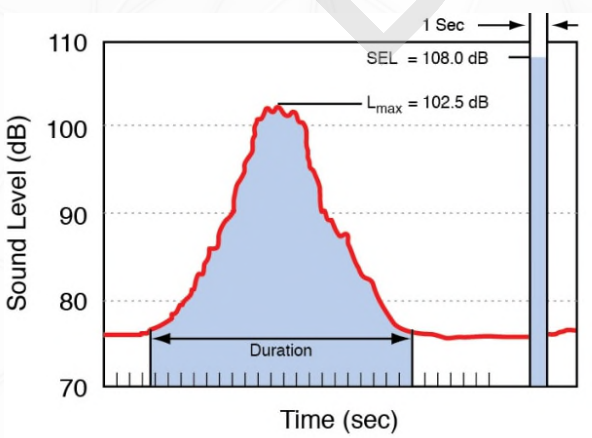
LOUISVILLE NEM UPDATE

Aircraft Noise Terminology



- Noise levels can be expressed many ways, including but not limited to:
  - Maximum Noise Level (Lmax)
  - Sound Exposure Level (SEL)
  - Day-Night Average Sound Level (DNL)

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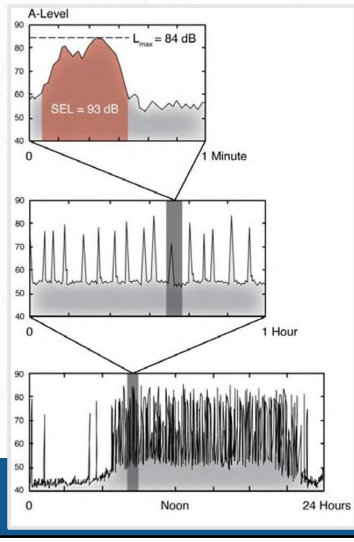
LOUISVILLE NEM UPDATE

Aircraft Noise Terminology – DNL



- FAA requires use of DNL in a Part 150 study
  - DNL represents noise as it occurs over a 24-hour period, with 10 decibels (dB) added to noise events occurring at night (10 p.m. to 7 a.m.).
  - Nighttime operations are weighted to represent the greater sensitivity for most people by nighttime sounds.
- Part 150 guidelines consider all land uses compatible below 65 dB DNL

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LOUISVILLE NEM UPDATE

Supplemental Analysis

- LRAA requested two supplemental noise metrics:
  - Number of aircraft noise events above 70 dB (N70)
    - Results will be shown in grid point plots
  - Estimated time during a school day that instruction may be disrupted by aircraft noise at local educational facilities
    - The CNF and LRAA will determine up to six educational facilities for analysis
    - Results will be reported as school day equivalent sound level (Leq) and school day loudest 1-hour Leq(1)
- LRAA requested flight track density plots

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LOUISVILLE NEM UPDATE

Noise Modeling Overview

Use of FAA's Aviation Environmental Design Tool (AEDT) noise modeling software is required

- The most current version at study's commencement
  - Version 3e (https://aedt.faa.gov)

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

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LOUISVILLE NEM UPDATE

NEM Update Process Summary

1. Collect data and information
2. Develop five-year forecast of aircraft operations
3. Prepare noise model inputs
4. Run the noise model and assess land use compatibility
5. Prepare draft Noise Exposure Map (NEM) documentation
6. Publish NEM documentation for public review and hold public workshop
7. Submit NEM to the FAA for review and acceptance

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LOUISVILLE NEM UPDATE

NEM Update Schedule

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

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Noise Exposure Map Update
Community Noise Forum Meeting
January 22, 2024
hmmh

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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
7 Health Effects
8 Project Schedule
9 Wrap Up & Discussion

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INTRODUCTIONS

Consultant Project Team

hmmh
- Project Management
- Noise Lead
- Documentation

C&S COMPANIES®
- Aviation Forecast
- Land Use Verification

Kimley»Horn
- Aviation Forecast Review

priceweber
- Community/ CNF Liaison

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ROLES AND RESPONSIBILITIES

Noise Exposure Map Update

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PART 150 OVERVIEW

Airport Noise Compatibility Planning

REGULATION

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PART 150 OVERVIEW

Noise Exposure Map (NEM)

The NEM describes:

01 Airport layout and operation

02 Aircraft-related noise exposure

03 Land uses in the airport environs

04 Noise/land use compatibility assessment

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

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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:

1 Aircraft Noise and Performance Data
- Aircraft performance profiles
- Noise level vs. distance curves

2 Airport Physical Inputs
- Airport Layout
- Weather data
- Terrain data

3 Aircraft Operational Inputs
- Number of aircraft operations
- Aircraft fleet mix
- Day-night split of flight and runup operations
- Runway utilization
- Flight track geometry and utilization

