Noise Exposure Map Update

Louisville
INTERNATIONAL AIRPORT

Appendices

December 2016

Noise Exposure Map Update
Louisville International Airport

In Compliance with

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APPENDICES

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Appendix A Introduction to Noise Evaluation

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This appendix presents the basic tools for describing and understanding sound: how it originates, moves through a medium – most frequently the atmosphere – and how it is experienced by a receiver. Understanding these fundamentals at a basic level is critical to subsequently understanding how characteristics of sound influence human perception of *noise*, which is commonly referred to as "unwanted sound." Information presented in the NEM document relies upon a reader's understanding of the characteristics of sound, the effects noise has on persons and communities, and the metrics or descriptors most commonly used to quantify noise. This appendix presents these fundamentals to facilitate an understanding of the noise exposure setting against which land-compatibility is assessed and recommendations are made.

Contents

A.1. Fundamentals of Acoustics

Sound is a physical phenomenon consisting of minute vibrations (waveforms) that travel through a medium such as air or water. Audible sounds are those vibrations that can be sensed by the human ear. At the ear, sound waves vibrate the ear drum, which transmits the vibration via a network of bones to the cochlea. The cochlea then converts the vibration into neurological impulses that are interpreted by the brain as sound. One's experience and perception of sound depends on both the pattern of vibrations from the sound source and the way our hearing mechanism interprets these vibrations.

A sound *source* induces vibrations in the air which spread outward from the sound source as alternating bands of dense (compression) and sparse (expansion) air particles. This results in a variation of pressure above and below the baseline atmospheric pressure (as shown in Figure A-1). The distance between successive compressions or successive expansions is the wavelength of the sound, and the number of compressions or expansions passing a fixed location per unit of time is the frequency of the sound. Frequency is normally expressed in cycles per second or Hertz (Hz); a sound having a1000 Hz frequency indicates that the alternating compression and expansion occurs 1000 times per second. A high frequency sound is shorter in wavelength and lower frequency sound is correspondingly longer in wavelength. In contrast to frequency which describes the cycling of impulses, the overall magnitude of such impulses that is the average amplitude of the variations of the pressure above and below atmospheric pressure is called the sound pressure. Referring again to Figure A-1, the frequency and related wavelength are viewed from left to right whereas the pressure amplitude or overall magnitude are the distances above and below the baseline or reference atmospheric pressure.

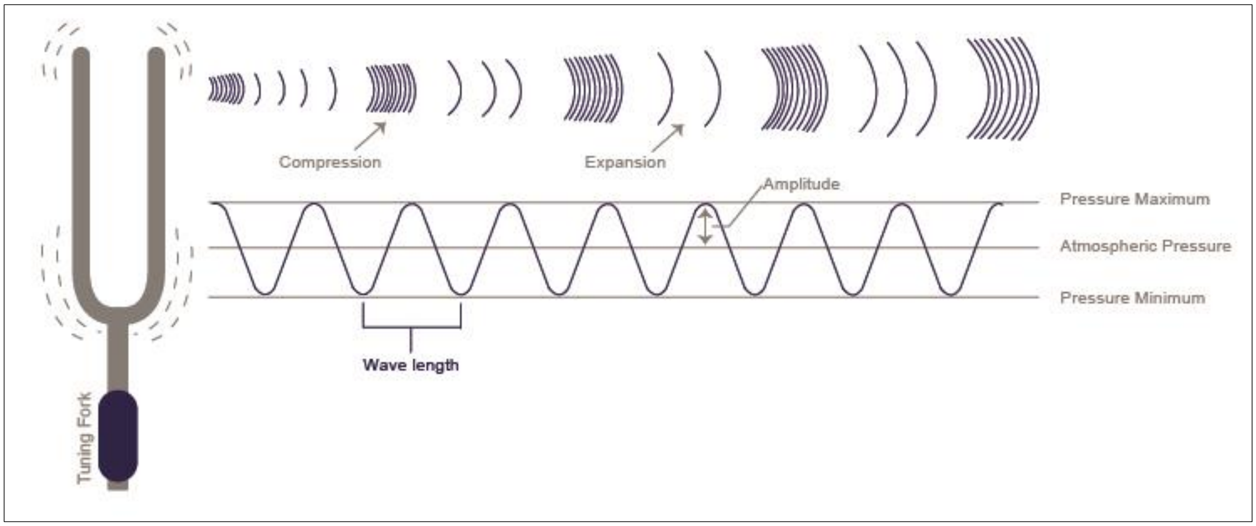

Figure A-1 - Characteristics of Sound

Sound travels through air at about 1,100 feet per second; however, its speed is different speeds in other media (e.g., water). Therefore, to more fully characterize sound, its three defining characteristics are typically identified: (1) magnitude, (2) frequency spectrum, and (3) the variations of these two over a time interval.

A.1.1. Magnitude

Telephone engineers were among the first to extensively study the ear's response to sound pressure, finding that the ear responds to a broad range of sound pressures. A healthy human ear can detect a sound tone having a frequency a 1,000 Hz at sound pressures (amplitudes) as low as 20 micropascals. (This is expressed as 20µPa and equals to 20 x 10-6 Pascals (Pa). For reference, standard atmospheric pressure at sea level is 101,325 Pascals.). At the other end of an amplitude scale, the threshold of pain was found to occur around a sound pressure of 200 Pascals—10,000,000 times as large as the barely audible 20µPa magnitude. Whether barely audible (20 µPa) or pain-inducing (200 Pa), these pressures are comparatively small variations around atmospheric pressure (101,235 Pa).

Since a human ear is able to respond to such a large range of sound pressures, early telephone engineers had a measurement problem. At the threshold of hearing where the ear could detect a sound pressure of 20µPa, an increase of 40µPa was a noticeable change; yet at 10 Pa, that same increase of 40 µPa (or 0.00004 pascals) was undetectable. Thus, a shorthand method for expressing the magnitude of a sound was necessary. Their solution was to develop a logarithmic scale based on the ratio of the sound pressure to a reference sound pressure.

> *A logarithm (base 10 "common" logarithm) is simply a power of 10. For example, 100 equals 10 times 10, which equates to 10^2. The logarithm of 100 is then 2 (log 100 = 2). Similarly, 10^3 equals 10 times 10 times 10, which equates to 1,000. Consequently, the log of 1,000 is 3.*

When units were standardized, the Bel, in honor of Alexander Graham Bell, was defined as the log of the square of the ratio of two sound pressures, with the decibel one tenth of that. The Bel itself proved to be too coarse of a unit, so the term decibels (dB) remained in common use. Values on the decibel scale are referred to as levels. The following equation shows the relationship of sound pressure level, L, in decibels to sound pressure where p is the

$$L = 10 \log 10 \left(\frac{p^2}{p_0^2}\right)$$

Equation A-1 - Sound Pressure Level in dB

pressure of the sound that is being compared and p0 is the reference pressure against which p is compared.

The level (in decibels) equals 10 times the log of the square of the quantity of measured sound pressure divided by 20 µPa (this squared quantity is proportional to the sound power). Recall that the sound pressure that is barely detectable by the human ear is 20µPa. By using this as a reference, the telephone engineers "zeroed" the logarithmic scale for sound at the threshold of hearing.

Sensitivity to Changes in Loudness

Under laboratory conditions, people can detect single-decibel changes in sound level. But, when comparing sounds in our everyday experience, we are less sensitive to differences in sound intensities. From a practical standpoint, a 5-dB difference is the smallest change generally noticeable to the average listener. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness. This relation holds true for loud sounds and for quieter sounds across the speech frequencies. See §2.1.2, below, for additional information on frequency and human hearing.

Adding Decibels

Because of the logarithmic nature of the decibel and the fact that sound pressure is a measure of the variation in air pressure, neither sound pressure level in decibels nor sound pressures in µPa can be added directly. However, the quantity inside the parentheses in Equation A.1, which is proportional to the sound energy, can be added. Note that if the sound pressure levels being added are quite different in magnitude, adding the lesser value to the greater value yields relatively little change to the higher value when expressed as dB and that adding sounds with equal sound pressure levels results in a three-decibel increase.

A.1.2. Frequency

As noted, frequency is the rate of vibrations for a sound and is measured in Hz where one Hz indicates one vibration (or cycle) per second. As with the ability to hear events of widely ranging pressure amplitudes described above, the human ear also hears sounds having widely ranging frequencies (e.g., from about 20 Hz to about 20,000

Hz). However, not all sounds in this wide range of frequencies are heard equally well by the human ear. The ear is most sensitive to sounds having frequencies in the range of 1,000 Hz to 4,000 Hz.

Some simple sound sources, such as a tuning fork, produce sounds with a single frequency (i.e., a pure tone). Most sounds however are more complicated and their signals consist of multiple many frequencies. A sound spectrum is a representation of a sound showing the magnitude of the various frequencies present in the sound. Knowledge of the frequency spectrum of a signal is important for the following reasons:

- People and animals have different hearing sensitivity and react differently to various frequencies. For instance, everyone is familiar with a "dog whistle" which produces a signal that dogs can hear but humans cannot. This occurs because dog whistles produce a tone having a frequency above the range at which humans can hear but within the range of the dog's hearing. At the other end of the frequency scale, elephants communicate at frequencies below the range of human hearing.
- Structures respond to much lower frequencies (e.g., 1–30 Hz) than humans. Therefore, low-frequency sounds that people cannot hear can still create problems by inducing vibration in buildings.
- Different sound sources produce signals consisting of different frequency characteristics.
- Engineering solutions for reducing or controlling sound are therefore frequency-dependent.

Figure A-2 shows an example of a frequency spectrum for jet departure noise. Unlike the vibrations of the tuning fork shown in Figure A-1, the turbulent mixing of the jet exhaust gases produces noise across a wide range of frequencies as opposed to a single frequency. The spectrum is shown divided into frequency bands, each of which spans one-third of an octave. An octave is a doubling of frequency. Spectra are often displayed in octave or one-third octave bands.

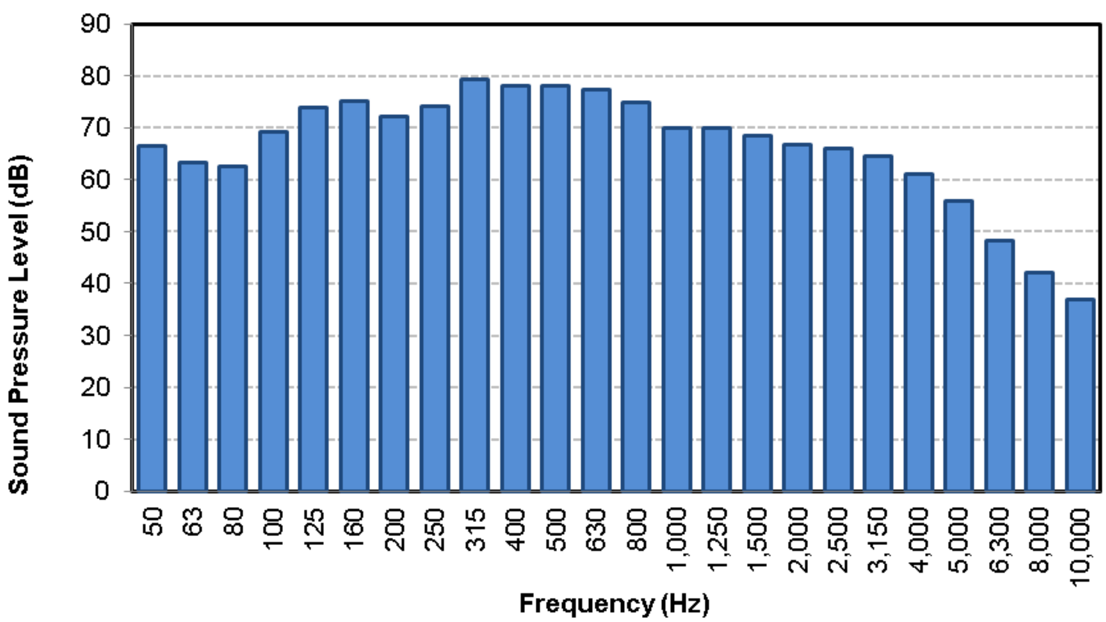

Figure A-2. Example Spectrum of Jet Departure Noise

High-quality measuring devices (e.g., sound level meters) are equally sensitive to sounds across the full range of human hearing. Therefore, to approximate the human perception of common environmental sounds, the acoustical community designed a range of frequency-based adjustments to be applied to measured sound levels.

Today, two of these weighting systems remain in common usage, the A-weighting and C-weighting, illustrated in Figure A-3.

These weightings are based on the response of human ears to moderate- (A-weighting) or high-level (C-weighting) sounds. For most industrial and transportation applications, A-weighting is used. For loud sounds with significant low frequency content, C-weighting is used. A-weighting applies progressively higher reductions to lower frequencies, mimicking the reduced sensitivity of human ears to low frequency sounds. However, in order to more accurately capture the low frequency energy and higher levels present, C-weighting, with its much slower roll-off at lower frequencies, is more appropriate for noise sources such as explosions and sonic booms.

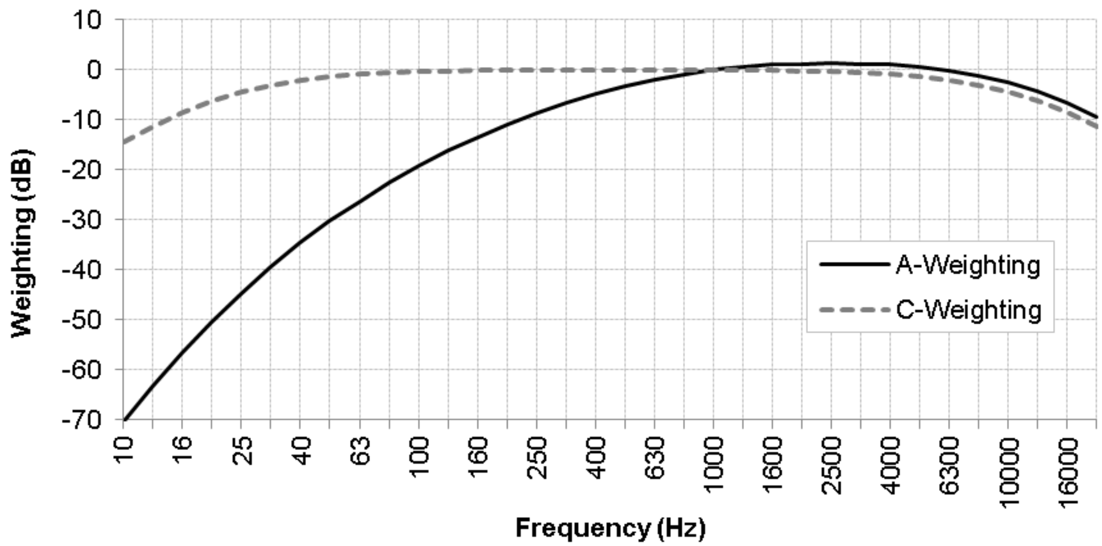

Figure A-3. A- and C-Weighting Scales

A.1.3. Variation of Sound with Time

The third characteristic used to describe sound (after magnitude and frequency) is its relative stability over time. The temporal pattern of sound is important in predicting annoyance. Sound can be classified into three categories that define its basic time pattern: steady state, intermittent, and impulsive.

Steady-State Sound

Steady-state sound is a sound of consistent level and spectral content. Typical examples of steady-state sound are the sounds produced by ventilation or mechanical systems that operate more or less continuously. Annoyance due to steady-state sound depends on the level of the sound, its frequency content, and its duration. Generally, the longer the sound goes on and the more tones are audible, the greater degree of annoyance people will experience.

Intermittent Sound

Intermittent sounds are those which are produced for short periods. The sound temporarily rises above the background and then fades back into it. Intermittent sounds are typically associated with moving sound sources such as an aircraft overflight or a single-vehicle drive-by. Intermittent sound is typically a few minutes or less in duration; the annoyance of a transient sound is dependent on both the maximum level and the duration.

Impulsive Sound

Impulsive sound is of short duration (typically less than one second), low frequency, and high intensity. It has abrupt onset, rapid decay, and often a rapidly-changing spectral composition. Impulsive sound is characteristically associated with such sources as large-caliber weapons, demolition activities, sonic booms, and many industrial processes (e.g., jackhammers, pile drivers). However, certain aspects of helicopter noise events are also impulsive.

A.2. Propagation of Sound

As sound travels from the source to the receiver, several factors influence the level and spectrum of the sound heard by a receiver. These factors generally result in a reduction, or *attenuation*, of the sound level:

- Spherical spreading
- Ground effect
- Attenuation through vegetation
- Attenuation due to barriers (including terrain)
- Atmospheric effects

Note that, for other than spherical spreading, all factors tend to have more effect on higher frequencies with low frequencies able to propagate over long distances with little attenuation. Hence, the "rumble" of jet departures or highway traffic can often be heard at large distance, while the higher frequency characteristics of the signal are lost.

A.2.1. Spherical Spreading

The sound from the point source, such as a generator, spreads in all directions like an expanding sphere. A rule of thumb in acoustics is that a spherically spreading sound decreases by 6 dB for every doubling of distance. Thus, increasing the distance from 200 feet to 300 feet does not provide as much reduction as moving from 100 to 200 feet. In practice, high-frequency sound is attenuated faster than 6 dB per doubling of the distance because some energy is lost in the medium (air) due to atmospheric effects at this frequency range. This loss, called excess attenuation, is dependent upon air temperature and humidity as well as the signal's sound frequency and is due to a process called vibrational relaxation in oxygen and nitrogen molecules.

Another exception to the "6-dB-per-doubling rule" involves a line source (such as a busy freeway) rather than a point source. When standing by a line source, the listener receives noise simultaneously from the entire breadth of the feature – in this case, it would be the line of cars traveling on the freeway. The sound from a line source can be pictured as an expanding cylinder. For a long, straight line source, the sound level drops by 3 dB for every doubling of distance from the source. In practice, due to excess attenuation and other factors, highway noise tends to drop off by about 4 dB for every doubling of distance from the highway.

A.2.2. Ground Effect

When sound propagates along the surface of the earth from a source to a receiver it follows two paths. The first is a direct path from the source to the receiver and the second is a path that starts at the source, reflects off the ground, and then travels to the receiver. If the ground is hard, such as pavement or water, the sound reflects off of the surface and adds to the sound from the direct path resulting in higher levels than the direct path alone. When sound reflects off of soft ground such freshly-plowed earth, grass, or loose snow, some frequencies of the reflected sound experience a phase reversal, where the areas of high and low pressure become reversed. Adding this phase-reversed sound with the sound from the direct pathway results in a reduction in the total sound at the receiver. Thus, sound levels are generally higher when the sound propagates over hard ground as compared to soft ground.

A.2.3. Attenuation from Vegetation

Wide areas of dense foliage provide some attenuation for higher frequency sound when they are located between a source and receiver. The vegetation must be dense enough to block the line of sight over even short distances and must extend well above the line of sight. The attenuation is negligible for low-frequency sound sources such as explosions, but increases with frequency. At 250 Hz, approximately 400 ft of dense foliage would be required to produce a noticeable 5 dB of attenuation for a sound source such as an aircraft run-up. At 1,500 Hz, approximately 250 ft of dense foliage would be required to produce 5 dB of attenuation for a sound source such as roadway traffic.

A.2.4. Attenuation Due to Barriers (Including Natural Terrain)

Barriers, berms, and natural terrain can attenuate sound when they are located in the line of sight between the source and the receiver. This attenuation, which acousticians call insertion loss, increases with height, width, and proximity to either the source or the receiver. If there are gaps in a barrier, the potential benefits of acoustical shielding will be substantially reduced.

Figure A-4 illustrates the concept. The sound from the helicopter has a direct path to the person on the right of the diagram. The direct path to the person on the left of the diagram is blocked by the hill. The sound must travel over the hill to the person. The greater the change in direction of the sound path at the top of the barrier is, the greater the reduction in sound that occurs. The change in direction can be increased by increasing the height of the barrier or moving the source or receiver closer to the barrier (if the source or receiver is below the top of the barrier). As the figure illustrates, barriers are most effective for sound sources on the ground. If the helicopter in the figure were to climb upward, there would be a direct path to both people on the ground.

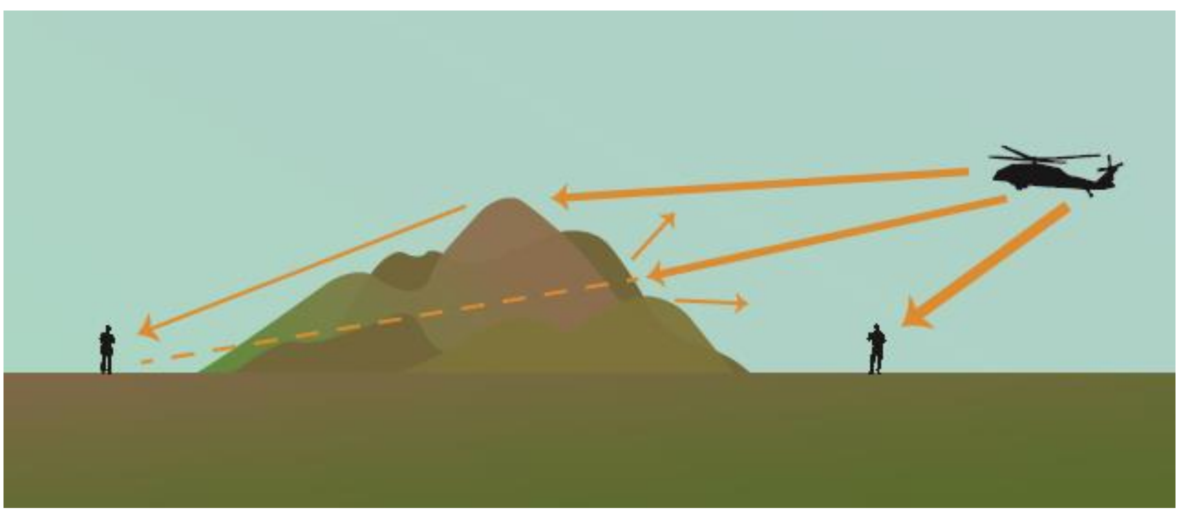

Figure A-4. Barrier Insertion Loss Example

A.2.5. Atmospheric Effects

Weather (or atmospheric) conditions that influence the propagation of sound include humidity, precipitation, temperature, wind, and turbulence (or gustiness). The effect of wind—turbulence in particular—is generally more important than the effects from other factors. Under calm wind conditions, the importance of temperature can increase, in particular, temperature changes occurring with altitude known as temperature gradients. This can sometimes influence propagation quite significantly. Humidity generally has little significance compared to the other effects.

Influence of Humidity and Precipitation

Humidity and precipitation rarely affect sound propagation in a significant manner. Humidity can reduce propagation of high-frequency noise under calm wind conditions. In very cold conditions, listeners often observe that noise sources such as aircraft sound "tinny," because the dry air increases the propagation of high-frequency sound. Rain, snow, and fog also have little, if any, noticeable effect on sound propagation. A substantial body of empirical data supports these conclusions.

Influence of Temperature

Air temperature affects the velocity of sound in the atmosphere. As a result, if the temperature varies at different heights above the ground, sound will travel in curved paths rather than straight lines. This bending of the sound path is called refraction. During the day, temperature normally decreases with increasing height. Under such "temperature lapse" conditions, when the air temperature decreases with height, the atmosphere refracts ("bends") sound waves upwards, and an acoustical shadow zone may exist at some distance from the noise source.

Under some weather conditions, an upper level of warmer air may trap a lower layer of cool air. Such an inversion of normal conditions (i.e., temperature gradients typically lapse with altitude) is most common in the evening, at night, and early in the morning when heat absorbed by the ground during the day radiates into the atmosphere. The effect of an inversion is just the opposite of lapse conditions: it causes sound propagating through the atmosphere to refract downward.

The downward refraction caused by temperature inversions often allows sound rays with originally upward-sloping paths to bypass obstructions and ground effects, increasing noise levels at greater distances. This type of effect is most noticeable at night, when temperature inversions are most common and when ambient sound levels are low enough that they do not otherwise mask distant noise sources.

Influence of Wind

Sound traveling in the direction of the wind (downwind) has a higher speed than sound traveling through calm air. Likewise sound traveling against the direction of the wind (upwind) has a lower speed than sound traveling through calm air. Wind speed typically increases with the height above the ground. This gradient in wind speeds, and sound speeds, causes the sound to refract. Sound refracts downward in the downwind direction and upward in the upwind direction. In general, receivers that are downwind of a source will experience higher sound levels, and those that are upwind will experience lower sound levels. As with a temperature inversion, the downward curving paths reduce or eliminate the insertion loss of barriers in the downwind direction. Wind perpendicular to the sound path has no significant effect.

Wind turbulence (or gustiness) can also affect sound propagation. Sound levels heard at remote receiver locations will fluctuate with gustiness. In addition, gustiness can cause considerable attenuation of sound due to the effects of eddies traveling with the wind. Attenuation due to eddies is essentially the same in all directions, with or against the flow of the wind, and can mask the refractive effects discussed above.

A.2.6. Effects on Propagation

The foregoing effects on propagation described above interact with each other and in some cases are additive. Specific combinations of conditions influence propagation and in order to predict how sound would propagate it is important to understand these varied effects. While the basics are described in this document, for complex permutations entailing interaction of several variables, consultation with an acoustical professional for modeling support and analysis may be required.

A.3. Noise Metrics

Noise metrics may be thought of as measures of noise 'dose'. There are two main types, describing (1) single noise events (Single Event Noise Metrics) and (2) total noise experienced over longer time periods (Cumulative Noise Metrics). Note that all decibel values, whether they relate to basic scales, event metrics or cumulative metrics, are generally referred to as levels - indeed in acoustic measurement, a level is always a decibel value.

Single event metrics are indicators of the intrusiveness, loudness, or noisiness of individual aircraft noises. Cumulative metrics used to measure long-term noise are indicators of community annoyance. But for aircraft noise it is logical that they represent aggregations of single events in some way. A practical noise index must be simple, practical, unambiguous, and capable of accurate measurement (using conventional, standard instrumentation). It must also be suitable for estimation by calculation from underlying source variables and robust - not over-sensitive to small changes in input variables.

Community annoyance research (much of which has been concerned with the noise of aircraft and road traffic), and the search for reliable long-term noise rating procedures, started in the mid- 1950s. As instrumentation for measuring long term noise was very limited then and for some time afterwards, early noise indices tended to incorporate measures that could be obtained manually or by simple mechanical means. Aircraft noise near airports could (and still can) be characterized by statistics describing individual noise events, such as their average levels and numbers. The noise of heavy road traffic, on the other hand, is made up of a very large number of overlapping events and it was then more appropriate to determine level distribution statistics such as L10, the level exceeded for 10% of the time. On the whole, aircraft noise affects far fewer people than road traffic noise but can reach high exposure levels close to busy airports. Here a separate identification of event levels and numbers of events focuses attention on the relative contributions of these two variables to annoyance.

Noise levels are usually presented at discrete, fixed observer locations or alternatively are presented as contours (i.e. lines/curves connecting points of equal values) depicting the area where the specified levels are exceeded. Noise levels are used - especially cumulative metrics - in assessment of effects from all domains of transportation noise: road, railway and air-traffic, as well as for the description of the noise produced from industrial sources, recreational activities etc. In practice, contours are almost always estimated via calculation (i.e., modeled) whereas values at specific locations can also be measured directly (except in the case of forecasted future activity).

Community judgments about the suitability of a sound environment are rarely based on a single sound. Rather, multiple sources of sound accumulate to produce the overall experience of a "quiet" or "noisy" neighborhood. Noise, as noted at the outset of this appendix, is defined as unwanted sound. The receiver imparts a value judgement onto an otherwise neutral physical phenomenon (i.e., sound). In 1974, the Environmental Protection Agency (EPA) established a procedure to assess the cumulative, 24-hour exposure to noise for citizens of the United States. This procedure was published in what has become known as "the Levels Document." To explain this procedure, the sections below will define noise metrics, beginning with simple metrics and progressing to the more complex. Because these metrics typically were developed to systematically characterize sound in the context of evaluating its undesirable effects, they are ordinarily labeled as noise metrics.

A.3.1. Maximum Level (L_{max})

Figure A-5 depicts the time history for an intermittent noise event, such as an aircraft flyover or car pass-by. The sound level increases as a car or aircraft approaches, then the sound level falls and blends into the background as the aircraft or car recedes into the distance. It is often convenient to describe a particular noise event by its *Maximum A-weighted Sound Pressure Level* (L_{max}). The sound level rises as the noise source nears the receiver and decreases as the noise source moves away.

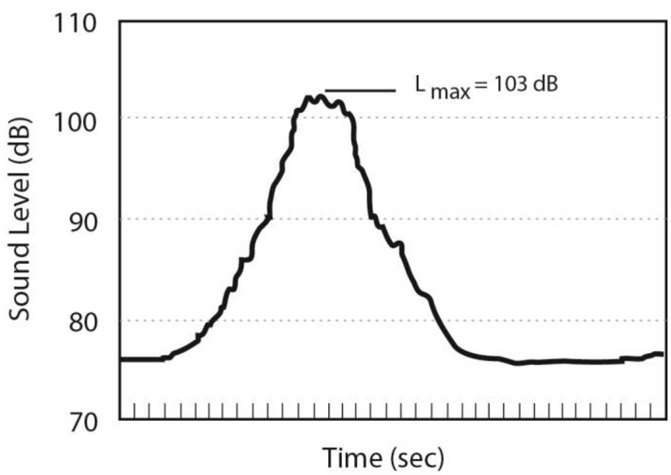

Figure A-5. Variation in Sound Level over Time and Maximum Sound Level

Subjective tests indicate that human response to sound is a function not only of its maximum level, but also of the duration of the signal and its temporal variation. Time-related changes might range from a sound level constant over time, as produced by a continuously operating machine, to the constantly varying sound levels perceived near highways and, even more so, around airports.

Over the past 30 years, a wide variety of acoustic measures or rating scales have been developed for the purpose of quantifying the sound generated by particular sources. These measures of sound have been described by the Acoustical Society of America (ASA) and are defined in the American National Standards Institute (ANSI) publication, *Acoustical Terminology* (ref ANSI S1.1, 1994).

This great number of measures results from the wide variations in the description of specific spectral and temporal characteristics among sound sources. For an engineering analysis of the noise exposure of a particular source, one measure may have many advantages over another. For management of noise at airports (or military airfields) three cumulative measures are important: *Equivalent Sound Level* (L_{eq}), *Day-Night Average Sound Level* (DNL or L_{dn}), and *Community Noise Equivalent Level* (CNEL). However, to understand a cumulative measure, it is helpful to first describe another single-event measure, *Sound Exposure Level (SEL)* in addition to the L_{max} described above because SEL is a metric accounts for duration in addition to the maximum pressure level that L_{max} quantifies.

A.3.2. Sound Exposure Level (SEL)

Research has established that annoyance of an intrusive noise event increases with both the level (magnitude) and the duration of the intrusion. Thus, a long-duration, lower-level event can be as annoying as a higher-level, shorter event. The SEL captures both variables in a single numerical quantity. The SEL (as illustrated in Figure A-6) is defined as the total acoustic energy in an event from background to background (typically computed or defined as a level that is 10 to 20 dB lower than the event peak) that is then normalized or compressed into a one-second interval. This single number, SEL, represents all the acoustic energy of an event as if that event had occurred within a one-second time period. In the example presented below, the several second duration event having a L_{max} of 103 dB would have a SEL of 108 dB. By definition, if the event duration is greater than one second, the SEL would be greater than the L_{max} of the same event.

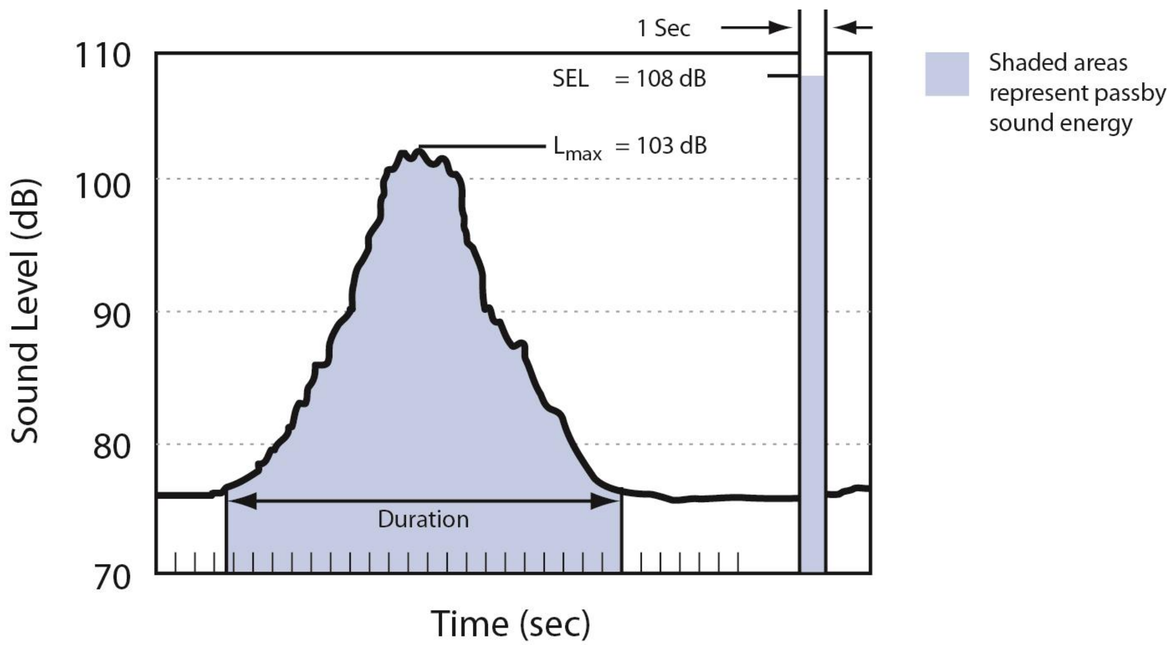

Figure A-6. Sound Exposure Level of a Noise Event

A.3.3. Equivalent Sound Level (L_{eq})

Annoyance also increases with the number of separate times an intrusive sound is experienced during a given period of time. The equivalent sound level (L_{eq}) captures the number of intrusions by measuring the average acoustic energy over a period of time in order to assess the cumulative effect of several events occurring over a period of time. The period can be of any length but it usually is a meaningful block of time such as an eight-hour L_{eq} for the office setting or a one-hour L_{eq} for a classroom environment. The L_{eq} is defined as the level of continuous sound over a given period that would deliver the same amount of energy as the actual time-varying sound exposure. Figure A-7 illustrates how the variation in sound exposure can be summarized in terms of a single, cumulative, value of a one-hour L_{eq}.

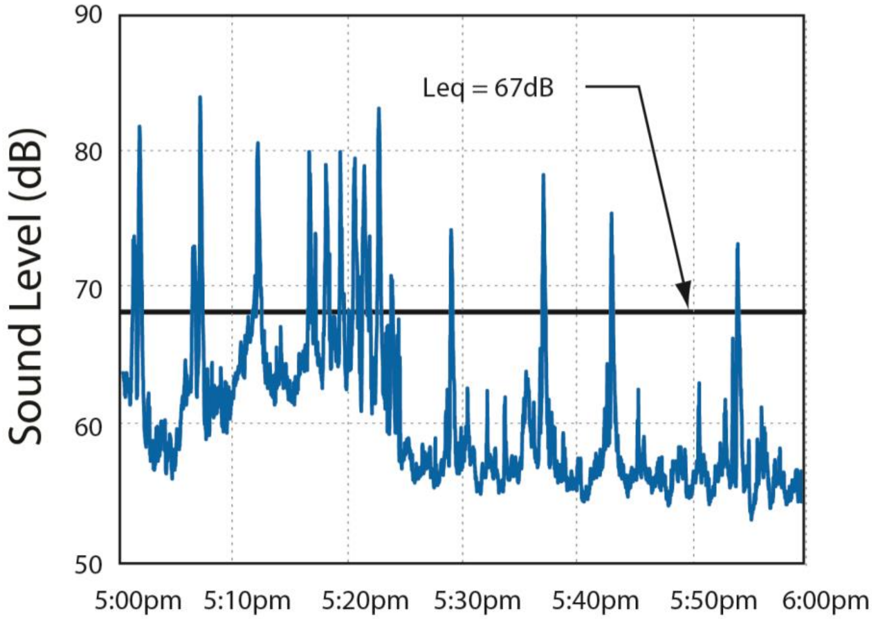

Figure A-7. Equivalent Sound Level (Leq)

A.3.4. Day Night Average Sound Level (DNL)

Annoyance is greater when an intrusive sound occurs at night. To capture the heightened annoyance of nighttime noise, when ambient or background noise tends to diminish and the atmospheric conditions noted in §X.2.5 can tend to attenuate sound to a lesser degree (e.g., wind diminishes or temperature inversions might form), the EPA recommends a special kind of 24-hour L_{eq} known as the DNL (or sometimes referred to as L_{dn}). As is implied in its name, the DNL represents the noise energy present during a daily period. However, it normally is calculated through use of operations data from a longer period, such as a year, in order to smooth out fluctuations occurring in day-to-day operations.