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NOISE MODELING OVERVIEW

Noise Modeling Input Categories

	AEDT Input Category	Data Source
1	Aircraft Noise and Performance Characteristics	Standard AEDT database
2	Physical Description of the Airfield Layout	FAA 5010 data and AEDT database
2	Meteorological Conditions	AEDT database - National Climatic Data Center data
2	Terrain Data	U.S. Geological Survey National Elevation Dataset - geoTIFF
3	Aircraft Flight Operations	SDF NOMS system data for baseline conditions fleet mix and SDF forecast data for 2024 and 2029
3	Aircraft Ground Runup Operations	Aircraft Operators
3	Runway Utilization Rates	SDF NOMS system data
3	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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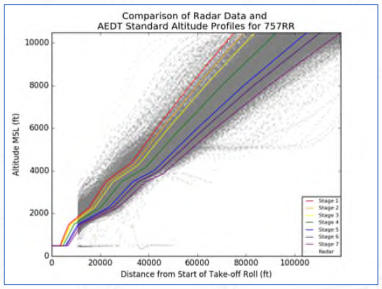
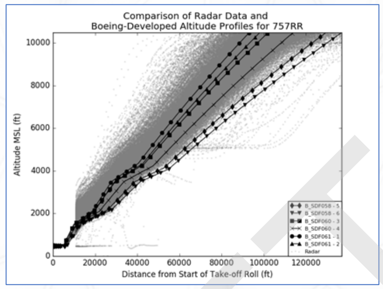
NOISE MODELING OVERVIEW

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

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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

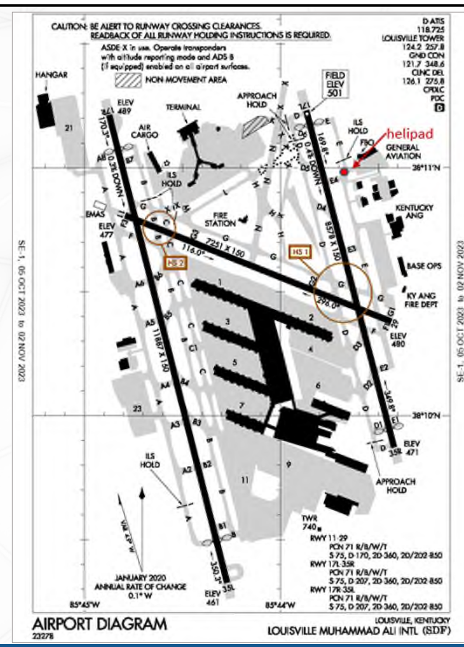

Diagram Source: https://www.faa.gov/airports/runway_safety/diagrams, accessed October 12, 2023
Annotations added by HMMH for noise modeling purposes; data sources are SDF NOMS and information from SDF staff

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NOISE MODELING OVERVIEW

Physical Input Requirements

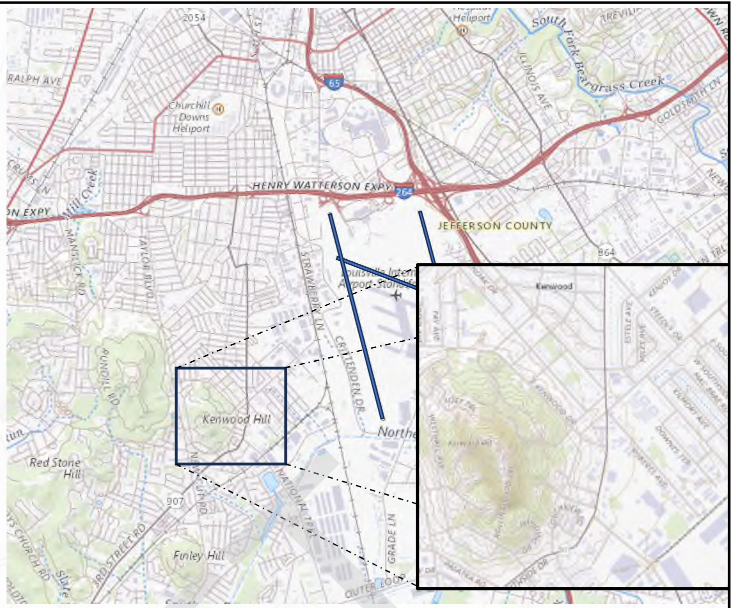
METEOROLOGICAL CONDITIONS

- 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

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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

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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