The DNL is calculated in two parts: a fifteen-hour daytime L_{eq} (0700 to 2359) and a nine-hour nighttime L_{eq} (2200 to 0659). When calculating the 24-hour DNL the nighttime L_{eq} is treated as if it were 10 decibels higher to account for the additional intrusiveness of noise at night (see Figure A-8). An alternative way of describing this adjustment is that each event occurring during the nighttime period calculated is as if it were equivalent to ten daytime events.

When recommending the 10 dB nighttime increase, the EPA did not intend its measure to be used to predict sleep disturbance but instead to capture the added annoyance of nighttime events. Different metrics would be used to estimate sleep disturbance are not discussed in this appendix as the Part 150 program relies on the linkage of community annoyance and land-use compatibility recommendations. In recommending the DNL for general use, the EPA also recommends that community planners use the 365-day annual average DNL.

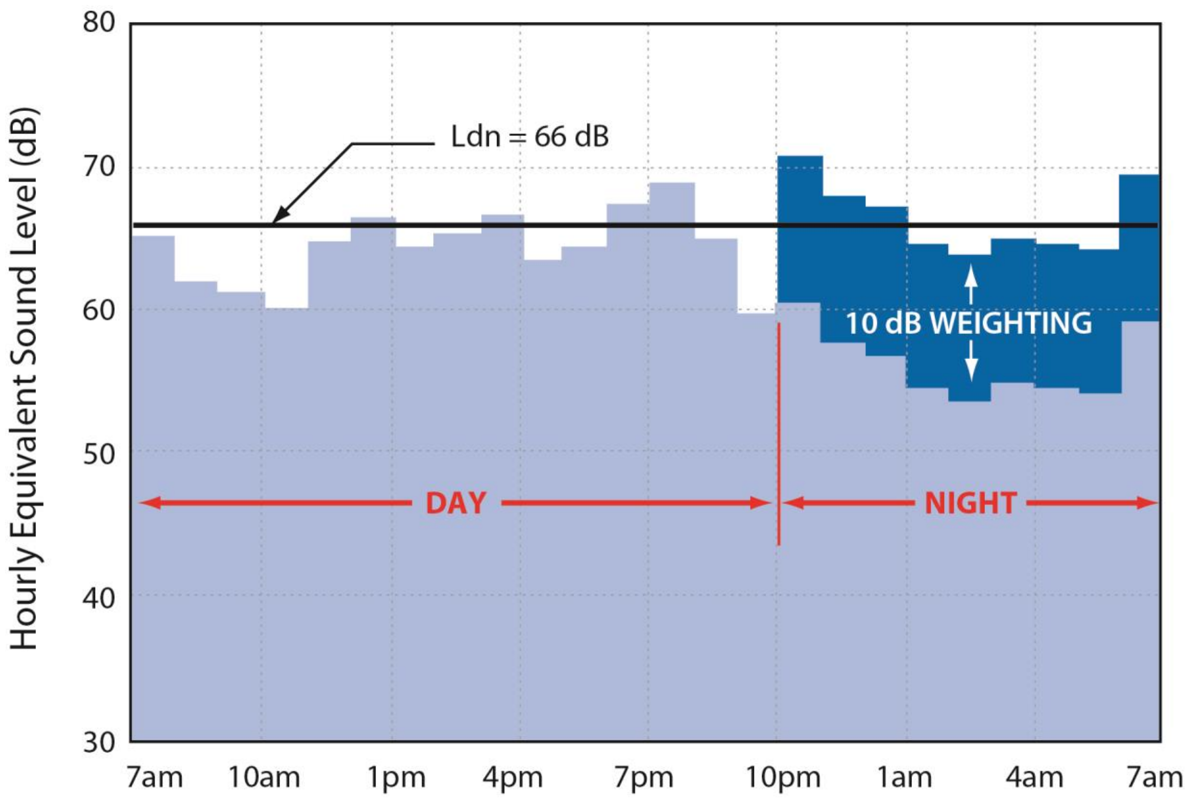

Figure A-8. Example of a Day-Night Average Sound Level Calculation

A.4. Noise Effects

As noted previously, sound refers to the physical description of an event, whereas noise reflects human reaction to it and is customarily defined as unwanted sound. Strictly speaking, this guidance deals principally with aircraft sound and sound levels. However here, as elsewhere, the word noise is generally used as a synonym for sound, especially when - as is the case for aircraft - the sound is unwanted by the receiver.

A.4.1 Noise Effects

There are many different effects of noise on people and individuals experience them to different degrees. The effects can be separated into two broad categories as illustrated in Figure A-9: (a) behavioral - the interference of noise with normal living - and (b) physiological - including potential health effects. At a first level of behavioral reaction, noise disturbs human activity by causing distraction or by physically interfering with it. Grouped together under the general heading of disturbance, these effects include detection/distraction, speech interference, disruption of work/mental activity, and sleep disturbance. A second level of behavioral reaction, sometimes viewed as an indirect response to disturbance of different kinds, is annoyance. A third level response is overt reaction including complaints.

Possible health effects that might be caused by noise over a period of time include (1) noise induced hearing loss and (2) other, indirect, risks to physiological and psychological well-being. The first, which is a consequence of very high levels of sound exposure, is well-documented and is not considered likely to be caused by the levels of aircraft noise experienced beyond airport boundaries. The nature of the second is much less certain; it is known that noise can cause a variety of biological reflexes and responses referred to as stress reactions but whether, over a period of time, these could lead to clinically recognizable illness is unclear. Research into these continues in many countries.

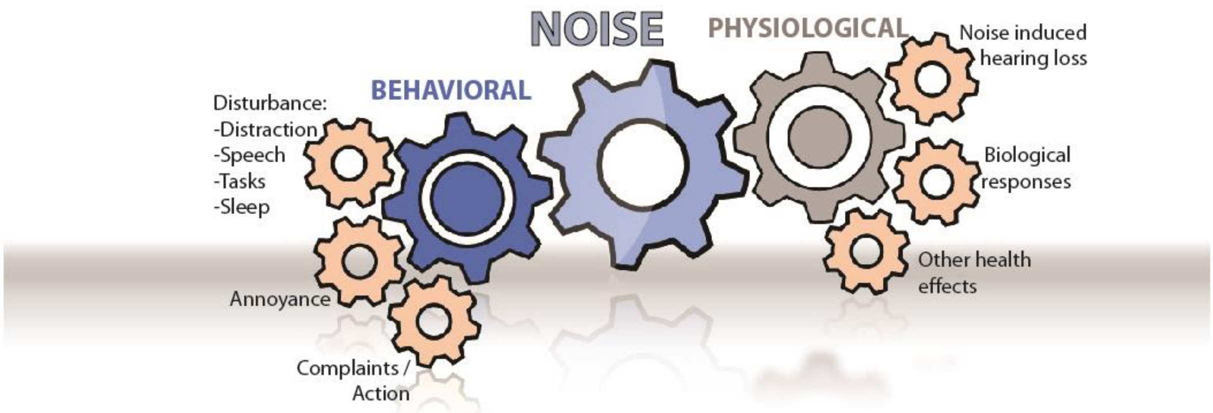

Figure A-9. General Cause and Effect Relationships between Noise and Noise Effects

The effects of noise have been extensively researched, particularly with the aim of establishing quantitative relationships between the amount of noise and the severity and extent of the effects. But behavioral reactions are essentially subjective and very sensitive to non-acoustic socio-psychological factors such as location, activity, state of well-being, familiarity with the noise, environmental expectations and attitudes to the noise makers. The effects of such modifying factors dramatically weaken correlations between noise and response by masking or confounding their dependency on noise. Such relationships are further obscured by variations in noise exposure over time and space, because individuals move around and engage in different activities.

Obvious physical factors include time and situation which govern intrusions into activities - sleep disturbance occurs primarily at night, speech interference during the day and so on. But equally important are those that control attitudes and susceptibilities; whether or not a particular noise annoys may depend very much upon the message it carries; concerns about the sources of noise can influence annoyance reactions more strongly than physical sound exposure itself. Ultimately noise might give rise to complaints (or in more extreme cases other overt reactions such as petitions or public demonstrations) depending on various sociological factors such as historical events, the expectations of affected communities, publicity and beliefs that progress can be achieved via protest.

Because of the combined influences of acoustical and non-acoustical factors, it is difficult to isolate the underlying noise-response relationships. In general, noise assessment methodology needs to be consistent with the understanding of the factors involved. Because effects on the community as a whole can only be described in broad statistical terms, noise exposures are commonly defined only as long-term averages at representative locations. This is why cumulative noise exposure metrics such as DNL are favored when assessing community annoyance.

An essential conclusion from aircraft noise effects research is that community annoyance is the most useful general criterion of overall, long-term aircraft noise impact and that it can be correlated with long-term average sound exposure. However, before considering community annoyance and noise-annoyance relationships, it is worthwhile reviewing the various effects of noise, and their interrelationships - with each other and with sound exposure.

Some noise-effect relationships - the connecting lines in **Figure A-9 above** - can be quantified; others cannot. Noise disturbance and short-term annoyance - immediate responses to individual noise events of relatively short duration - have been studied extensively in research laboratories. Laboratory experiments can be performed with great accuracy and they have provided a wealth of knowledge about the fundamental characteristics of human hearing and perception of sound.

But a detailed understanding of specific disturbance criteria is not particularly helpful when it comes to assessing the day-by-day impact of environmental noise on communities. The noise experienced by individuals obviously depends on where they live and work and upon their lifestyles; no two people experience exactly the same sound exposure patterns over a period of time or the same interference with their activities. And different people react differently to the same sound; some are a great deal more sensitive than others. When coupled with the multiple and differing potential disturbance effects, these variations make studies in the community intrinsically much more complex than laboratory work. Yet it is only in that real world that the relationships between cause and long-term annoyance - as a consequence of total long-term sound exposure from all sources - can be investigated.

This long-term aspect of cause and effect has been the primary influence on the direction that field research on noise effects on communities has taken. Community annoyance has been adopted as a general indicator for all of the possible impacts of environmental noise. In social survey studies, individuals' annoyance has been measured in a variety of ways - quantifying it on simple numerical or category scales or via elaborate multi-question procedures. These measurements have then been correlated with various measures of typical sound exposure, first to decide what the appropriate metric is, and then to 'calibrate' the metric, that is to determine the exposure-response relationship. In such correlations, the overall impact of noise is sometimes expressed as an average across individuals or, alternatively, as the incidence of high annoyance (such as the percentage of respondents 'highly annoyed').

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Appendix B Federal Register Notice of FAA Finding of Compliance for Noise Exposure Maps

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B.1 2003/2008 Finding of Compliance for Noise Exposure Maps

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410–965–0454, or by writing to the address listed above.

1. Representative Payee Report of Benefits and Dedicated Account—20 CFR 416.546, 416.635, 416.640, and 416.665—0960–0576. Form SSA–6233 is used to ensure that the representative payee is using the benefits received for the beneficiary's current maintenance and personal needs and that the expenditures of funds from the dedicated account are in compliance with the law. The respondents are individuals and organizational representative payees who are required by law to establish a separate ("dedicated") account in a financial institution for certain past-due SSI benefits.

Type of Request: Extension of an OMB-approved information collection.

Number of Respondents: 30,000.

Frequency of Response: 1.

Average Burden Per Response: 20 minutes.

Estimated Annual Burden: 10,000 hours.

2. Employment Relationship Questionnaire—20 CFR 404.1007—0960–0040. SSA uses the information collected on Form SSA–7160 to determine whether the Social Security number-holder is self-employed or is an employee. The respondents are applicants for Social Security benefits and/or their employers.

Type of Request: Extension of an OMB-approved information collection.

Number of Respondents: 47,500.

Frequency of Response: 1.

Average Burden Per Response: 25 minutes.

Estimated Annual Burden: 19,792 hours.

3. Continuation of Full Benefit Standard for Persons Institutionalized—20 CFR 416.212—0960–0516. SSA is required by law to establish procedures for collecting information on whether an SSI recipient who becomes institutionalized (*e.g.* hospital, nursing home) is eligible for continued benefits, based on the full federal rate, if a physician certifies that he expects the period of medical confinement to last no more than 90 days. The individual, or someone acting on his behalf, must demonstrate that he needs to pay some or all of the expenses of maintaining the home to which he expects to return. The respondents are applicants for SSI benefits.

Type of Request: Extension of an OMB-approved information collection.

Number of Respondents: 60,000.

Frequency of Response: 1.

Average Burden Per Response: 5 minutes.

Estimated Average Burden: 5,000 hours.

Dated: December 8, 2003.

Elizabeth A. Davidson,

Reports Clearance Officer, Social Security Administration.

[FR Doc. 03–30825 Filed 12–12–03; 8:45 am]

BILLING CODE 4191–02–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Noise Exposure Map Notice; Receipt of Noise Compatibility Program Update and Request for Review, Louisville International Airport, Louisville, KY

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice.

SUMMARY: The Federal Aviation Administration (FAA) announces its determination that the noise exposure maps submitted by Regional Airport Authority of Louisville and Jefferson County, Kentucky for Louisville International Airport under the provisions of 49 U.S.C. 47501 *et seq.* (Aviation Safety and Noise Abatement Act) and 14 CFR part 150 are in compliance with applicable requirements. The FAA also announces that it is reviewing a proposed noise compatibility program that was submitted for Louisville International Airport under part 150 in conjunction with the noise exposure map, and that this program will be approved or disapproved on or before May 16, 2004.

EFFECTIVE DATE: The effective date of the FAA's determination on the noise exposure maps and of the start of its review of the associated noise compatibility program is November 18, 2003. The public comment period ends February 3, 2004.

FOR FURTHER INFORMATION CONTACT: Jerry O. Bowers, Airports District Office, 2862 Airport Business Park Drive, Bldg. G, Memphis, Tennessee 38118; 901–322–8184. Comments on the proposed noise compatibility program should also be submitted to the above office.

SUPPLEMENTARY INFORMATION: This notice announces that the FAA finds that the noise exposure maps submitted for Louisville International Airport are in compliance with applicable requirements of part 150, effective November 18, 2003. Further, FAA is reviewing a proposed noise compatibility program for that airport which will be approved or disapproved on or before May 16, 2004. This notice also announces the availability of this program for public review and comment.

Under 49 U.S.C. 47503 (the Aviation Safety and Noise Abatement Act, hereinafter referred to as "the Act"), an airport operator may submit to the FAA noise exposure maps which meet applicable regulations and which depict non-compatible land uses as of the date of submission of such maps, a description of projected aircraft operations, and the ways in which such operations will affect such maps. The Act requires such maps to be developed in consultation with interested and affected parties in the local community, government agencies, and persons using the airport.

An airport operator who has submitted noise exposure maps that are found by FAA to be in compliance with the requirements of Federal Aviation Regulations (FAR) part 150, promulgated pursuant to the Act, may submit a noise compatibility program for FAA approval which sets forth the measures the operator has taken or proposes to take to reduce existing non-compatible uses and prevent the introduction of additional non-compatible uses.

The Regional Airport Authority of Louisville and Jefferson County, Kentucky, submitted to the FAA on February 12, 2003, noise exposure maps, descriptions and other documentation that were produced during the FAR part 150 Noise Study Update, dated January 30, 2003. It was requested that the FA review this material as the noise exposure maps, as described in section 47503 of the Act, and that the noise mitigation measures, to be implemented jointly by the airport and surrounding communities, be approved as a noise compatibility program under section 47504 of the Act.

The FAA has completed its review of the nose exposure maps and related descriptions submitted by the Regional Airport Authority of Louisville and Jefferson County, Kentucky. The specific documentation determined to constitute the noise exposure maps includes:

Existing Noise Exposure Map, 2003, Figure 10–1;

Future Noise Exposure Map, 2008, Figure 10–2;

Noise Monitoring Sites, appendix E, part 2 of volume 2 and accompanying Figure 6;

Flight Tracks for the existing condition, 2003, and 5-year, 2008 are depicted in Figures 6–3 through 6–6 and Figures 10–1 and 10–2;

Table 6–1 provides the Aviation Forecast and appendices D and G

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updates and justifies the forecast, the forecast is consistent and reasonable;

Existing Land Use depicted by Figures 5–1; Future Land Use depicted by Figures 5–2 and 5–2, Noise Exposure Map 2003 Impacts are tabulated in Table 10–3 and Noise Exposure Map 2008 Impacts are tabulated in Table 10–5;

Consultation Methodology and Program are presented in appendix A.

National Register of Historic Places described, section 5.3 at pages 5–7 through 5–9, Figure 5–4, Table 5–1 and appendix C.

The FAA has determined that these maps for Louisville International Airport are in compliance with applicable requirements. This determination is effective on November 18, 2003. FAA's determination on an airport opertor's noise exposure maps is limited to a finding that the maps were developed in accordance with the procedures contained in appendix A of FAR part 150. Such determination does not constitute approval of the applicant's data, information or plans, or constitute a commitment to approve a noise compatibility program or to fund the implementation of that program.

If questions arise concerning the precise relationship of specific properties to noise exposure contours depicted on a noise exposure map submitted under section 47503 of the Act, it should be noted that the FAA is not involved in any way in determining the relative locations of specific properties with regard to the depicted noise contours, or in interpreting the noise exposure maps to resolve questions concerning, for example, which properites should be covered by the provisions of section 47506 of the Act. These functions are inseparable from the ultimate land use control and planning responsibilities of local government. These local responsibilities are not changed in any way under part 150 or through FAA's review of noise exposure maps. Therefore, the responsibility for the detailed overlaying of noise exposure contours onto the map depicting properties on the surface rests exclusively with the airport operator that submitted those maps, or with those public agencies and planning agencies with which consultation is required under section 47503 of the Act. The FAA has relied on the certification by the airport operator, under section 150.21 of FAR part 150, that the statutorily required consultation has been accomplished.

The FAA has formally received the noise compatiblity program for Louisville International Airport, also effective on November 18, 2003. Preliminary review of the submitted material indicates that it conforms to the requirements for the submittal of noise compatibility programs, but that further review will be necessary prior to approval or disapproval of the program. The formal review period, limited by law to a maximum of 180 days, will be completed on or before May 16, 2004.

The FAA's detailed evaluation will be conducted under the provisions of 14 CFR part 150, section 150.33. The primary considerations in the evaluation process are whether the proposed measures may reduce the level of aviation safety, create an undue burden of interstate or foreign commerce, or be reasonably consistent with obtaining the goal of reducing existing non-compatible land uses and preventing the introduction of additional non-compatible land uses.

Interested persons are invited to comment on the proposed program with specific reference to these factors. All comments, other than those properly addressed to local land use authorities, will be considered by the FAA to the extent practicable. Copies of these noise exposure maps, the FAA's evaluation of the maps, and the proposed noise compatibility program are available for examination at the following locations:

Federal Aviation Administration, 800 Independence Avenue, SW., Room 621, Washington, DC 20591.

Federal Aviation Administration, Airports District Office, 2862 Business Park, Bldg G, Memphis, Tennessee 38118-1555.

Regional Airport Authority of Louisville and Jefferson County, P.O. Box 9129, Louisville, Kentucky 40209–0129.

Questions may be directed to the individual named above under the heading **FOR FURTHER INFORMATION CONTACT.**

Issued in Memphis Airports District Office, Memphis, Tennessee, November 18, 2003.

LaVerne F. Reid,

Manager, Memphis Airports District Office.

[FR Doc. 03–30911 Filed 12–12–03; 8:45 am]

BILLING CODE 4910–13–M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

[Summary Notice No. PE–2003–74]

Petitions for Exemption; Summary of Petitions Received; Dispositions of Petitions Issued

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of dispositions of prior petitions.

SUMMARY: Pursuant to FAA's rulemaking provisions governing the application, processing, and disposition of petitions for exemption part 11 of title 14, Code of Federal Regulations (14 CFR), this notice contains a summary of certain dispositions of certain petitions previously received. The purpose of this notice is to improve the public's awareness of, and participation in, this aspect of FAA's regulatory activities.

FOR FURTHER INFORMATION CONTACT: Tim Adams (202) 267–8033, Sandy Buchanan-Sumter (202) 267–7271, or Denise Emrick (202) 267–5174, Office of Rulemaking (ARM–1), Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591.

This notice is published pursuant to 14 CFR 11.85 and 11.91.

Issued in Washington, DC on December 10, 2003.

Donald P. Byrne,

Assistant Chief Counsel for Regulations.

Dispositions of Petitions

Docket No.: FAA–2003–15749.
Petitioner: Qantas Airways, Ltd.
Section of 14 CFR Affected: 14 CFR 145.45(f).
Description of Relief Sought/Disposition: To permit Qantas Airways, Ltd., to make its inspection procedures manual available to its supervisory, inspection, and other relevant personnel rather than give an individual copy to each of its supervisory and inspection personnel. *Grant, 11/12/2003, Exemption No. 8173.*

Docket No.: FAA–2003–16532.
Petitioner: Avigate, LLC.
Section of 14 CFR Affected: 14 CFR 135.143(c)(2).
Description of Relief Sought/Disposition: To permit Avigate, LLC, to operate certain aircraft under part 135 without a TSO–C112 (Mode S) transponder installed in those aircraft. *Grant, 11/21/2003, Exemption No.8179.*

Docket No.: FAA–2003–16486.
Petitioner: CJPJ Associates, Inc.
Section of 14 CFR Affected: 14 CFR 135.143(c)(2).
Description of Relief Sought/Disposition: To permit CJPJ Associates, Inc., to operate certain aircraft under part 135 without a TSO–C112 (Mode S) transponder installed in those aircraft. *Grant, 11/21/2003, Exemption No. 8178.*

Docket No.: FAA–2002–12137.
Petitioner: Rockwell Collins, Inc.
Section of 14 CFR Affected: 14 CFR 21.327(a).
Description of Relief Sought/Disposition: To permit Rockwell

B.2 2011/2016 Finding of Compliance for Noise Exposure Maps

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U.S. Department of Transportation
Federal Aviation Administration

Memphis Airports District Office
2862 Business Park Dr, Bldg G
Memphis, Tennessee 38118-1555

Phone: 901-322-8181

RECEIVED
APR 11 2011

April 7, 2011

Mr. C.T. "Skip" Miller, A.A.E.
Executive Director
Louisville Regional Airport Authority
PO Box 9129
Louisville, KY 40209

Noise Exposure Map Compliance Determination
2011 Noise Exposure Map Update (NEM)
Louisville International Airport (SDF)

Dear Mr. Miller:

This is to notify you that the Federal Aviation Administration (FAA) has evaluated and accepted the Noise Exposure Maps and supporting documentation transmitted by a letter from your office dated March 8, 2011 for the Louisville International Airport, in accordance with Section 103(a) (1) of the Aviation Safety and Noise Abatement Act of 1979 (ASNA), and has determined that they are in compliance with applicable requirements of 14 CFR Part 150. Further, we have determined that the "Existing Condition (2011) Noise Exposure Map" and "Forecast Condition (2016) Noise Exposure Map" fulfill the requirements for the current and the future year noise exposure maps.

FAA's determination that your Noise Exposure Maps are in compliance is limited to a finding that the maps were developed in accordance with the procedures contained in Appendix A of 14 CFR Part 150. Such determination does not constitute approval of your data, information or plans.

Should questions arise concerning the precise relationship of specific properties to noise exposure contours depicted on the Noise Exposure Maps, you should note that the FAA will not be involved in any way in the determination of relative locations of specific properties with regard to the depicted noise contours, or in interpreting the maps to resolve questions concerning, for example, which properties should be covered by the provisions of Section 107 of the Act. These functions are inseparable from the ultimate land use control and planning responsibilities of local government. These local responsibilities are not changed in any way under Part 150 or through FAA's determination relative to your Noise Exposure Maps. Therefore, the responsibility for the detailed overlaying of noise contours onto the maps depicting properties on the surface rests exclusively with you the airport operator, or those public agencies and planning agencies with which consultation is required under Section 103 of the Act. The FAA relies on the certification by you under 150.21 of 14 CFR Part 150, that the statutorily required consultation has been accomplished.

The FAA will publish a notice in the Federal Register announcing the acceptance of the Noise Exposure Maps for Louisville International Airport.

Your notice of this determination and the availability of the Noise Exposure Maps, when published at least three times in a newspaper of general circulation in the county or counties where the affected properties are located, will satisfy the requirements of Section 107 of the ASNA Act.

Your attention is called to the requirements of Section 150.21(d) of 14 CFR Part 150, involving the prompt preparation and submission of revisions to these maps of any actual or proposed change in the operation of Louisville International Airport might create any substantial, new, noncompatible land use in any areas depicted on the Noise Exposure Maps, or significant reduction in noise over existing noncompatible land uses that is not reflected in either map now on file with the FAA.

Should you have any questions, please feel free to contact me at (901) 322-8181.

Sincerely,

Phillip J. Braden, Manager
Memphis Airports District Office

cc: APP-400
ASO-610
ASO-7

such other relief as the Department may deem necessary or appropriate.

Docket Number: DOT–OST–2011–0068.

Date Filed: March 29, 2011.

Due Date for Answers, Conforming Applications, or Motion to Modify Scope: April 19, 2011.

Description: Application of American Eagle Airlines, Inc. requesting a certificate of public convenience and necessity authorizing scheduled foreign air transportation of person, property, and mail from a point or points in the United States, via intermediate points, to a point or points in any open skies country.

Docket Number: DOT–OST–2011–0073.

Date Filed: April 1, 2011.

Due Date for Answers, Conforming Applications, or Motion to Modify Scope: April 22, 2011.

Description: Application of Orange Air, LLC requesting a certificate of public convenience and necessity authorizing Orange Air to engage in interstate charter air transportation of persons, property and mail.

Docket Number: DOT–OST–2011–0074.

Date Filed: April 1, 2011.

Due Date for Answers, Conforming Applications, or Motion to Modify Scope: April 22, 2011.

Description: Application of Orange Air, LLC requesting a certificate of public convenience and necessity authorizing Orange Air to engage in foreign charter air transportation of persons, property, and mail between any place in the United States and any place outside thereof.

Renee V. Wright,

Program Manager, Docket Operations, Federal Register Liaison.

[FR Doc. 2011–9162 Filed 4–14–11; 8:45 am]

BILLING CODE 4910–9X–P

DEPARTMENT OF TRANSPORTATION

Office of the Secretary

Aviation Proceedings, Agreements Filed the Week Ending April 2, 2011

The following Agreements were filed with the Department of Transportation under the Sections 412 and 414 of the Federal Aviation Act, as amended (49 U.S.C. 1382 and 1384) and procedures governing proceedings to enforce these provisions. Answers may be filed within 21 days after the filing of the application.

Docket Number DOT–OST–2011–0069.

Date Filed March 30, 2011.

Parties Members of the International Air Transport Association.

Subject (a) TC23 between Middle East, Africa and TC3 (except South West Pacific) Flex Fares Resolutions, Geneva, 14–15 June 2010 (Memo 0449/0447), TC23 between Middle East, Africa and TC3 (except South West Pacific) Flex Fares, Geneva, 14–15 June 2010 (Memo 0454/0452), TC23 between Middle East, Africa and TC3 (except South West Pacific) Minutes (Memo 0450/0448).

(b) TC23 Middle East/Africa—TC3 (except South West Pacific) Flex Fare Resolution 111tt, Mail Vote 673 (Memo 0458/0454), Intended Effective Date: 1 April 2011.

Renee V. Wright,

Program Manager, Docket Operations, Federal Register Liaison.

[FR Doc. 2011–9164 Filed 4–14–11; 8:45 am]

BILLING CODE 4910–9X–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Noise Exposure Map; Louisville Interntional Airport, Louisville, KY

AGENCY: Federal Aviation Administration, DOT.

ACTION: Notice.

SUMMARY: The Federal Aviation Administration (FAA) announces its determination that the Noise Exposure Maps submitted by Louisville Regional Airport Authority for Louisville International Airport under the provisions of 49 U.S.C. 47501 *et. seq* (Aviation Safety and Noise Abatement Act) and 14 CFR part 150 are in compliance with applicable requirements.

DATES: *Effective Date:* The effective date of the FAA's determination on the noise exposure maps is April 7, 2011.

FOR FURTHER INFORMATION CONTACT: Phillip J. Braden, Federal Aviation Administration, Memphis Airports District Office, 2862 Business Park Drive, Building G, Memphis, Tennessee 38118, 901–322–8181.

SUPPLEMENTARY INFORMATION: This notice announces that the FAA finds that the Noise Exposure Maps submitted for Louisville International Airport are in compliance with applicable requirements of Title 14 Code of Federal Regulations (CFR) part 150, effective April 7, 2011. Under 49 U.S.C. section 47503 of the Aviation Safety and Noise Abatement Act (the Act), an airport operator may submit to the FAA Noise Exposure Maps which meet applicable regulations and which depict noncompatible land uses as of the date of submission of such maps, a description of projected aircraft operations, and the ways in which such operations will affect such maps. The Act requires such maps to be developed in consultation with interested and affected parties in the local community, government agencies, and persons using the airport. An airport operator who has submitted Noise Exposure Maps that are found by FAA to be in compliance with the requirements of 14 CFR part 150, promulgated pursuant to the Act, may submit a Noise Compatibility Program for FAA approval which sets forth the measures the airport operator has taken or proposes to take to reduce existing noncompatible uses and prevent the introduction of additional noncompatible uses.

The FAA has completed its review of the Noise Exposure Maps and accompanying documentation submitted by Louisville Regional Airport Authority. The documentation that constitutes the "Noise Exposure Maps" as defined in Section 150.7 of 14 CFR part 150 includes: Figure 11, "Existing Condition 2011 Noise Exposure Map"; Figure 12, "Forecast Condition 2012 Noise Exposure Map"; Figure 4, "Existing 2011 North Flow Arrival and Departure Tracks"; Figure 5, "Existing 2011 South Flow Arrival and Departure Tracks"; Figure 6, "Forecast 2016 North Flow Arrival and Departure RNAV Tracks"; Figure 7, "Forecast 2016 South Flow Arrival and Departure RNAV Tracks"; Figure 8, "Military Arrival and Departure Tracks"; Figure 13, "Comparison of Existing 2011 and Forecast 2016 Noise Exposure Maps"; Table 4, "2011 Operations Summary"; Table 5, "Modeled Average Daily Aircraft Operations for 2011"; Table 6, "2016 Operations Summary"; Table 7, "Modeled Average Daily Aircraft Operations for 2016"; Table 9, "Overall Runway Use Percentages for 2011"; Table 10, "Modeled Average Daily Runway Use for 2011"; Table 14, "Overall Runway Use Percentages for 2016"; Table 15, "Modeled Average Daily Runway Use for 2016"; Table 21, "Military Helicopter Flight Tracks and Use"; Table 25, "Estimated Residential Population within 2011 and 2016 DNL Contours". The FAA has determined that these Noise Exposure Maps and accompanying documentation are in compliance with applicable requirements. This determination is effective on April 7, 2011.

FAA's determination on the airport operator's Noise Exposure Maps is limited to a finding that the maps were developed in accordance with the procedures contained in Appendix A of 14 CFR part 150. Such determination does not constitute approval of the airport operator's data, information or plans, or a commitment to approve a Noise Compatibility Program or to fund the implementation of that Program. If questions arise concerning the precise relationship of specific properties to noise exposure contours depicted on a Noise Exposure Map submitted under Section 47503 of the Act, it should be noted that the FAA is not involved in any way in determining the relative locations of specific properties with regard to the depicted noise exposure contours, or in interpreting the Noise Exposure Maps to resolve questions concerning, for example, which properties should be covered by the provisions of Section 47506 of the Act. These functions are inseparable from the ultimate land use control and planning responsibilities of local government. These local responsibilities are not changed in any way under 14 CFR part 150 or through FAA's review of Noise Exposure Maps.

Therefore, the responsibility for the detailed overlaying of noise exposure contours onto the map depicting properties on the surface rests exclusively with the airport operator that submitted those maps, or with those public agencies and planning agencies with which consultation is required under Section 47503 of the Act. The FAA has relied on the certification by the airport operator, under Section 150.21 of 14 CFR part 150, that the statutorily required consultation has been accomplished.

Copies of the full Noise Exposure Maps documentation and of the FAA's evaluation of the maps are available for examination at the following locations:

Federal Aviation Administration, Memphis Airports District Office, 2862 Business Park Drive, Building G, Memphis, Tennessee 38118.

Questions may be directed to the individual named above under the heading, **FOR FURTHER INFORMATION CONTACT**.

Issued in Memphis, Tennessee on April 7, 2011.

Phillip J. Braden,

Manager, Memphis Airports District Office.

[FR Doc. 2011–9224 Filed 4–14–11; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

[Docket No. FAA–2011–0361]

Policy and Procedures Concerning the Use of Airport Revenue; Policy Regarding Airport Rates and Charges: Petition of the Clark County Department of Aviation To Use a Weight-Based Air Service Incentive Program

AGENCY: Federal Aviation Administration (FAA), Department of Transportation (DOT).

ACTION: Notice of petition; request for comments.

SUMMARY: This notice requests comments on a petition to accept an air service incentive program at McCarran International Airport (Airport) as consistent with Federal law and policies on the use of airport revenue and on airport rates and charges. The petitioner Clark County Department of Aviation is the owner and operator of the Airport. The petitioner is the recipient of Federal grants under the Airport Improvement Program (AIP), and is subject to obligations under AIP grant agreements, including Federal law and policy on the use of airport revenue and on airport rates and charges. The FAA has interpreted these policies, and the underlying Federal statutes, to permit a temporary waiver of standard airport fees for carriers that provide new air service at an airport, as an incentive to begin or expand air service. The agency recently issued the Air Carrier Incentive Program Guidebook to provide specific guidance to airport operators on the use of air service incentive programs. That guidance restates FAA's previously issued opinions regarding what constitutes new service as characterized in the FAA's *Policy and Procedures Concerning the Use of Airport Revenue* (*Revenue Use Policy*) (64 FR 7696). Since the inception of the *Revenue Use Policy in 1999,* the FAA has defined new air service as: (a) Service to an airport destination not currently served, (b) nonstop service where no nonstop service is currently offered, (c) new entrant carrier, and/or (d) increased frequency of flights to a specific destination. The FAA's interpretation has not permitted an airport operator to offer an incentive program that provides discounts based on increased aircraft weight or an increased number of seats on existing flights. The petitioner proposes an incentive program that would reward air carriers for an increase in landed weight. An increase in landed weight could result from an increase in the size of aircraft used, or "upgauging," on existing flights as well as from added flights. The petitioner requests that the FAA amend existing guidance to make clear that its proposed incentive plan is consistent with Federal law and general agency policies on the use of airport revenue and on airport rates and charges. The FAA is publishing this notice of the petition for public comment on whether agency guidance should be interpreted or amended as requested.

DATES: Send your comments on or before May 31, 2011.

ADDRESSES: You may send comments [identified by Docket Number FAA–2011–0361] using any of the following methods:

- *Government-wide rulemaking Web site:* Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- *Mail:* Docket Operations, U.S. Department of Transportation, West Building, Ground Floor, Room W12–140, Routing Symbol M–30, 1200 New Jersey Avenue, SE., Washington, DC 20590.
- *Fax:* 1–202–493–2251.
- *Hand Delivery:* To Docket Operations, Room W12–140 on the ground floor of the West Building, 1200 New Jersey Avenue, SE., Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Privacy: We will post all comments we receive, without change, to *http://www.regulations.gov,* including any personal information you provide. For more information, see the Privacy Act discussion in the **SUPPLEMENTARY INFORMATION** section of this document.

Docket: To read background documents or comments received, go to *http://www.regulations.gov* at any time or to Room W12–140 on the ground floor of the West Building, 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Stacy Swigart, Airport Compliance Division, ACO–100, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, telephone (202) 267–8725; facsimile: (202) 267–5257; e-mail: *Stacy.Swigart@faa.gov.*

SUPPLEMENTARY INFORMATION: An air service incentive program is a temporary reduction in the fees that an airport operator charges air carriers at the airport, or other temporary benefits for carriers, for the purpose of promoting new or additional air service.

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THE COURIER-JOURNAL | Wednesday, May 11, 2011 | B 9

Public Notice
Louisville International Airport
FAA Noise Exposure Maps Acceptance

Pursuant to Section 107 (a) & (b) [Title 49, United States Code, Section 47506] of the Airport Safety and Noise Abatement Act of 1979, as amended, notice is hereby given that on April 7, 2011, the Federal Aviation Administration has completed its evaluation of, and has formally accepted the Noise Exposure Maps for Louisville International Airport, located in Louisville, Kentucky that were prepared pursuant to Title 14, Code of Federal Regulations, Part 150 (14 CFR Part 150). These maps and supporting documentation are available for public review at www.flylouisville.com and at the Administrative Offices of the Louisville Regional Airport Authority, 700 Administration Drive, Louisville, Kentucky 40209-0129.

Appendix C FAA Record of Approvals Regarding Current NCP

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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.

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.

ATTACHMENT 1

LOUISVILLE
REGIONAL
AIRPORT
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P.O. Box 9129
LOUISVILLE, KY
40209-0129
TEL 502/368-6524
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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
01/26/05	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	18:06	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

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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	6
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	28	48	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	48	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
08/25/05	9:49	12:08	2:19	81	35	39	BKN024	10
08/2705	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.**

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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.