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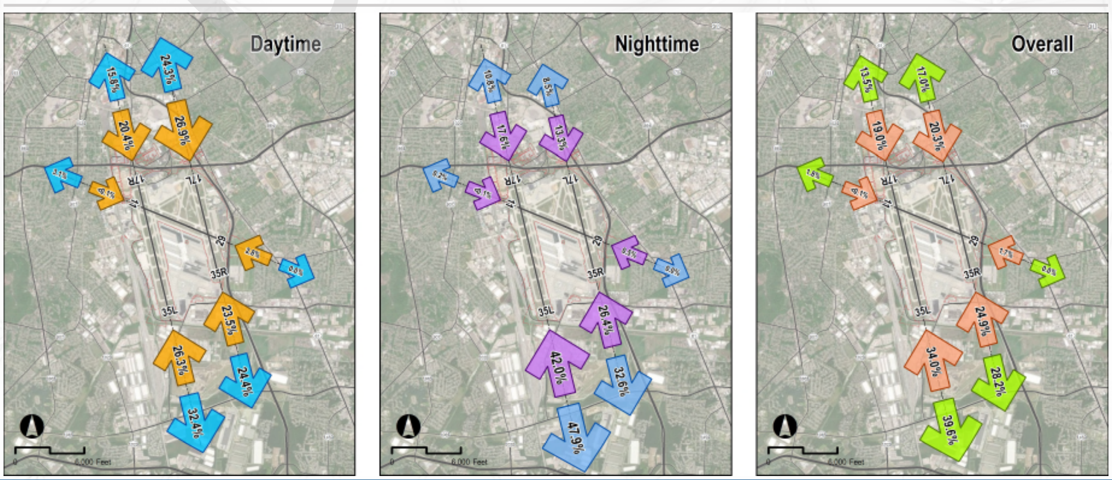
NOISE MODELING OVERVIEW

Runway Use



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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

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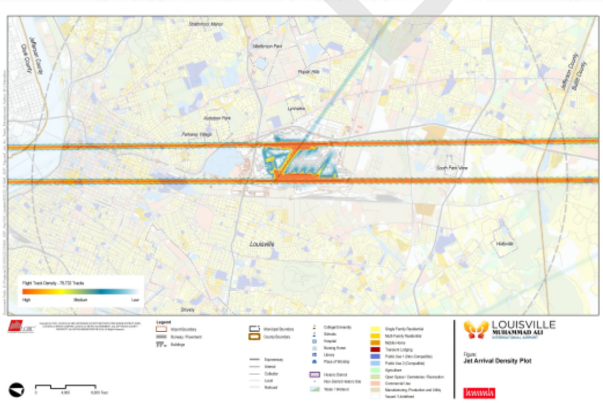
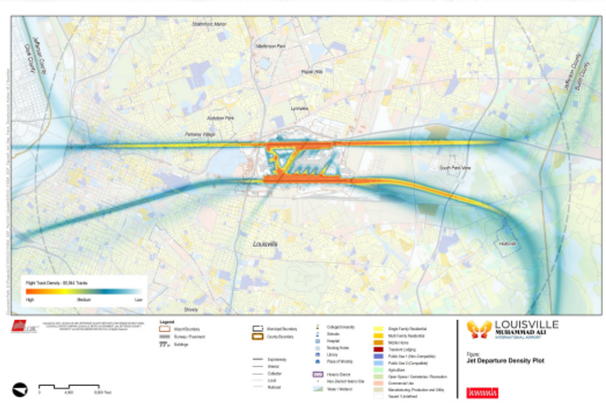
NOISE MODELING OVERVIEW

Existing Flight Track Density (12 months)





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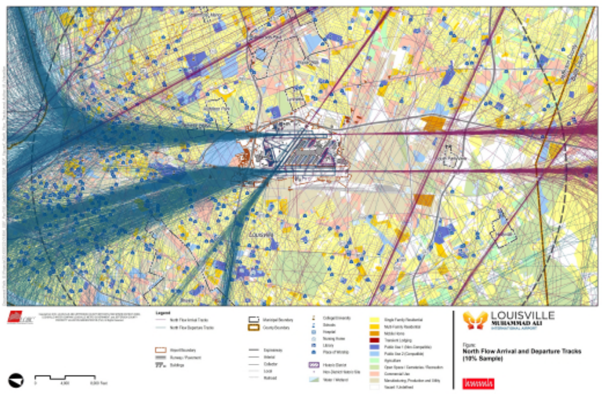
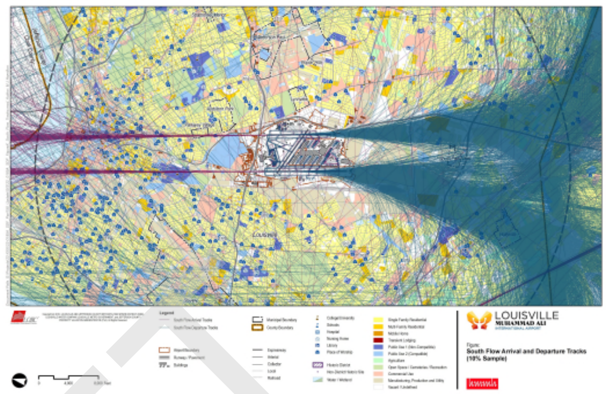
NOISE MODEL OVERVIEW

Existing Flight Tracks (10% of 12 months)





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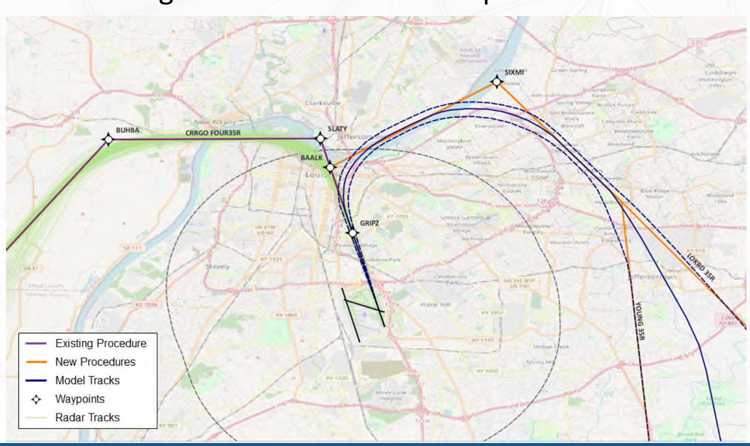
NOISE MODELING OVERVIEW

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.



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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.

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AVIATION FORECAST

Baseline Data Analysis - Military

Data sources include:
- *Kentucky Air National Guard interviews*
- *Atlantic Aviation military refueling counts*

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

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)

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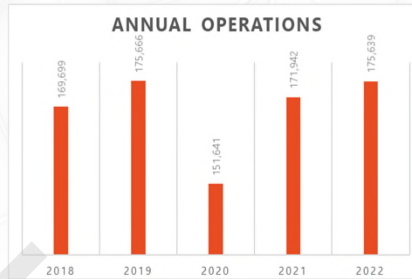
AVIATION FORECAST

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



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AVIATION FORECAST

2024 Annual Aircraft Operations

Category	Type		Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Air Carrier	Jets	Passenger	22,641	6,630	23,380	5,891	58,541
		Cargo	15,598	30,408	17,160	28,846	92,012
Air Taxi	Jets	Passenger	4,132	680	4,231	581	9,625
	Non-jets	Passenger	561	984	690	855	3,090
		Cargo	-	1,394	20	1,374	2,788
GA	Helicopters		41	57	46	52	195
	Jets		3,776	254	3,773	258	8,062
	Non-jets		819	68	798	90	1,774
Military	KYANG	C-130s	550	-	550	-	1,100
	Transient		336	-	297	39	671
Totals			**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

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AVIATION FORECAST

2029 Annual Aircraft Operations

Category	Type		Arrivals Day	Arrivals Night	Departures Day	Departures Night	Total Operations
Air Carrier	Jets	Passenger	24,511	7,177	25,311	6,377	63,376
		Cargo	16,799	32,031	18,476	30,355	97,661
Air Taxi	Jets	Passenger	4,416	727	4,522	621	10,287
	Non-jets	Passenger	599	1,052	737	914	3,303
		Cargo	-	1,490	21	1,469	2,980
GA	Helicopters		43	61	49	55	208
	Jets		4,036	272	4,032	276	8,616
	Non-jets		876	72	852	96	1,896
Military	KYANG	C-130s	550	-	550	-	1,100
	Transient		335	-	297	39	671
Totals			**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

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AVIATION FORECAST

Aircraft Fleet Mix

Air Carrier/Cargo	6 types	
	2024	2029
Airbus A300	23%	20%
Boeing 747-400	7%	7%
Boeing 747-800	4%	4%
Boeing 757-200	13%	14%
Boeing 767-300	37%	48%
Boeing MD-11	17%	7%

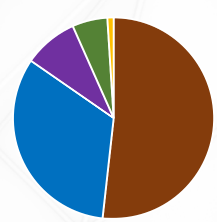
Air Carrier/Passenger	14 types
Embraer ERJ170	5%
Embraer ERJ175	32%
Boeing 737-700	10%
Boeing 737-800	9%
Boeing 717-200	5%
Boeing 737-900	4%
Airbus A319	7%
Airbus A320	8%
Bombardier CRJ-900	10%
Other (5 types)	10%

Air Taxi	14 types
Bombardier CRJ-200	17%
Embraer ERJ145	7%
corporate jet (8 types)	38%
turboprop (2 types)	15%
single engine (PC12)	5%
SH36 turboprop - cargo	18%