October 29, 2008
Page 6 of 7

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.

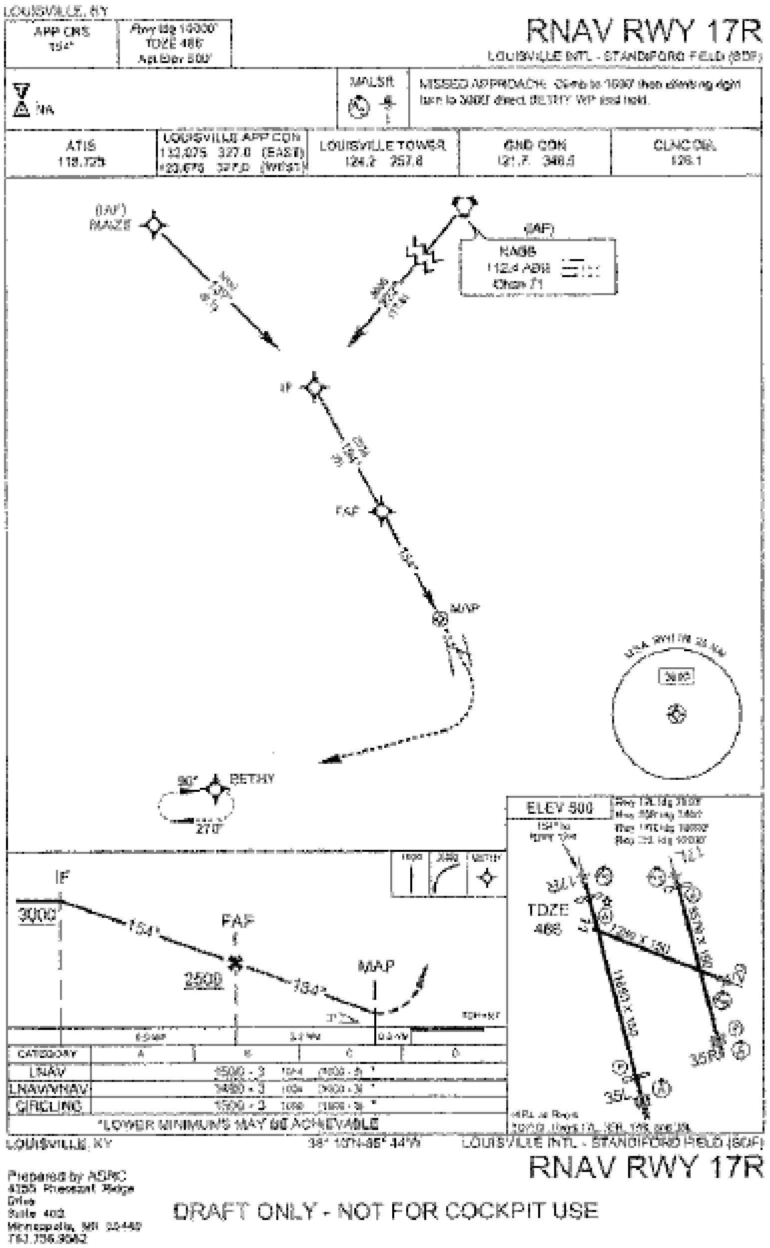
We look forward to working with you on this project and thank you for your assistance. If you have any questions, please contact me at 502-368-6524.

Sincerely,

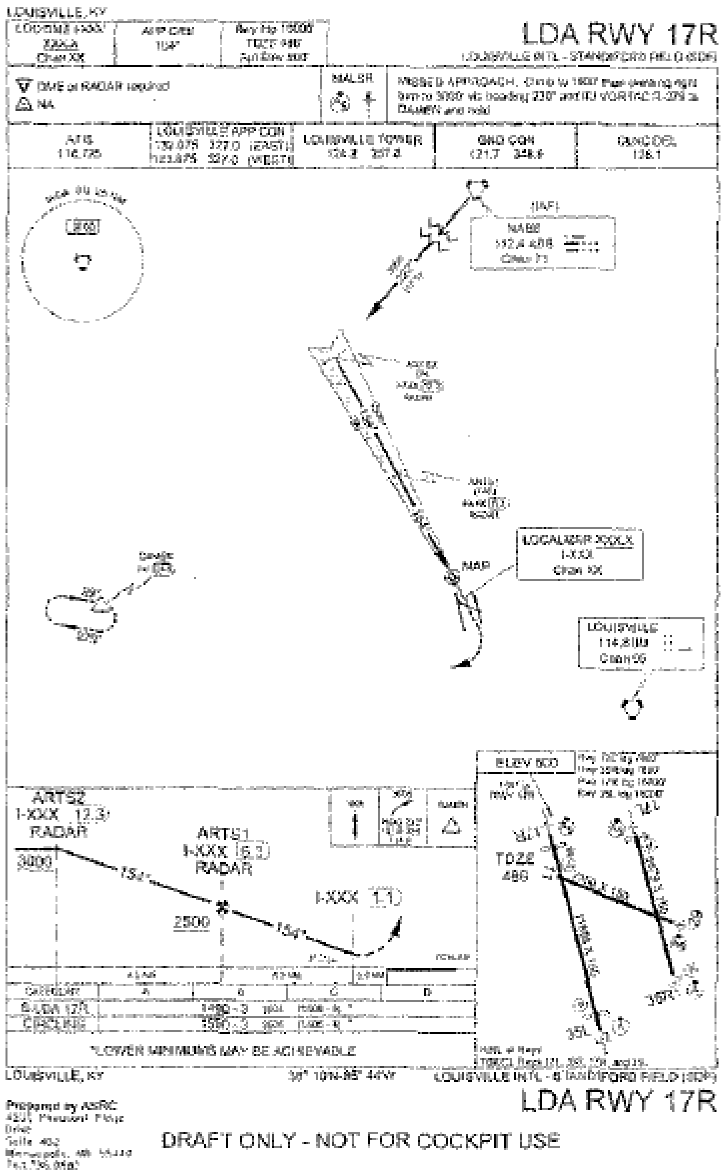
C.T. Miller

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



Attachment 1



Attachment 2

ATTACHMENT 2

U.S. Department
of Transportation
Federal Aviation
Administration

1701 Columbia Avenue
College Park, GA 30337-2748

APR 03 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

[Federal Register: November 18, 2009 (Volume 74, Number 221)]
[Notices]
[Page 59602]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr18no09-106]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Noise Compatibility Program (NCP); 14 CFR Part 150; Notice of Record of Approval (ROA) the Louisville International Airport, Louisville, KY (SDF)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice.

SUMMARY: The Federal Aviation Administration (FAA) announces its findings on the noise compatibility program update submitted by the Louisville Regional Airport Authority (LRAA).

On October 29, 2008, the LRAA submitted to the FAA Air Traffic Organization (ATO) a request with supporting documentation for an offset approach to Runway 17R at Louisville International Airport (SDF). This request was for a re-evaluation of noise abatement measure NA-7, and associated measures NA-2 and NA-3, submitted to the FAA for action in its 2003 NCP but were deferred.

The FAA ATO evaluated the offset approach procedure provided by LRAA. After considerable review and evaluation, the procedure was disapproved. The FAA ATO notified LRAA of its determination on April 3, 2009. Subsequent to ATO's determination, the FAA issued its Record of Approval (ROA) concerning the LRAA's NCP update on August 4, 2009, and disapproved noise abatement measures NA-2, NA-3, and NA-7.

In its evaluation, the FAA reviewed the proposal under 14 CFR part 150 and the Aviation Safety and Noise Abatement Act of 1979. Section 150.35 of Part 150 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.

DATES: Effective Date: The effective date of the FAA's disapproval of the request for an offset approach to Runway 17R at Louisville International Airport is April 3, 2009. The effective date of FAA's ROA of LRAA's NCP update is August 4, 2009.

FOR FURTHER INFORMATION CONTACT: Stephen Wilson, Community Planner, Federal Aviation Administration, Memphis Airports District Office, 2862 Business Park Drive, Building G, Memphis, TN 38118. Documents reflecting this FAA action can be reviewed in person at this same location.

SUPPLEMENTARY INFORMATION: The FAA has reviewed Noise Abatement Measures (NA-2), (NA-3) and (NA-7) in accordance with 14 CFR Part 150.

The ROA contains the FAA's decisions for 3 of the 7 NCP measures that were previously deferred under LRAA's 2003 NCP. The FAA has given its disapproval to the Runway 17R offset approach request at LRAA. All other portions of the previously issued ROA remain in effect.

The following is a brief overview of the request:

On October 29, 2008, the LRAA provided the FAA Air Traffic Organization with a letter and supporting documentation requesting an offset approach to Runway 17R at Louisville International Airport (SDF). This was additional information submitted for re-evaluation of previously submitted but deferred noise abatement measures NA-2, NA-3, and NA-7 in LRAA's 2003 NCP

Issued in Memphis, TN on November 3, 2009.

Tommy L Dupree,
Acting Manager, Memphis Airports District Office, Southern Region.
[FR Doc. E9-27684 Filed 11-17-09; 8:45 am]

Appendix D Proposed Forecast

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Louisville Regional Airport Authority®

Louisville International Airport

Louisville, Kentucky

14 CFR Part 150 Noise Exposure Map Update Draft Activity Forecast 2016–2021

Prepared by:
HMMH
C&S Engineers, Inc.

Revised July 1, 2016

14 CFR Part 150 Noise Exposure Map
Update Activity Forecast, 2016–2021

LOUISVILLE REGIONAL AIRPORT AUTHORITY®

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14 CFR Part 150 Noise Exposure Map
Update Activity Forecast, 2016 and 2021

Section 1—Forecast Background

1.1 Forecast Overview

The Louisville Regional Airport Authority (LRAA) is preparing an update to its Title 14 Code of Federal Regulations (CFR) Part 150 Noise Exposure Map (NEM) for Louisville International Airport (SDF or Airport). In support of this update, detailed aircraft activity forecasts were necessary to model and evaluate the current and projected levels of noise exposure generated from aircraft operations at the Airport.

The forecasts presented in this document are founded on the historical activity and operations trends found at SDF in conjunction with previously prepared airport planning studies, published forecasts, and socioeconomic and other forecast factor data. The last forecast approved by the Federal Aviation Administration (FAA) was in 2011 in the Noise Exposure Map Update at SDF.

To meet the needs of the noise exposure modeling effort, aviation activity forecasts are broken down into the following detail per FAA guidance:

- Existing operations (calendar year 2016, developed according to 2015 activity) and future-year operations (2021)
- Identification of annual average daily operations (i.e., arrivals and departures) by:
    - Activity type (i.e., Passenger Carrier, General Aviation, Cargo and Military)
    - Aircraft type
- Time of day; daytime is defined as 7:00 a.m. to 10:00 p.m., while nighttime is defined as 10:00 p.m. to 7:00 a.m.

It is important to note that the baseline year for the purposes of the activity forecasts was generated from aircraft activity statistics provided by the FAA for the period January 2015 to December 2015. However, the year for the existing contour map to be used in the Part 150 Study is calendar year 2016, which is referred to as existing throughout the report.

1.2 Data Sources

Information factored into the forecasting effort included commercial carrier industry trends, aircraft order and retirement programs, FAA General Aviation (GA) fleet trends, anticipated changes in the aircraft fleet mix operating at SDF, and local and regional socioeconomic trends. The data and assumptions used to define baseline conditions that were used to determine future activity trends were derived from several data sources including:

- Louisville Regional Airport Authority – LRAA provided previously prepared documentation that included aviation activity forecasts and passenger enplanement data.

These included the 2004 Airport Master Plan Update and the 2011 Noise Exposure Map Update.

- Airport operators – A number of airport operators and businesses were contacted to obtain information regarding existing and anticipated activity.
- FAA Terminal Area Forecast (TAF) – The TAF is the official FAA forecast of aviation activity for U.S. airports. Activity estimates are derived from national estimates of aviation activity that are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast. The 2015 TAF was published in January 2016 (hereafter referred to as the 2015 TAF).
- FAA Air Traffic Activity System (ATADS) — The Air Traffic Activity Data System contains the official air traffic operations data available for public release.
- SDF Radar Data — The LRAA provided operations counts by category (air carrier, air taxi, and General Aviation [GA]), airline, aircraft, arrival/departure, day/night, and stage length. This data does not capture all activity and represents approximately 92 percent of the operations recorded through ATADS (aircraft with less than one operation per day and operations with "Unknown" aircraft were not included).
- FAA Traffic Flow Management System Counts (TFMSC) — TFMSC contains data derived from the FAA's Air Traffic Airspace Lab's Traffic Flow Management System. The data provides historical records of aircraft operations including aircraft types operating at SDF.
- Flight Wise — Flight Wise, a commercial online platform, provides live flight tracking data and historical information on aircraft operations at individual airports, including tail numbers, flight numbers, aircraft type, origin and destination, and time enroute. Flight Wise data is used for its historical and real-time information to provide input on flight schedules and aircraft fleet mix.
- Woods & Poole Economics, Inc. — Woods & Poole is an independent firm that specializes in developing long-term economic and demographic projections. Their database includes every state, Metropolitan Statistical Area (MSA), and county in the U.S. and contains historic data and projections through 2050 utilizing more than 900 economic and demographic variables.

1.3 Historical and Existing Aviation Activity

To derive the annual average daily forecasts of aircraft operations by aircraft type required for the NEM update, it is first necessary to identify the baseline level of annual operations on which future activity levels will be based. Historical operations data for 2006 through 2015 was obtained from the FAA ATADS system. ATADS provides historical activity for the following four major users of the air traffic system:

- Air Carrier: Operations include scheduled service on aircraft with more than 60 seats operated by carriers certified under Federal Aviation Regulations (FAR) Part 119 (Certification: Air Carriers and Commercial Operators), whose operations are governed under FAR Part 121 (Operating Requirement: Domestic, Flag and Supplemental Operations). Given the typical capacity of the cargo aircraft at the Airport, the majority of these operations fall under Air Carrier. SDF is a hub for UPS and therefore experiences a significant number of cargo operations. Examples of air carriers at SDF are UPS, Southwest Airlines, and Sky West when aircraft exceed 60 seats.
- Air Taxi and Commuter: Carriers that operate aircraft with 60 or fewer seats or have a cargo payload capacity of less than 18,000 pounds, and carries passengers on an on-demand basis only (charter service) and/or carries cargo or mail on either a scheduled or charter basis. Commuter operators provide scheduled passenger service (five or more round trips per week on at least one route according to published flight schedules) while utilizing aircraft of 60 or fewer seats. Air taxi and commuter carriers are governed under FAR Part 135 (Commuter and On Demand Operations). Sky West, which includes United Express and Delta Connection when aircraft are fewer than 60 seats, is an example of air taxi and commuter at SDF.
- Military: Operations conducted by the nation's military forces. Examples of military aircraft at SDF are KYANG C-130s.
- General Aviation: All other operations not including air carrier, air taxi and commuter, and military. These operations are conducted under FAR Part 91 (General Operating and Flight Rules). General aviation examples at SDF are private jets, helicopters and propeller aircraft.

Airport operations are classified as local and itinerant. Local operations are those operations performed by aircraft that remain in the local traffic pattern, execute simulated instrument approaches or low passes at the airport, and operations to or from the airport and a designated practice area within a 20−mile radius of the tower. Itinerant operations are operations performed by an aircraft, either IFR, SVFR, or VFR that land at an airport, arriving from outside the airport area, or departs an airport and leaves the airport area.

As shown in **Table 1.1**, the FAA ATADS recorded an average annual decrease of 2.0 percent in total airport operations over the 10-year reporting period. The major reductions in operations were associated with air taxi activity. Over the most recent five years the decline has begun to stabilize, which may reflect economic recovery following the Great Recession, the economic downturn from December 2007 through June 2009. The Annual Average Growth Rate (AAGR) for this period was -0.5 percent.

Table 1.1— Historical and Existing Aircraft Operations Data

	Itinerant					Local			All
Calendar Year	**Air Carrier***	**Air Taxi***	**GA**	**Military**	**Sub-Total**	**Civil**	**Mili-tary**	**Sub-Total**	**Total**
2006	86,670	66,476	19,199	7,204	179,549	8	0	8	179,557
2007	98,605	57,731	14,512	2,837	173,685	482	0	482	174,167
2008	96,137	48,121	12,433	2,766	159,457	1,537	60	1,597	161,054
2009	89,305	42,706	10,748	2,590	145,349	972	171	1,143	146,492
2010	91,731	45,238	12,061	2,923	151,953	1,137	90	1,227	153,180
2011	94,505	42,299	12,114	2,860	151,778	996	224	1,220	152,998
2012	92,494	41,137	10,836	2,735	147,202	390	88	478	147,680
2013	94,311	41,502	10,314	2,822	148,949	195	116	311	149,260
2014	97,993	35,146	11,651	2,900	147,690	487	252	739	148,429
2015	104,953	29,004	11,467	2,993	148,417	529	187	716	149,133
Avg. Annual Growth Rate (AAGR) (5-year trend)	**2.8%**	**-8.2%**	**-0.7%**	**0.5%**	**-0.5%**	**7.0%**	**42.3%**	**7.6%**	**-0.5%**
AAGR (10-year trend)	**2.3%**	**-8.5%**	**-4.9%**	**-6.0%**	**-2.0%**	**684.4%**	**38.8%**	**685.9%**	**-2.0%**

*Cargo operations are primarily included in the air carrier activity represented above. Of the 104,953 air carrier operations in 2015, 72,434 were attributed to cargo operators. 2,184 cargo operations were included in the air taxi category.

Source: FAA ATADS, March 2016

1.4 Existing Forecasts

The latest aviation activity forecasts developed for SDF were reviewed to evaluate the projected forecasting trends and the methodologies used to prepare those analyses. Future forecast data was provided from the 2004 Airport Master Plan Update (**Table 1.2**), the 2011 Noise Exposure Map Update (**Table 1.3**), and the FAA 2015 TAF for years 2016 to 2021 (**Table 1.4**).

1.4.1 Airport Master Plan Update (2004)

The most recent Airport Master Plan Update (Master Plan) for SDF was completed in 2004. The Master Plan included an evaluation of forecasted activity at the Airport. The forecast covered a 20-year planning period from 2000 - 2020. **Table 1.2** provides a breakdown of the Master Plan forecast. The forecast projected an Average Annual Growth Rate (AAGR) of 1.9 percent in total aircraft operations and that the majority of gains in operations would be experienced in regional carriers. Recent FAA published operations activity for SDF (see Table 1.1) indicates that the total growth projection was not realized as actual activity has shown a decrease over the past 10 years.