General Aviation	14 types
corporate jet (9 types)	78%
single engine (2 types)	15%
turboprop (2 types)	5%
helicopter (EC35)	2%

Military	12 types
Lockheed C-130	62%
T-38 Talon	6%
Beechcraft Texan	5%
helicopter	9%
Other (8 types)	18%

Fleet Mix by Category



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%

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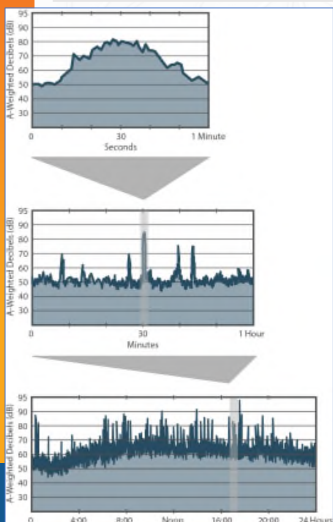
REQUIRED NOISE METRIC

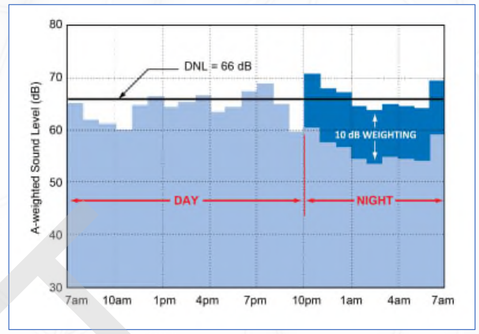
Day-Night Average Sound Level (DNL)



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



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SUPPLEMENTAL NOISE METRICS

FAA Recommended

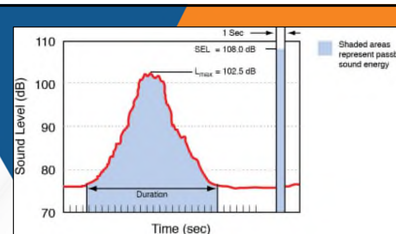
Maximum Sound Level (Lmax)
- Flight track/procedure analyses
- Speech/sleep interference assessments

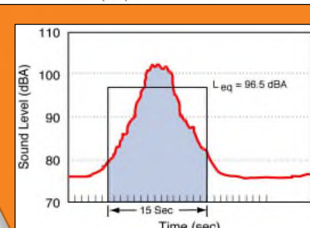
Sound Exposure Level (SEL)
- Flight track/procedure analyses

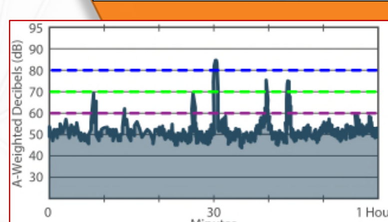
Time Above a Threshold (TA)
- Informational purposes

Equivalent Noise Level (Leq)
- School/learning assessments

Number of Events Above a Threshold (NA)
- Informational purposes







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HEALTH EFFECTS

Overview

- Community Annoyance
- Sleep Disturbance
- Non-Auditory Health Effects
- Children's Learning

Note: Part 150 does not evaluate health effects of noise exposure – limited to land use compatibility by regulation.

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PROJECT SCHEDULE

SDF Noise Exposure Map Update

Phase		Expected Completion
No.	**Description**	
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

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Discussion

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SDF Part 150 Noise Exposure Map Update

Community Noise Forum (CNF) Meeting

January 22, 2024, 6:00pm

Zoom and In-person at SDF

Table 1. Attendees

Consultant Team	Community Noise Forum Members	Guests
Kate Larson (HMMH)	Bob Slattery (LRAA)	Dorn Crawford (Zoom)
Gene Reindel (HMMH)	Brian Sinnwell (LRAA)	Travis (Zoom)
Julia Nagy (HMMH)	Mary Rose Evans (ANA)	Pat Gould (Zoom)
Tom Schnetzer (KHA)	John Sistarenik (LRAA Board)	Edward Mansfield (Zoom)
Joni Steigerwald (C&S)	Jeff Kozak (UPS)	Suzi Wessel
Wendy Harrower (C&S)	Tom Foote (Airline Affairs)	Christian Cobler (FAA)
Steve Kozarovich (PW)	Greg Petto (FAA)	Jessie Roth
Ali Hammond (PW)	Doug Black (Southwest resident)	Mark Roth
		Troy Tucker
		Courtney Tucker

COMMUNITY NOISE FORUM MEETING AGENDA

1. Call to Order
2. Approval of Prior Minutes
3. Active Noise Cancellation Grant Update
4. Airspace Project Update
5. Southwest Quadrant Working Group
6. Noise Exposure Map (NEM) Update
   Consultant Team Presentation
7. Part 150 NCP
8. Current Noise Concerns
9. Guest Comments
10. Announcements
11. Next Meeting: March 25, 2024
12. Adjournment

This document provides detailed notes for agenda item 6.