Table 1.2—Airport Master Plan Update Forecasted Operations

Year	Air Carrier	Regional	Air Freight*	Charter	GA	Air Taxi & Others	Military	Total
2000	48,400	16,800	55,462	702	29,700	19,200	4,600	174,864
2005	51,800	24,600	65,110	790	31,200	22,600	4,600	200,700
2010	54,600	28,200	71,672	844	33,900	24,800	4,600	218,616
2020	64,600	38,200	82,232	1,008	41,400	28,600	4,600	260,640
AAGR 1998-2020**	**1.2%**	**5.1%**	**1.8%**	**1.8%**	**1.5%**	**1.8%**	**0%**	**1.9%**

Note: Titles of aircraft operations types are taken from terms used in the 2004 Master Plan.
*Based on the fleet mix presented in the Airport Master Plan Update, the majority of these operations are by aircraft that can hold more than 60 passengers. Therefore, when comparing these numbers to ATADS data, air freight was assumed to be captured under the latter's Air Carrier activity.
**AAGR was presented in the Master Plan according to 1998 – 2020 forecasted totals so may not align with the 2000 – 2020 totals presented in the table.
Source: Louisville International Airport Master Plan Update – December 2004

1.4.2 2011 Noise Exposure Map Update

The previous Noise Exposure Map Update for Louisville International Airport was completed in March 2011 and include an updated forecast that received approval from the FAA. Operations were presented for only the baseline year of 2011 and the forecasted year of 2016. In order to assess the estimated annual increase or decrease a Compound Annual Growth Rate (CAGR) was calculated. (In contrast, other forecasts presented or enabled calculation of the Average Annual Growth Rate [AAGR].) The forecasted totals by activity type and their associated CAGRs are presented below.

Table 1.3—2011 Noise Exposure Map Update Forecasted Operations

Year	Air Carrier	Air Taxi & Commuter	GA	Military	Total
2011	87,876	43,981	11,667	3,344	146,868
2016	90,198	51,236	13,213	3,344	157,991
CAGR	**0.52%**	**3.1%**	**2.52%**	**0%**	**1.48%**

Source: Noise Exposure Map Update Louisville International Airport – March 2011 (Number of Annual Operations Modeled)

1.4.3 Terminal Area Forecast (2016-2021)

The 2015 TAF provides forecasted operations data for passenger enplanements, airport operations, Terminal Radar Approach Control Facilities (TRACON) operations, and based aircraft, and as such serves as the benchmark against which the FAA compares all airport activity forecasts. As shown in **Table 1.4**, the 2015 TAF for Louisville International Airport projects an AAGR of 1.3 percent for total airport operations from 2016 to 2021. Air carrier operations have the largest percentage increase with an annual average increase of 3.4 percent while air taxi operations are forecasted to decrease by 8.4 percent annually on average. Other operations categories show no or only modest growth or decline in the five-year timeframe. It should be noted that cargo activity is included in the air carrier and air taxi/commuter forecasts.

Table 1.4—FAA 2015 TAF

	Itinerant				Local		
Year	Air Carrier*	Air Taxi & Commuter*	GA	Military	Civil	Military	Total
2016	105,959	26,622	11,102	2,953	523	131	147,290
2017	108,933	25,661	11,136	2,953	530	131	149,344
2018	112,483	23,977	11,170	2,953	537	131	151,251
2019	116,319	21,969	11,204	2,953	545	131	153,121
2020	120,454	19,829	11,238	2,953	553	131	155,158
2021	125,097	17,127	11,272	2,953	561	131	157,141
Avg. Annual Increase	**3.4%**	**-8.4%**	**0.3%**	**0.0%**	**1.4%**	**0.0%**	**1.3%**

*Includes cargo activity.
Source: FAA 2015 TAF, January 2016

1.5 Suitability of Existing Forecasts

The above forecasts were reviewed and compared with existing operations and the activity trends over the past 10 years to determine whether or not the projected levels of activity and/or the growth rates applied are suitable for use in updating the SDF aviation forecasts.

1.5.1 Master Plan and NEM Update Forecasts

In reviewing historical activity from 2006 to 2015 as provided via ATADS, activity has declined by an average of 2.0 percent annually. However, the Master Plan forecast projected steady growth from 2000 to 2020 with an AAGR of 1.9 percent. The NEM Update relied on a similar methodology and rates with some modifications reflecting specific growth rates shared by users. The resultant forecast anticipated an increase in activity from 2011 to 2016 with a CAGR of 1.8 percent (again, only a CAGR could be calculated as opposed to an AAGR). Because this discrepancy represents total activity, individual activity types (or cohorts) and the associated trends were also reviewed. Over the past decade, air taxi activity declined, which was not anticipated in the Master Plan or NEM Update forecasts. Although both projected growth for air carrier activity, ATADS showed a more significant growth rate than was projected (2.3 percent AAGR over the 10-year period and 2.8 percent over the most recent five years).

General Aviation (GA) activity, both local and itinerant, has fluctuated over the past decade. According to the ATADS data, local non-commercial, non-military activity has increased from eight operations in 2006 to 529 in 2015, representing an AAGR of 684 percent. Growth has been more moderate, however, in the most recent five years with an AAGR of seven percent. Itinerant GA activity has experienced an AAGR of -4.9 percent over the past decade and -0.7 percent over the past five years. In order to compare this with the Master Plan and NEM Update, local and iterant GA activity provided through the ATADS were combined, showing an AAGR from 2006 to 2015 of -4.0 percent. The Master Plan Update projected an average annual increase of 1.5 percent and the NEM Update forecast showed a CAGR of 2.5 percent.

Despite a significant drop in itinerant military activity from 2006 to 2007, total military operations have remained fairly steady with minor fluctuations since then. The Master Plan and NEM Update anticipated no change in activity from 2011 to 2016.

Due to the variance between the existing activity levels and projections presented, the Master Plan and NEM Update forecasts are deemed unsuitable for use in the development of an updated forecast.

1.5.2 FAA 2015 TAF

The FAA 2015 TAF for the Airport was also assessed for suitability in updating future projections. As mentioned above, historical activity recorded via ATADS showed an average annual decline of 2.0 percent from 2006 to 2015, which is equal to what was represented in the 2015 TAF over this timeframe. Further, current operations represented in the ATADS are comparable to the last recorded, i.e., not projected, level included in the 2015 TAF. Given the consistency of the historical TAF and ATADS records, the considerations incorporated into the 2015 TAF forecast development, and the projected growth rates that consider the different activity types – or cohorts – **the 2015 TAF will serve as a starting point for establishing an updated forecast. This will be supplemented by a review of socioeconomic and industry forecast factors that may influence airport usage over the planning horizon, as well as information provided through interviews with major operators at the Airport to understand potential changes in activity and fleet mix.**

1.6 Forecast Factors

With the 2016 existing operations numbers established, this section will describe the socioeconomic and industry forecast factors, or trends, that are expected to influence airport usage over the planning horizon.

1.6.1 Aviation Industry Trends

Multiple industry data sources in addition to those described previously were used to identify aviation trends that are anticipated to influence activity at SDF over the planning horizon. The following describes these sources and how the identified trends were applied to the aviation activity forecasts:

- The FAA National Aviation Forecast is a cumulative total of all U.S. airports and provides the anticipated national growth in enplanements, operations, and GA aircraft. The national growth rates and forecasts will differ from the Airport-specific SDF 2015 TAF forecast since the SDF 2015 TAF is, as is each individual airport's TAF, based on assumptions of local growth and market demand.
- The FAA Aerospace Forecast, Fiscal Years (FY) 2016-2036 provides an overview of aviation industry trends and expected growth for the commercial passenger carrier, cargo carrier, and GA activity segments. National growth rates in enplanements, operations, fleet growth and fleet mix for commercial fleets and the GA fleet are provided over a 20-year forecast horizon.
- The Boeing Current Market Outlook 2015-2034 provides insight into future commercial carrier fleet growth and anticipated fleet mix of both domestic and foreign airlines.
- The Boeing World Air Cargo Forecast 2014-2015 provides insight into future air cargo growth both worldwide and domestically. With the flat and negative traffic growth during the few years prior to 2013, the slow and steady growth that began later in 2013 and continued throughout 2014 shows an uptick that continues to gather strength. This growth will increase the number of airplanes in the freighter fleets by more than half by the end of the forecast period reported.

These insights were used to assist in developing and confirming the validity of future SDF commercial carrier fleet mix assumptions.

1.6.2 Socioeconomic Trends Affecting Aviation

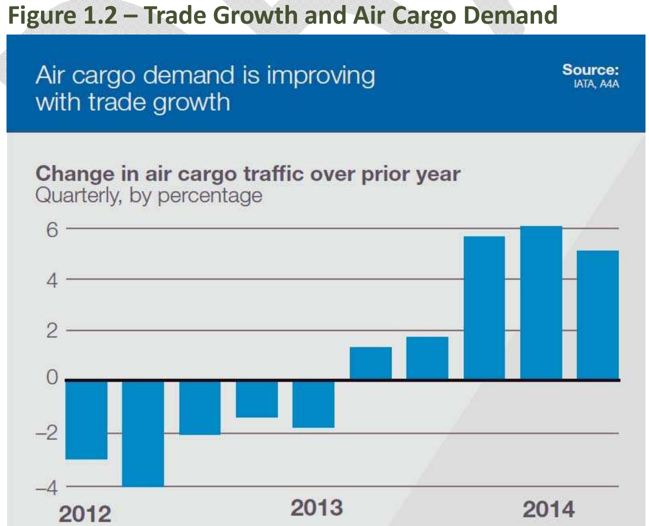
Cargo Activity

Given the significant amount of cargo activity at the Airport, it is important to consider socioeconomic trends that may influence this. While commercial and GA activity are more connected to local factors, cargo operations are better represented by national or even global socioeconomic trends. As a measure of economic performance, world merchandise trade is an important indicator of long-term air cargo traffic trends. The following figures published by the CBP Netherlands Bureau for Economic Policy Analysis (CBP) and International Air Transport Association (IATA) show the correlation of air cargo demand and trade growth.

Figure 1.1 – Economic Strength and Trade Growth

Source: The Boeing World Air Cargo Forecast 2014-2015

Figure 1.2 – Trade Growth and Air Cargo Demand



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Source: The Boeing World Air Cargo Forecast 2014-2015

Looking forward, world air cargo traffic is projected to more than double over the next 20 years according to the Boeing World Air Cargo Forecast 2014-2015.

Commercial and General Aviation Activity

As noted above, commercial service and GA operations are typically influenced by national and regional trends in population, per capita income, and employment, as well as airport prominence, and flights offered. The population growth, or decline, could have a direct influence on the level of demand for aviation services. Per capita income is usually a strong indicator of a community's discretionary income and ability to afford flying, either commercially or recreationally. For these reasons, a clear understanding of local demographic and economic forces and trends is important for developing an accurate aviation activity forecast.

To this end, historic and projected data of population and per capita income in the United States, State of Kentucky, and Louisville/Jefferson County (which makes up the Louisville/Jefferson Metropolitan Statistical Area [MSA]), were obtained from Woods & Poole Economics, Inc. The socioeconomic data shows projected growth in the two key indicators of future Airport use, population growth and per capita income, for the Louisville/Jefferson County MSA over the forecast period. The following describes these trends.

Louisville/Jefferson County Population Trends

The historic and projected populations and corresponding average annual growth rates (AAGR) for the Louisville/Jefferson County MSA, the State of Kentucky, and the United States for years 2005 through 2013 (historic) and 2014 through 2021 (projected) are shown in **Table 1.5 and Figure 1.3**. These trends show that the historic Louisville/Jefferson County population growth is equivalent to that reported for the United States, and greater than that of the State of Kentucky.

For years 2014 through 2021, the projected population growth of the Louisville/Jefferson County MSA is anticipated to be equivalent to those projected for the State of Kentucky and the national average.

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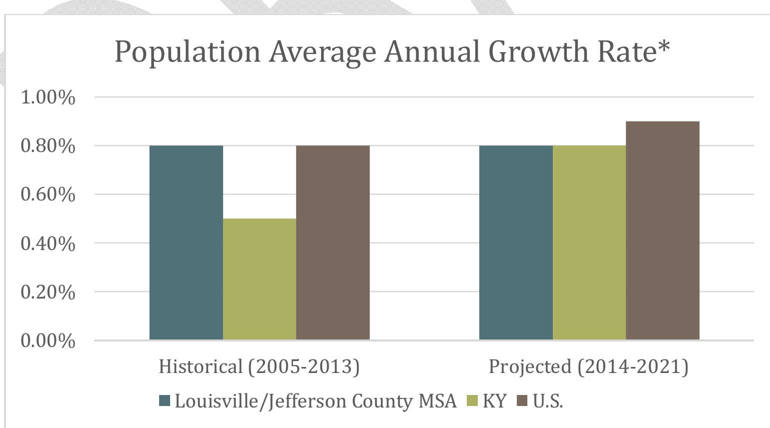
Table 1.5— Historic and Projected Population

Year	Louisville/ Jefferson County MSA (1000s)	Growth Rate*	KY (1000s)	Growth Rate*	U.S. (1000s)	Growth Rate*
2005	1,173	-	4,183	-	295,517	-
2010	1,238	1.1%	4,348	0.8%	309,326	0.9%
2011	1,245	0.6%	4,367	0.4%	311,583	0.7%
2012	1,252	0.5%	4,380	0.3%	313,874	0.7%
2013	1,262	0.9%	4,395	0.4%	316,129	0.7%
2005 – 2013 AAGR*		**0.8%**		**0.5%**		**0.8%**
2014	1,271	0.7%	4,425	0.7%	318,699	0.8%
2015	1,280	0.7%	4,457	0.7%	321,449	0.9%
2016	1,291	0.8%	4,491	0.8%	324,392	0.9%
2017	1,301	0.8%	4,526	0.8%	327,372	0.9%
2018	1,311	0.8%	4,561	0.8%	330,383	0.9%
2019	1,321	0.8%	4,596	0.8%	333,427	0.9%
2020	1,332	0.8%	4,631	0.8%	336,500	0.9%
2021	1,342	0.8%	4,667	0.8%	339,602	0.9%
2014 – 2021 AAGR*		**0.8%**		**0.8%**		**0.9%**

*Annual growth rates calculated for 2006 – 2013; compound annual growth rate calculated for 2000 – 2005. AAGR includes average of all rates.
Source: Woods & Poole Economics, Inc., 2015

Figure 1.3— Historic and Projected Population Growth Rates



*Annual growth rates calculated for 2006 – 2013; compound annual growth rate calculated for 2000 – 2005. Figures represent average of all rates.

Source: Woods & Poole Economics, Inc., 2015

Louisville/Jefferson County MSA per Capita Income Trends

The historic and projected per capita income for the Louisville/Jefferson County MSA, the State of Kentucky, and the United States are shown in **Table 1.6 and Figure 1.2**. As shown, the historic per capita income growth rate for the Louisville/Jefferson County MSA is equivalent to the State of Kentucky and below the United States. For the years 2014-2021, the projected per capita income growth for the Louisville/Jefferson County MSA will rise to be comparable to the State of Kentucky and the United States, with less than 0.1 percent differences amongst the three.

Table 1.6 — Historic and Projected Per Capita Income

Year	Louisville/ Jefferson County MSA ($)	Growth Rate*	KY ($)	Growth Rate*	U.S. ($)	Growth Rate*
2005	34,723	-	29,211	-	35,888	-
2010	37,561	1.6%	32,929	2.4%	40,145	2.3%
2011	39,094	4.1%	34,568	5.0%	42,332	5.4%
2012	41,404	5.9%	35,857	3.7%	44,200	4.4%
2013	41,477	0.2%	36,214	1.0%	44,765	1.3%
2005 – 2013 AAGR		**3.0%**		**3.0%**		**3.4%**
2014	42,758	3.1%	37,277	2.9%	46,044	2.9%
2015	44,087	3.1%	38,470	3.2%	47,472	3.1%
2016	45,531	3.3%	39,764	3.4%	49,022	3.3%
2017	47,107	3.5%	41,173	3.5%	50,709	3.4%
2018	48,814	3.6%	42,700	3.7%	52,532	3.6%
2019	50,639	3.7%	44,332	3.8%	54,479	3.7%
2020	52,595	3.9%	46,083	4.0%	56,563	3.8%
2021	54,652	3.9%	47,923	4.0%	58,757	3.9%
2014– 2021 AAGR		**3.5%**		**3.6%**		**3.5%**

*Annual growth rates calculated for 2006 – 2013; compound annual growth rate calculated for 2000 – 2005. AAGR includes average of all rates.

Source: Woods & Poole Economics, Inc. 2015

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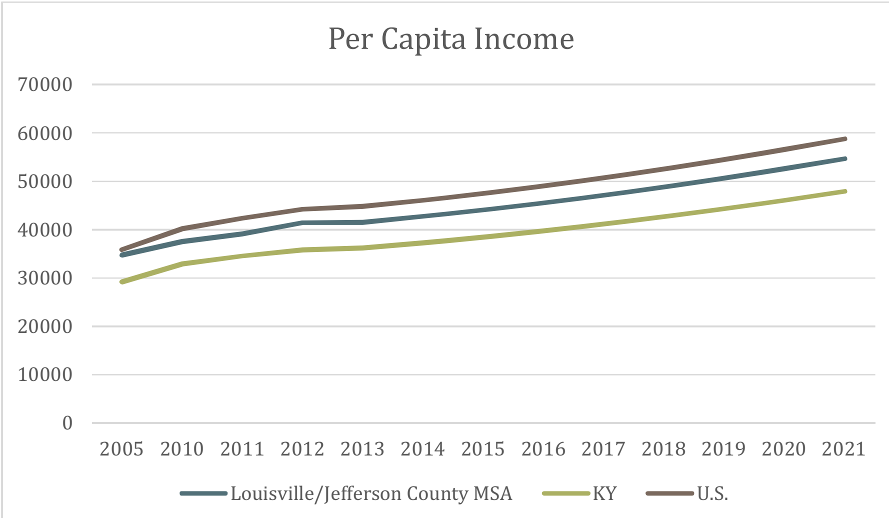
Figure 1.4— Historic and Projected Per Capita Income



Note: 2014 and beyond are projected.

Source: Woods & Poole Economics, Inc. 2015

While historical and projected growth in key socioeconomic factors for the state of Kentucky is slightly slower compared to the national trends, growth rates for the Louisville/Jefferson County MSA are more aligned with the U.S. growth rates. Because no significant difference is noticeable, regional adjustments to the FAA 2015 TAF projections for commercial and GA activity are not necessary.

Section 2—Commercial Passenger Operations Forecasts

This section presents the development and results of the activity forecast and fleet mix for passenger commercial air carrier and air taxi operations, including discussions of overall trends, airline and market factors, and trends in the use of specific aircraft types.