NEM Update Consultant Team Presentation Notes (Agenda item 6)

a. **Introductions**
   - Gene Reindel reviewed the Part 150 presentation agenda items.
   - Gene introduced himself, Kate Larson, and Julia Nagy of HMMH.
   - Gene noted that HMMH is leading the project as the prime consultant and managing the noise components. HMMH has a long history of working with Louisville Regional Airport Authority (LRAA) on Part 150 projects.
   - Joni Steigerwald introduced herself and the C&S role as the aviation forecasters.
   - Tom Schnetzer introduced himself and the Kimley-Horn role which is to ensure consistency with the forecast for the Louisville Muhammad Ali International Airport (SDF) Master Plan.
   - Steve Kozarovich and Ali Hammond introduced themselves and the Price-Weber role as public outreach and engagement consultant.

b. **Roles and Responsibilities**
   - Gene reviewed roles and responsibilities of the various stakeholders critical to the Noise Exposure Map (NEM) update process including the LRAA, FAA, consultant team, Community Noise Forum (CNF), and the public.
   - Gene provided a brief overview of each stakeholder's role as outlined in slide 4.
   - Gene noted that the public is a critical stakeholder in the NEM update process.

c. **Part 150 Overview**
   - Gene presented a historical regulatory perspective of airport noise compatibility planning and identified the technical elements included in the Part 150 process.
   - The Noise Exposure Map (NEM) identifies incompatible land uses and the Noise Compatibility Program (NCP) is used to address incompatible land uses.
   - This project only includes an NEM update and a review of the NCP; it is not a full Part 150 update.
   - The NEM describes the noise exposure around the airport.
   - Land use data was reviewed by HMMH and verified by C&S through windshield surveys.
   - The NEM includes two timeframes by regulation: existing condition (year of submittal, or 2024 in this project) and 5-year forecast condition (2029 for this project).

d. **Noise Modeling Overview**
   - The Aviation Environmental Design Tool (AEDT) has been used since 2016 for noise modeling as required by the FAA. AEDT Version 3f is the most recent version and will be used for this project.

- Kate Larson provided an overview of the AEDT inputs including 3 categories: aircraft noise and performance data, airport physical layout, and aircraft operational data.
- Kate provided a detailed overview of the data sources associated with each of the inputs required for AEDT.
- Kate reviewed the aircraft noise and performance data, noting the extensive AEDT database of aircraft and flight profiles for users to choose from; this data was collected and verified by FAA.
- Adjusting any noise and performance parameters within the AEDT requires FAA approval (also known as a non-standard modeling request).
- Kate reviewed physical AEDT input requirements, including the airfield layout, helipad location and displaced runway thresholds.
- Kate discussed meteorological conditions and terrain data inputs and noted that these factors may affect noise propagation.
- Doug Black asked a question about whether the NEMs take into effect the way noise propagates across the water. He lives near lakes southwest of the airport and he noted that studies have shown that water reflects noise.
- Gene and Kate explained that AEDT does not take ground impedance into account.
- Gene explained an example in the Boston area near the water where that concern was studied and the over-water noise propagation over a large bay only made a negligible difference.
- Kate described that operational noise inputs include the projected operations, aircraft types, day-night split, runway use, flight tracks, track use, and stage length (based on aircraft weight).
- Kate described the runway use table that shows the six runway ends which are broken out by arrivals and departures.
- HMMH will be modeling every flight captured in the flight track and aircraft identification data representing the existing year; therefore, the runway use represents an actual year of flights. For this study the data are from September 1, 2022, through August 31, 2023.
- Kate described the runway use figures that show the runway use percentages for each runway end. The size of the arrow correlates to the proportion of runway use on arrival and departure to each runway end.
- Kate described how HMMH's proprietary preprocessing software models the complete year of actual aircraft operations, which for SDF, includes over 170,000 actual flight tracks in the 12-month timeframe.
- Doug Black asked a question about the vertical climb rates since these affect noise.