2.1 Commercial Passenger Operations Forecast Factors

Commercial operations at SDF were adjusted to follow the trends provided in the FAA 2015 TAF for the five-year forecasting period.[1] The increase in air carrier operations is indicative of the continued increase in passenger enplanements projected by the FAA 2015 TAF.

Table 2.1 presents the commercial service forecast for the years 2016 to 2021. Commercial operations growth at SDF is directly associated with the growth in passenger activity and changes to the commercial aircraft fleet mix. The forecast incorporates specific factors directly related to SDF based on information provided by the airlines and the Airport:

- The passenger market at SDF is mature with no anticipated additional carriers or routes in the five-year planning horizon.
- Gains in passenger activity are anticipated as a result of the population growth and national/regional trends.
- Delta Airlines provided input and noted its intention to continue servicing SDF, though there are no plans for facility improvements that would affect capacity or levels of future operations. Delta Connection carriers at SDF include:
    - Compass
    - Endeavor
    - Express Jet
    - GoJet
    - Shuttle America
    - Sky West
- Passenger load factors are expected to increase in line with national projections over the five-year forecasting period. While passenger/enplanement growth is expected to increase at a rate of 2.07% according to the FAA 2015 TAF, the growth will likely be accommodated through larger aircraft rather than an increase in operations.
- The overall growth will be experienced in air carrier aircraft (greater than 50 seats) as air taxi aircraft will continue to decrease operations at SDF as airlines adjust their fleet mix.

[1] Because the ATADS and TAF data compile cargo activity with air carrier operations, the former was omitted from the totals for determining commercial activity.

Baseline operations (2015) were calculated from data provided in ATADS. Aircraft types recorded in radar data provided by the Airport was supplemented with the TFMSC where possible to more accurately represent total activity indicated in the ATADS. Remaining operations were assigned to aircraft according to the percentages represented in the Radar data. Projected growth in the air carrier and air taxi activity is aligned with the 2015 TAF forecasted growth rates with some adjustments made based on airline-specific input that indicated intended fleet changes, definitively shifting certain activity from air taxi to air carrier. This resulted in a higher growth rate compared to the 2015 TAF in the air carrier activity and a more dramatic reduction rate in the air taxi activity.

Table 2.1— Commercial Passenger Operations Forecast

Year	Air Carrier	Air Taxi & Commuter	Annual Operations
2015 (Baseline)	32,519*	26,820*	59,339
2016	34,937	23,916	58,853
2017	37,393	21,146	58,539
2018	39,887	18,498	58,386
2019	42,422	15,963	58,385
2020	44,999	13,530	58,528
2021	47,618	11,191	58,809
Avg. Annual Increase	**6.6%**	**-13.5%**	**-0.2 %**

*Omits cargo activity reported in ATADS under air carrier and air taxi but attributed to cargo operators per radar data.

Source: C&S Engineers, Inc.

2.2 Fleet Mix Assumptions

The commercial aircraft fleet mix projections are a function of the scheduled commercial airlines that operate (or are expected to operate) at the Airport during the forecast period. SDF currently has four major airline carriers and a number of regional carriers that provide service to 25 destinations. Each airline's fleet mix and forecasted enplanement levels influence a carrier's aircraft type and level of operations. This data is then coupled with the forecast commercial air carrier operations to determine the number of annual arrival and departures by aircraft type.

The first step in determining SDF's future commercial carrier fleet mix is identifying the overall market trends that will drive future airline fleets, as well as aircraft fleet mix decisions specific to each airline operating at the Airport. Recent trends at SDF have shown that 50-

seat regional jets (CRJ200) are being replaced by larger 70- and 90-plus seat regional jets as well as single aisle aircraft.

Specific fleet mix characteristics and trends were identified and applied directly to the passenger carrier forecasts through 2021. In order to provide a detailed picture of future SDF operations, the following assumptions are based upon airline-specific fleet plans and aircraft orders, as well as overall industry trends:

- As 50-seat regional jet operations transition to 70-seat aircraft; likewise a percentage of 70-seat regional jet operations will transition to larger 80-plus seat and 99-seat regional jets. A narrow-body mainline aircraft (B737, A319/320) could also replace a regional jet for certain routes in peak periods.
- Growth at SDF is expected to mimic national trends in passenger growth. It is anticipated that this growth will be handled by increased gauge of aircraft rather than by increased frequency of operations. A new, passenger-serving business model that may be offered could include scheduled service on business jet aircraft. There are no specific offerings planned as of yet so these will not be incorporated into the 2021 forecast.
- Delta Airlines feedback:
    - The MD80 aircraft will remain in its fleet through the forecast period; however, some will be replaced by B717 aircraft. Estimates for 2021 anticipate even distribution of these two aircraft.
    - 50-seat aircraft (ERJ 145, CRJ 200) will be phased out by 2021 and replaced with larger regional jet aircraft (such as the CRJ 900).
- Compass Airlines does not expect any changes to equipment or levels of operations anticipated for the five-year period.

2.3 Forecast Presentation

In accordance with Part 150 guidance, operations are shown by arrivals and departures, and time-of-day. Time-of-day indicates whether the operation take place in the day or night. The following presents the parameters that define the time-of-day metrics:

- Day – arrival and departures that occur between 7:00 am to 10:00 pm
- Night – arrival and departures that occur between 10:00 pm to 7:00 am

Due to the number of aircraft types used by the commercial carriers, a detailed breakdown of the projections by aircraft is included in the Appendix.

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Update Activity Forecast, 2016 and 2021

Table 2.2— 2015 Commercial Passenger Operations Baseline (Annual Operations)

	Arrivals			Departures			
Category	Day	Night	Total Ops	Day	Night	Total Ops	Total Ops
Air Carrier (> 60 passenger)	12,309	3,951	16,260	13,424	2,836	16,260	32,519
Air Taxi (< 60 passenger)	10,070	3,340	13,410	10,720	2,690	13,410	26,820
Total	22,379	7,290	29,670	24,144	5,526	29,670	59,339

Source: C&S Engineers, Inc. Note: Totals are calculated with formulas and are rounded.

Table 2.3— 2016 Commercial Passenger Operations Forecast (Annual Operations)

	Arrivals			Departures			
Category	Day	Night	Total Ops	Day	Night	Total Ops	Total Ops
Air Carrier (> 60 passenger)	13,303	4,166	17,469	14,480	2,988	17,469	34,937
Air Taxi (< 60 passenger)	8,951	3,007	11,958	9,532	2,426	11,958	23,916
Total	22,254	7,173	29,427	24,013	5,414	29,427	58,853

Source: C&S Engineers, Inc. Note: Totals are calculated with formulas and are rounded.

Table 2.4— 2021 Commercial Passenger Operations Forecast (Annual Operations)

	Arrivals			Departures			
Category	Day	Night	Total Ops	Day	Night	Total Ops	Total Ops
Air Carrier (> 60 passenger)	18,496	5,313	23,809	20,006	3,803	23,809	47,618
Air Taxi (< 60 passenger)	3,996	1,600	5,596	4,282	1,313	5,596	11,191
Total	22,492	6,913	29,405	24,289	5,116	29,405	58,809

Source: C&S Engineers, Inc. Note: Totals are calculated with formulas and are rounded.

Section 3—Cargo Carrier Operations Forecast

Similar to most sectors within the aviation industry, air cargo activity and demand is cyclical in nature and fluctuates based upon both national and global economic trends. As documented in Section 1.6.2, world air cargo traffic is projected to more than double over the next 20 years according to the Boeing World Air Cargo Forecast 2014-2015. Significant growth is also anticipated in the United States. According to the FAA Aerospace Forecasts, FY 2016 – 2036, specific factors that influence air cargo activity include movement of real yields, fuel price instability, and globalization. According to the Aerospace Forecast, air cargo – measured by revenue ton miles (RTMs) – will grow 4.5 percent in 2016 and is projected to grow at an AAGR of 3.5 percent throughout the remainder of the forecast period (2036). However, domestic air cargo growth is forecast to increase at a modest AAGR of 0.4 percent. International cargo is forecast to increase an average of 4.7 percent per year over the next 20 years.

Air cargo traffic is comprised of freight and express cargo, and mail. United Parcel Service (UPS) has its air distribution hub at SDF and is responsible for the majority of cargo operations, of which less than five percent are associated with international destinations. FedEx and other cargo operators also operate at the Airport, though entirely to/from U.S. destinations and on a smaller scale. Cargo activity made up 74,618 operations in 2015. Aircraft used by the cargo operators include the Airbus 300-600 (A306) and the Boeing 767-300 (B763) (contributing the greatest percentage of cargo operations); the Boeing 757-200 (B752) and Boeing (Douglas) MD 11, which represent the next greatest contributors of cargo operations; and the Boeing 747-400 (B744), Boeing 727-200 (B722), the Shorts 360 (SH36), and the Shorts 330 (SH33) that contributes the remaining activity. According to the cargo providers contacted, the aircraft types are anticipated to remain the same though there may be slight fluctuations in the breakdown activity. UPS provided a detailed forecast of their cargo activity, which was used in the activity projections. For the remaining activity, growth was anticipated to mimic domestic air cargo trends using an AAGR of 0.4 percent. The following tables present the baseline, 2016 and 2021 cargo operations. A detailed breakdown of the projections by aircraft is included in the Appendix.

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Table 3.1— 2015 Baseline Cargo Forecast (Annual Operations)

	Arrivals			Departures			
	Day	Night	Total Ops	Day	Night	Total Ops	Total Ops
Total	9,811	27,498	37,309	10,451	26,858	37,309	74,618

Source: C&S Engineers, Inc.
Note: Totals are calculated with formulas and rounded.

Table 3.2— 2016 Cargo Forecast (Annual Operations)

	Arrivals			Departures			
	Day	Night	Total Ops	Day	Night	Total Ops	Total Ops
Total	9,983	27,800	37,784	10,658	27,126	37,784	75,568

Source: C&S Engineers, Inc.
Note: Totals are calculated with formulas and rounded.

Table 3.3— 2021 Cargo Forecast (Annual Operations)

	Arrivals			Departures			
	Day	Night	Total Ops	Day	Night	Total Ops	Total Ops
Total	10,646	30,327	40,973	11,280	29,693	40,973	81,946

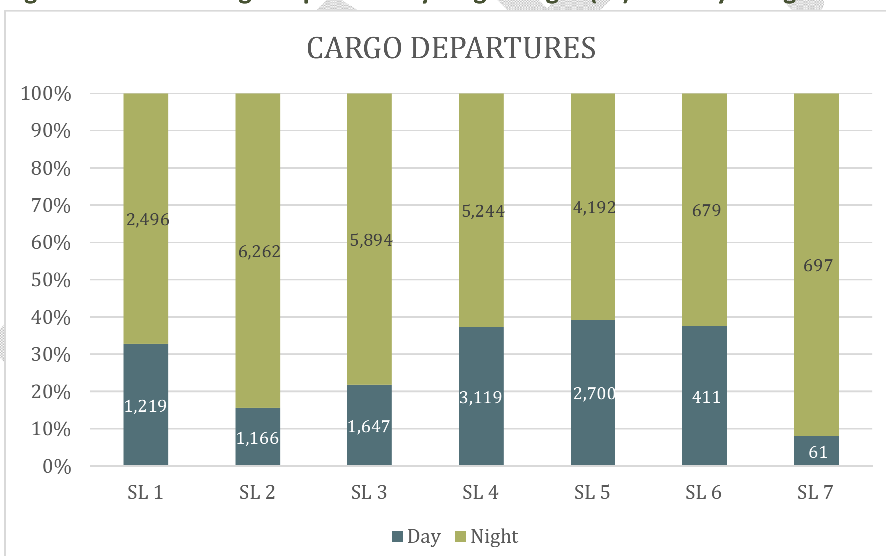
Source: C&S Engineers, Inc.
Note: Totals are calculated with formulas and rounded.

3.1 Stage Length Adjustments

Within the Aviation Environmental Design Tool (AEDT) database, the FAA's software used to produce the contours for the Noise Exposure Maps, aircraft departure profiles are usually defined by a range of trip distances identified as "stage lengths." A longer trip distance or higher stage length is associated with a heavier aircraft due to the increase in fuel requirements for the flight. For this study, city pair distances were determined for each departure flight track and used in most cases to define the specific stage length using the AEDT standard definitions. Given that cargo flights typically take off with an increased average takeoff weight, stage lengths were adjusted where expected takeoff weight (TOW) were known. Applicable stage lengths associated with the TOW by aircraft were provided by the AEDT database and assigned to forecasted activity.

Figure 3.1 below depicts the day/night breakdown of stage lengths of the cargo operations that had information available on their TOWs.

Figure 3.1—2016 Cargo Departures by Stage Length (SL) and Day v. Night



Source: C&S Engineers, Inc.

Section 4—General Aviation Operations Forecast

There are a variety of aviation activities that comprise the broad definition of general aviation (GA). GA includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled commercial cargo, and military operations.

GA represents the largest percentage of civil aircraft in the U.S. and accounts for the majority of operations handled by towered and non-towered airports, as well as the majority of certificated pilots. Its activities include flight training, sightseeing, aerial photography, recreational, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi charter operations. GA aircraft encompass a broad range of types, from single-engine piston aircraft to large corporate jets, as well as rotorcraft, gliders, and amateur-built aircraft.

GA operations at SDF are divided by local and itinerant activity and include single-engine piston, multi-engine piston, turbo-prop, jet and rotorcraft aircraft. GA growth rates for the forecast period, as presented in the 2015 TAF, show itinerant GA operations growing at an AAGR of 0.3 percent from 2015 to 2021 and local GA operations growing at an AAGR of 1.4 percent. The 2015 TAF for SDF already adjusts the national growth rates for GA operations to levels that reflect conditions of the Airport's market area. According to the Fixed-Base Operator (FBO) at the Airport, GA activity is anticipated to mimic national trends. The forecast scenario therefore utilizes TAF-based growth factors applied to actual 2015 operations.

For the purposes of the approved forecast, the 2015 TAF for SDF annual growth numbers were used as the variable for yearly GA operations growth. However, the individual aircraft types were adjusted based on the FAA Aerospace Forecast data.

Table 4.1 shows the FAA Aerospace Forecast for FY 2016 – 2036 annual growth rates predictions for active aircraft within the GA fleet. It is important to note that these numbers represent the fleet growth per aircraft type, not to be confused with operations.

Table 4.1— National GA Fleet Growth Rates

Years	Single-Engine Piston*	Multi-Engine Piston	Turbo Prop	Turbo Jet	Rotorcraft
2015 - 2021	-0.34%	-0.42 %	-0.63%	+1.91%	+2.66%

*Includes sport and experimental aircraft.
Source: FAA Aerospace Forecast for FY 2016 – 2036

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Again, note that these forecast factors do not represent anticipated growth in operations by the respective aircraft type, but rather indicate the anticipated growth in their numbers within the GA operational fleet. These figures do, however, provide insight into what aircraft will drive incremental operations growth at SDF; piston and turbo prop operations will decline and jet and rotorcraft operations form the bulk of incremental growth. The existing breakdown of GA activity by aircraft type is provided below.

Table 4.2— Breakdown of GA Activity by Aircraft Type

Single-Engine Piston	Multi-Engine Piston	Turbo Prop	Turbo Jet	Rotorcraft	Unknown
6.8%	2.6%	9.5%	79.5%	0.8%	0.8%

Source: Radar Data supplemented by TFMSC, 2015.

As shown above, jet activity already represents the most significant portion of GA operations at the Airport. Given the short-term planning horizon (five years) it is unlikely that significant shifts in the fleet mix will occur over this timeframe. Therefore, the existing breakdown percentages were applied to the forecast for this NEM update.

ATADS data was used to calculate the baseline scenario. The next step applied growth rates provided by the 2015 TAF forecast to calculate the operations for GA activity. This was then broken down by aircraft type according to the radar data provided by the Airport, which was supplemented with TFMSC data. **Table 4.3** shows a summary of these operations by the aircraft categories previously mentioned.

Table 4.3—General Aviation Forecast

Year	Single-Engine Piston	Multi-Engine Piston	Turbo Prop	Jet	Rotor-craft	UNK	Total
2015	820	309	1,144	9,531	92	100	11,996
2016	823	310	1,148	9,565	92	100	12,039
2017	826	312	1,152	9,598	92	100	12,081
2018	829	313	1,156	9,632	93	101	12,124
2019	832	314	1,160	9,667	93	101	12,167
2020	835	315	1,165	9,701	93	101	12,210
2021	838	316	1,169	9,735	94	102	12,254

Note: Touch-and-go activity is assumed to be included in these numbers and are counted as one arrival and one departure for a total of two operations.

Source: C&S Engineers, Inc.

Section 5—Military Operations Forecast

Military operations forecasts and projected fleet mix composition at SDF are based on data provided through ATADS and the FAA 2015 TAF. Military aircraft and operations are simply defined as aircraft and operations conducted by the nation's military forces. Military aircraft are also included in the based aircraft and operations projections, but are not forecast in the same manner as GA activity since their number, location, and activity levels are not a function of anticipated market and economic conditions, but are rather a function of military decisions, national security priorities, and budget pressures that cannot be predicted over the course of the forecast period. Therefore, for the purposes of this forecast, the military operations were projected to remain static at baseline year levels throughout the forecast period. This is consistent with the FAA 2015 TAF and discussions with KYANG and the fixed-base operators that refuel transient military aircraft.

Military operations at SDF are derived in two ways: based military aircraft and transient military operations (i.e., military aircraft not attached to the KYANG based at SDF). Based military aircraft operating at SDF are comprised of only the Lockheed C-130. These operate three times per week, twice per day, with two aircraft per departure operation (which are counted as 1.5 operations for FAA ATCT service level purposes). Each arrival represents a single aircraft/operation. Departures occur in the afternoon and evening; one-fourth of the annual evening departures return after 10:00 p.m. Additional KYANG activity includes one to three aircraft departing once per week as a single aircraft per departure operation (these also return). Again, approximately one-fourth of the evening operations return to/arrive at SDF after 10:00 p.m. on an annual basis. In total, KYANG is responsible for 1,560 annual operations. This is not accurately represented in the ATADS data, which counts the departing formation operations as 1.5 rather than 2 operations. KYANG military activity is anticipated to remain steady through the planning horizon.

According to ATADS data, there were 2,993 itinerant military operations (excluding overflights) and 187 local military operations in 2015 for a total of 3,180 operations. Of these, 1,404 are assumed to be attributed to KYANG (when adjusting for the formation departures that are not accurately reflected in the ATADS data), leaving 1,776 operations that are occurring by transient aircraft. The vast majority (estimated at 95 percent) of these are occurring during daytime hours.