- Kate confirmed that the modeled vertical climb rates come from the AEDT flight profiles rather than the flight track data.
- Kate explained how military flight inputs come from military representatives since those flight tracks are not included in the flight track and aircraft identification data (due to national security concerns).
- Kate presented the flight track density map that shows arrival and departure dispersion as a "heat map" with the warmer colors showing areas of higher density of flight tracks.
- Kate showed flight track plots representing a random ten percent of 2022/2023 flights; this demonstrates the dispersion area.
- Question from Mary Rose about why the graphic only represents a sample of the flight tracks.
- Kate confirmed that the sample is used for illustrative purposes since the full year of flight tracks would be too dense to see the underlying map.
- Kate explained how HMMH developed future case tracks based on anticipated FAA airspace changes.
- Kate explained how model tracks need to replace some of the radar tracks for future year noise modeling due to the new FAA procedures that will be in use at that time (2029).
- Tom Foote asked presenters to confirm that 2024 noise contours will be based on existing flight tracks and 2029 contours will account for FAA airspace changes.
- Gene explained that for the future conditions where there is a new procedure that replaces an existing procedure then those existing tracks will be replaced with model tracks representing the new procedure. In subsequent NEM updates we will be able to use actual tracks but that data for the new procedures does not yet exist.

e. Aviation Forecast

- Joni explained the forecast process and validation of the Master Plan forecast.
- The forecast was based on the same twelve months of flight track and aircraft identification data (from September 1, 2022, through August 31, 2023).
- Joni explained coordination with the Kentucky Air National Guard to obtain and confirm military forecast operations.
- Consultant team explored whether airport Master Plan forecast was still valid since it was completed prior to the Covid pandemic. That forecast was compared to Air Traffic Activity System (ATADS)/ Operations Network (OpsNet) data (FAA Air Traffic Control Tower count data) and also compared with FAA's Terminal Area Forecast (TAF). The forecast growth rate from the Master Plan was a bit lower than the

growth seen in the actual most recent five-year period. C&S created a trend analysis and determined a 1.34% average annual growth rate.

- Mary Rose asked what is a derivative forecast?
- Joni explained that it is a full list of aircraft types and Gene explained how it is more detailed than what is required for the Master Plan because these inputs are needed for the noise model.
- Gene noted that there is a current nationwide reduction in cargo operations after the pandemic, which is seen in the industry as a correction, given the increase in cargo related to the pandemic.
- Doug asked whether UPS / cargo should be separated from passenger data to reflect the changes in the growth rates between different types of operations.
- Gene confirmed that they are separated and this is accounted for in the forecast.
- Bob Slattery explained that each aircraft category operation will have an associated forecast.
- Joni explained the table showing projected 2029 annual aircraft operations.
- Joni explained that aircraft fleet mix changes were determined based on input from operators; the breakdown of the aircraft types are projected to remain the same for most categories other than cargo.
- Doug asked whether hush kits are adjusted for?
- Tom explained that the hush-kitted aircraft of the past are out of the fleet now.
- Joni noted that the forecast has been submitted to the FAA but has not yet been approved by the FAA, therefore all operations data in the presentation are draft numbers.
- FAA's TAF is higher than the forecast for this study but the difference is not more than ten percent (it's close to seven percent), which does not require headquarters approval from the FAA. It was again noted that the reduction from the TAF was due to the reduction in cargo operations.

f. Noise Metric (DNL)

- Gene explained the Day-Night Average Sound Level (DNL) noise metric and its weighting based on time of day, where noise at night has a higher weighting.
- DNL accounts for the total number of noise events and it represents the noise level on an average annual day.
- DNL (average noise exposure) is the required metric from the FAA for Part 150 studies.

- Gene explained total noise exposure versus average noise exposure, specifically that total noise exposure is approximately 50 dB higher than average noise exposure.
- Doug asked about the time interval for measuring overflight, how many seconds is each event counted as?
- Gene explained that each event is counted separately based on its characteristics, there is no set time for a noise event. He noted that the next slide on supplemental noise metrics would explain more.

g. **Supplemental Noise Metrics**

- Gene described FAA-recommended supplemental noise metrics including Maximum Sound Level (Lmax), Single Event Level (SEL), Time Above (TA), Equivalent Continuous Sound Level (Leq), Number Above (NA).
- SEL describes total noise energy of an event. The length and magnitude of the noise event are both captured in the SEL.
- AEDT takes the total noise energy of an event into account, whether the event lasts 3 seconds or 30 seconds.
- Number of events Above a threshold (NA) can be used for informational purposes.
- Gene explained an example of the use of NA at Charlotte International Airport to supplement the DNL metric.
- Bob explained that supplemental metrics can be used as a component of this study and that LRAA wants input from the CNF on what metrics would be useful to them.
- Doug asked about the FAA noise policy review and whether the metrics explained on this slide are the same ones that FAA presented on.
- Gene confirmed these are the same standard noise metrics.
- Mary Rose asked when is the timeline for choosing supplemental metrics for this study?
- Gene confirmed that over the next few months the project team would need to know what is chosen so that the team can complete the analysis and draft the documentation.
- Doug asked whether the study can use supplemental metrics for the forecast.
- Gene confirmed that the same supplemental metrics will be used for the forecast since they are calculated based on the model inputs and will allow for comparison of existing to future noise environments.

h. **Health Effects**

- Gene stated that health effects are not currently included in the Part 150 Study process.

- Gene explained that FAA is undertaking research to assess health effects of noise and whether there can be thresholds determined. There is not enough research data to make specific determinations at this time.
- Gene confirmed that studies show that noise affects children's learning which is why sound insulation programs include schools.
- Doug noted that children's learning is also affected by lack of sleep/ awakenings at night at home as well.
- Gene noted that this project will be focused on land use compatibility which does not include health effects but does classify noise sensitive uses (like residential and educational) exposed to certain levels of aircraft noise.

i. **Project Schedule**
  - HMMH is currently developing a detailed noise model input memorandum and asks the CNF to provide feedback on the inputs presented in tonight's meeting so that they can be considered in the model inputs.
  - Mary Rose asked how long the CNF has to review the noise model inputs and get their comments to us.
  - Gene suggested two weeks as we anticipate finalizing the noise model input memorandum in early February.
  - The CNF will be provided with a copy of the noise model input memo to review and the team will request LRAA concurrence with the modeling assumptions.
  - The team anticipates presenting the NEMs to the public in June.

j. **Wrap up and discussion**
  - Question from audience about noise data collection
    - Gene explained that the data contained in the noise model is based on aircraft engine certification data from FAA; noise data from measurements goes into the noise model through the FAA certification process. The noise contours are not based on community noise measurements. Measurements/sampling are not components of this project. AEDT is more accurate for aircraft noise results since it does not include other noise sources.
  - Question from audience on measurement uncertainty
    - Gene explained that the FAA has never published uncertainty data or tests. FAA creates the database. Gene explained how noise monitors have uncertainty since there are other community noises that they capture. FAA is more concerned with consistency of methodology for determining

    - noise/land use compatibility across the nation. Gene confirmed that there is no localized verification process.
    - Gene confirmed that if AEDT inputs are accurate, then the results will provide a reliable representation of aircraft noise.
- Question from audience about the percentage of flights that come into SDF during regular sleeping hours/ nighttime?
    - Gene confirmed that the nighttime operations data are shown in the tables within the presentation. DNL defines daytime operations as those between 7 am to 10 pm and nighttime operations as 10 pm to 7 am. Gene confirmed that we have the data for any range of time and asked whether the audience member would suggest a different time period.
    - The audience member noted that 10 pm to 7 am is the time period they would define as nighttime as well so no further analyses were suggested.
- Doug noted that in his opinion takeoffs are louder than arrivals.
    - Doug asked whether arrivals or departures are louder at his location.
    - Mary Rose noted that arrivals are louder at her house.
    - Gene explained that aircraft are higher performing now, and departures are no longer always louder than arrivals.
- Question from audience whether it is normal for thirty flights to depart within a one-hour time period in the morning. He lives north of Audubon Park and east of the parallel runway and experiences sleep disturbance.
    - Greg Petto explained the runway use patterns and confirmed that this number is typical in certain time periods.
    - Bob explained that departures to the south are preferred.
- Question from audience about whether airlines are required to monitor their engines, are they tested?
    - Gene described how there is a regulation that sets limits to how loud an aircraft can be on arrival or departure. After aircraft are manufactured they have to be tested for compliance with this regulation.
    - Gene described how newer aircraft make less noise than older aircraft.
    - Aircraft currently must meet Stage 5 noise standards or higher when tested.
    - Jeff Kozak added that runway surface conditions may require the use of more thrust (including when it is snowing or raining) to ensure a safe takeoff; these are not preferred since it is not ideal for the engine to constantly be at full thrust. However, that might explain people noticing louder-than-usual takeoff noise.

- Question from Edward Mansfield (Zoom) about modeling procedures.
  - Gene confirmed the modeling methodology.
- Question from Dorn Crawford (Zoom): will team be analyzing NCP measures from prior study?
  - Gene explained that compliance with operational procedures that have been implemented will be captured through flight track data. We are not updating NCP as a component of this study.
  - Dorn asked, why is the study reviewing the NCP if that information is not used in the modeling process? The purpose of the NCP review is to understand the status of existing measures rather than evaluate whether updated measures are needed.
  - Bob explained that LRAA was considering a full NCP update and guidance from FAA was to start with NEM and see what the results show, then potentially update NCP in the future.
- Doug noted that he has taken noise measurements within his house and some measurements are over 80 dB.
  - Gene explained that DNL represents an average annual day and that is why, even though there may be loud single events, the home may fall outside of the 65 DNL noise contour. Gene explained that we could create an Lmax contour to illustrate these events or use the Number Above metric to determine the number of aircraft noise events in the vicinity of his house.
  - Doug asked whether noise exposure can be shown.
  - CNF to review recommendations on supplemental metrics.

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Appendix E: Public Comments

This appendix includes copies of all public comments received (*to be included in the Final NEM document*).

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