TFMSC data was reviewed to provide a breakdown of the transient military activity, which includes operations primarily by the Raytheon Texan 2 (greatest percentage), Northrop T-38 Talon, Beechjet 400, F-18s, and other aircraft including a number of helicopters – of which the Sikorsky SH-60 Seahawk represents the greatest activity. The transient aircraft mix is difficult to predict through the forecast period; for the purposes of this forecast, it is assumed that the transient military fleet mix will remain constant. In addition, all transient military operations are categorized as itinerant operations. For modeling purposes, transient activity is divided by the major aircraft contributors named above.

The following provides a summary of the assumptions and methodologies used to calculate the 2016 and 2021 Military Operations forecasts.

5.1 Assumptions

- Operation counts are based on information provided by the KYANG and both ATADS and TFMSC data.
- All non-based aircraft operations are itinerant operations.
- No increases or changes in fleet mix are anticipated.

5.2 Methodologies

- ATADS counts for local military activity were attributed entirely to the based aircraft though updated to reflect the actual operations per information provided by KYANG.
- Per the KYANG no changes in activity are projected.
- The non-based operations were estimated according to information provided by the ATADS and TFMSC data.

Table 5.1—Military Forecast

	KYANG (C-130)	Other (Raytheon Texan 2)	Other (Northrop T-38 Talon)	Other (Beechjet 400)	Other (F-18)	Other (Helo – SH-60)	Total
2015	1,560	710	356	356	180	174	3,336
2016	1,560	710	356	356	180	174	3,336
2017	1,560	710	356	356	180	174	3,336
2018	1,560	710	356	356	180	174	3,336
2019	1,560	710	356	356	180	174	3,336
2020	1,560	710	356	356	180	174	3,336
2021	1,560	710	356	356	180	174	3,336

Note: Touch-and-go activity is assumed to be included in these numbers and are counted as one arrival and one departure for a total of two operations.

Source: KYANG; C&S Engineers, Inc.

Section 6—Forecast Summary

The Forecast Summary summarizes the total operations profile of SDF through the forecast period (2016 to 2021) by aircraft category and type. This forecast was designed to provide a detailed picture of SDF's current and forecasted operations for use in updating the Airport's Part 150 Noise Exposure Map. It equally provides an overview of the Airport, its users, and the internal and external factors that influence future growth. The data gathered, analyzed and presented, coupled with industry research and a range of meetings with Airport staff, tenants and local government representatives, were instrumental in gaining a full understanding of the driving forces behind SDF's future activity levels. In order to ensure the greatest confidence in the findings of this Part 150 NEM Update forecast, the approach, level of research, data analysis, and due diligence applied were completed to meet the guidance outlined under FAA Advisory Circular (AC) 150/5070-6B–Airport Master Plans.

The following tables are provided to present the entirety of the forecast findings in a concise, yet comprehensive, format that brings together all of the elements from forecasting effort. SDF operations by activity type are shown in Table 6.1. Overall, operations are projected to grow at a compound annual growth rate of 0.77 percent. Table 6.1 also provides a comparison of the forecast to the FAA 2015 TAF. As shown in the table, the total operations forecast is within ten percent (.5 percent) of the 2015 TAF for the five-year forecast (2021). According to FAA guidance, forecasts that differ by less than ten percent in the five-year forecast period are considered consistent with the TAF.

Table 6.1—Operations Forecast Summary by Aircraft Category

	Year				2021 Ops Forecast v. FAA 2015 TAF
Aircraft Category	**2015**	**2016**	**2021**	**FAA 2015 TAF 2021**	**2021 Ops Forecast Percentage Comparison**
Commercial	59,339	58,853	58,809		
Cargo	74,618	75,568	81,946		
General Aviation	11,996	12,039	12,254		
Military	3,336	3,336	3,336		
Total	149,289	149,796	156,345	**157,141**	**-0.5%**

*2015 total differs from that reported in ATADS due to the manner by which FAA calculates military formation departures; see earlier discussion.

Source: C&S Engineers, Inc., FAA 2015 TAF, January 2016

Appendix A provides a detailed breakdown of operations by time-of-day for each aircraft type. This includes all aircraft types that will be included in the noise analysis. Due to rounding some column totals may be off by one operation.

14 CFR Part 150 Noise Exposure Map
Update Activity Forecast, 2016 and 2021

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Appendix A – Aircraft Operations Forecast Input Tables

Provided Separately

Appendix E Letter of Submittal to FAA for Approval of Non-Standard Aircraft Substitution Modeling

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TECHNICAL MEMORANDUM

To:	Robert Slattery Louisville Regional Airport Authority Noise/Environmental Programs Coordinator 700 Administration Drive P.O. Box 9129 Louisville, KY 40209
From:	Diana Wasiuk and Justin Divens, HMMH
Date:	May 5, 2016
Subject:	Louisville International Airport (SDF) Part 150 Noise Exposure Map – Substitution Aircraft Request
Reference:	SDF NEM Update, HMMH Project No. 307940.000

INTRODUCTION

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). The study will address aircraft noise and land-use compatibility projections based on Day-Night Sound Level (DNL) contours developed using the most current release of the Aviation Environmental Design Tool (AEDT); i.e., Version 2b. Consistent with Federal Aviation Administration (FAA) policies and procedures, we submit this request for approval of the identified aircraft types of interest (Attachment A).

HMMH recommends that LRAA submit this request to FAA. FAA should review and approve these AEDT 2b substitutes for use in this NEM Update, or provide appropriate guidance. We would be pleased to answer any questions you have regarding this request.

As a matter of convenience, we have also copied representatives in FAA's Airport Planning and Environmental Division (APP-400) and the Office of Environment and Energy Noise Division (AEE-100).

ATTACHMENT A

AEDT AIRCRAFT SUBSTITUTION REQUESTS AND SUGGESTIONS

The aircraft types listed in Table 1 are included in the Noise Exposure Map (NEM) Update and require FAA approved substitution. In each case, we have identified a substitute for each aircraft using the AEDT 2b database. The basis for our recommendations is discussed following Table 1.

The 2011 SDF NEM Nonstandard Aircraft Request memo included 29 aircraft that needed approval for FAA's Integrated Noise Model (INM) version 7.0b. The AEDT model now includes many of those substitutions as standard.

Table 1 – Aircraft Types and Recommended AEDT Substitutions

#	Group	Aircraft Code	Represented Aircraft Models	Recommended AEDT Substitution
1.1	Jet	BE40	Beechjet 400	MU3001 with JT15D-5 engines AEDT 2b Equipment ID 2100
1.2	Piston Prop	DA40	Diamond DA-40 Katana, Diamond Star	GASEPV

1.1 Beechjet 400 – BE40

We propose to model Beechjet 400 operations with AEDT ANP ID MU3001 with JT15D-5 engines (AEDT Equipment ID 2100). [1]

The Beechjet 400, the Raytheon Hawker 400XP and the USAF's T-1A Jayhawk, are essentially the same aircraft as the Mitsubishi MU-300-10 Diamond II powered by Pratt & Whitney JT15D-5 engines (ANP Airplane MU3001/AEDT 2b Equipment ID 2100). Beech bought the Diamond II program from Mitsubishi in December of 1985.[2] Beech renamed the Diamond II program the Beechjet 400. Both aircraft have JT15D-5 engines. In fact, the noise certification data for the Mitsubishi MU-300-10 Diamond II and Beechjet 400 is exactly the same for all categories in FAA Advisory Circular (AC) 36-1H, Appendix 1. Table 2 presents certification data for the Beechjet 400 (BE40) and the proposed ANP Airplane MU3001/AEDT 2b Equipment ID 2100.

The MU-300-10 Diamond II/ Beechjet 400 program continued under several marketing names, including the Hawker 400XP, and several corporate names, including Raytheon, Hawker Beechcraft and Hawker.[3] In 2010, the last production Hawker 400XP still had JT15D-5 engines and take-off weights similar to the original Mitsubishi MU-300-10 Diamond II. Likewise, the USAF's T-1A Jayhawk is a military version of the Beechjet 400 with the same JT15D-5 engines.

[1] AEDT 2b SP2 associated the BE40 to equipment IDs 2024, does offer the option of the Beehjet with ANP aircraft CNA500, however the CNA500 has JT15D-4 engines instead of has JT15D-4 engines.
[2] Note that the Mitsubishi MU-300 Diamond I, powered by JT15D-4 engines is a different aircraft from the MU-300-10 Diamond II, and Beech only continued with the latter.
[3] It should be noted that the Hawker 400XP is different aircraft than the similarly named Raytheon Hawker 125- 400 powered by TFE731 engines/aircraft type designator H25A.

Table 2 – Noise Certification Data for Beechjet 400

Manufacturer	Model	Engine Model	MTOW (lb)	Noise Level (EPNdB)		
				Takeoff	Sideline	Approach
BEECH	BEECHJET 400	JT15D-5	15,780	88.6	93.7	91.4
MITSUBISHI	MU-300-10 (DIAM. II)	JT15D-5	15,780	88.6	93.7	91.4

Source: FAA AC 36-1H, as posted on https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/22942 , as viewed on April 20, 2016.

1.2 Diamond DA-40 Katana, Diamond Star – DA40

We propose to model Diamond DA-40 Katana, Diamond Star operations with AEDT type GASEPV.

The Diamond DA-40 is a single-engine propeller aircraft powered by a Continental IO-360 engine. These aircraft are all small single-engine aircraft with a two or three-blade, constant-speed, variable pitch propeller that would probably be best modeled as AEDT type GASEPV (General Aviation Single Engine Piston Variable-pitch).

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Appendix F FAA Response to LRAA on Non-Standard Aircraft Substitution Modeling Request

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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

Date: July 07, 2016

Aaron Braswell
Environmental Protection Specialist
Federal Aviation Administration
2600 Thousand Oasks Bldv, Suite 2250
Memphis, TN 38118

Dear Mr. Braswell,

The Office of Environment and Energy (AEE) has received the memo dated May 6, 2016, requesting approval of using two user-defined aircraft (the BE40 and the DA40) in noise modeling. Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority (LRAA) to prepare a Noise Exposure Map Update for Louisville International Airport (SDF) using the Aviation Environmental Design Tool (AEDT) Version 2b.

AEE reviewed and approved the proposed substitutions. Please understand that this approval is limited to this particular project for SDF. Any additional projects or non-standard AEDT input at SDF or any other site will require separate approval.

Sincerely,

Rebecca Cointin
Manager, AEE/Noise Division

cc: Jim Byers, APP-400

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Appendix G Submittals to FAA for Approval of Non-Standard Aircraft Profiles Modeling Request

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TECHNICAL MEMORANDUM

To:	Aaron Braswell Environmental Protection Specialist Memphis Airports District Office Federal Aviation Administration 2600 Thousand Oaks Blvd., Suite 2250 Memphis, TN 38118
CC:	Bob Slattery, LRAA
From:	Diana Wasiuk and Justin Divens, HMMH
Date:	July 26, 2016
Subject:	Request for AEDT 2b User Defined Profiles for SDF NEM Update
Reference:	SDF NEM Update, HMMH Project No. 307940.000

INTRODUCTION

Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority (LRAA) to prepare Noise Exposure Map (NEM) update for Louisville International Airport (SDF). In addition to our previous request for approval of substitute aircraft types, we are also requesting approval of user-defined profiles for several aircraft.

Activity by the cargo aircraft in this submittal represents a very important segment of operations at SDF. They constitute over 50% 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 70% of departures by these aircraft occur during the nighttime period.

The Boeing Company (Boeing) was a member of the NEM contractor team for the 2011 SDF NEM Update. Boeing prepared the flight profiles, described in this request, for the then current Integrated Noise Model 7.0b (INM) and were subsequently approved by the FAA for use in the 2011 SDF NEM. Review of the current (2015) SDF radar data and airline procedures verifies that the Boeing-developed profiles developed and approved for the 2011 NEM are still relevant to current aircraft operations. Relevant materials from the 2011 NEM are reproduced as appendices to this letter.

The stagelength distribution applied to the cargo aircraft for noise modeling will be based upon forecasted weight information provided by the cargo operator. Whereas the exact distribution is still in development, the majority of cargo operations will be assigned to stagelengths 1 – 5, while stagelengths 6 – 9 will be used much less. Stagelength 1 – 5 profiles show high agreement with the 2015 radar data, as shown in the radar comparison figures in each aircraft appendix.

We have converted the profiles 2011 NEM from INM 7.0b format into AEDT 2b SP2. This user-defined profile submission has been prepared for in accordance with FAA guidance.[1] The profile information, and supporting documentation, is included in the following appendices:

[1] 1050.1F Desk Reference Appendix C. "Guidance on Using the Aviation Environmental Design Tool (AEDT) 2b to Conduct Environmental Modeling for FAA Actions subject to NEPA July 2015" is available on the FAA's AEDT2b website https://aedt.faa.gov/2b_information.aspx, as document "AEDT 2b NEPA Guidance (PDF), last updated 7/16/2015" viewed on 4/24/2016. Although this project is a Noise Exposure Map,

- Appendix A – Boeing Letter of Concurrence from the 2011 SDF NEM
- Appendix B – 757RR Profile Review with AEDT 2b
- Appendix C – 767300 Profile Review with AEDT 2b
- Appendix D – MD11GE Profile Review with AEDT 2b
- Appendix E – MD11PW Profile Review with AEDT 2b
- Appendix F – AEDT 2b Profile Performance Data Excel file
- Appendix G – 2011 SDF NEM Appendix G: Submittals to FAA for Approval of Non-standard Aircraft Profiles Modeling Request
- Appendix H – AEDT 2b study used for this non-standard profile submittal
- Appendix I – UPS concurrence memo

Appendices F, G and H are large electronic files that will be transmitted separately.

We have presented this profile submission to UPS, the operator of the aircraft in question, and have obtained their concurrence. The concurrence memo can be found in Appendix I.

On behalf of the LRAA, we request that the FAA approve these AEDT 2b user-defined profiles for the ongoing Louisville NEM Update. We would be pleased to answer any questions that FAA has regarding this request. Please don't hesitate to contact Diana Wasiuk by phone at (339) 234 2038 or by email at dwasiuk@hmmh.com.

Thank you for your assistance on this matter.

Sincerely yours,

D. Wasiuk

Harris Miller Miller & Hanson Inc. d/b/a/ HMMH
Diana Wasiuk
Chief Operating Officer

"Section 5.3.2 User-defined profiles" of the referenced document appears to provide the most relevant guidance for preparing this request for FAA review.

Aaron Braswell
July 26, 2016
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Appendix A

Boeing Letter of Concurrence from the 2011 SDF NEM

hmmh

BOEING

September 18, 2010

The Boeing Company (Boeing) is assisting, as a subcontractor to Harris Miller Miller & Hanson Inc., the Louisville Regional Airport Authority with the Noise Exposure Map Update for Louisville International Airport (FAA designator SDF). Boeing's work was related to custom flight profiles (user-defined INM profiles) for the Integrated Noise Model version 7.0b (INM).

User-Defined Profiles

Boeing supplied custom flight profiles for this study to account for the effects of reduced thrust takeoff typically in use under the average day conditions at SDF. The Assumed Temperature Method is a common way to reduce takeoff thrust. If the takeoff weight is lower than the performance limited weight at the ambient temperature (OAT), it is possible to assume a higher temperature that meets all the takeoff performance requirements.

Boeing Performance Software (BPS Standard Takeoff Software Version 2.14) was used to calculate the maximum weight, by runway, for an assumed temperature and compared to the standard INM weights for the relevant portion of the Boeing fleet. These temperatures were then fed into the Boeing Climb Out Program (BCOP Version 1.1) to get the custom flight profiles. This BCOP version was the same version shared with the FAA under a cooperative agreement with Boeing. These profiles were verified by Boeing Performance Software group.

In each case the climb thrust was chosen to be lower than the assumed temperature takeoff thrust at cutback. For very light airplanes this can be "CLB2" (the deepest cutback). For the highest weights, Max Climb is used. In between, "CLB1" is used. Sometimes climb thrust is barely lower than assumed temperature takeoff thrust. Also, climb thrust available is not smooth with takeoff weight and is not constant.

For the 757-200 and the 767-300, CLB2 is used, as it is low enough for all takeoff weights and thrusts. The MD-11 profiles were all based on the ambient temperature and did not model the assumed temperature.

These profiles are defined in INM profile point format (profile.dbf, prof_pts.dbf). In particular:

* the altitudes have been entered in terms of altitude above field elevation in units of feet
* the speed has been entered in terms of true airspeed in units of knots
* thrust has been entered in units of pounds, which matches the thrust-setting parameters used in the INM aircraft's associated noise-power-distance curves

These profiles are based on airline input and extensive consultation with HMMH to match radar track data. Boeing believes these profiles are the best fit for the conditions specified in Louisville.

David W. Forsyth, Lead Engineer
Airport Noise Engineering

Magaly Cruz, Lead Engineer
Performance Software Engineering

Appendix B

757RR Profile Review with AEDT 2b

Section 1 – Background
We are submitting this request for written approval of changes to the Aviation Environmental Design Tool, Version 2b (AEDT 2b) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing 757RR operating procedures as provided by The Boeing Company (Boeing) for the 2011 SDF Noise Exposure Map Update modeled with INM 7.0b. The profiles developed for INM 7.0b are assumed to be applicable to AEDT 2b.

Section 2 – Statement of Benefit
The AEDT does not contain profiles for the de-rated thrust departure procedures which are utilized by cargo operators at SDF. In addition, operators at SDF use "Climb 2" (CLB2) thrust instead of "Climb". The updated 757RR Boeing 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. Figure 1 and Figure 2 compare the standard AEDT profiles and Boeing profiles to actual aircraft climb performance at SDF. Figure 3 and Figure 4 compare the standard AEDT profiles and Boeing profiles to actual aircraft speed profiles at SDF. The Boeing profiles are presented in the figure legends in the following format: "Name – Stagelength"

Section 3 – Analysis Demonstrating Benefit
The differences between the existing 757RR profiles in AEDT 2b and the recommended Boeing-developed profiles are primarily due to the use of de-rated thrust on departure. Tables 1 through 6 show the SEL results under the flight path from the Boeing-developed departure; the standard AEDT departure profiles are presented for comparison.

The results of the analysis are very similar to the results documented to support the 2011 SDF NEM 757RR profiles. That documentation is reproduced as Appendix G of this letter.

Section 4 – Concurrence on Aircraft Performance
The profiles in this document were created by Boeing for the 2011 SDF Noise Exposure Map Update. Boeing's letter of concurrence from 2010 is attached as Appendix A of this letter. Airline concurrence was also received to verify the current relevance of the user-defined profiles. The airline concurrence letter is attached as Appendix I.

Section 5 – Certification of New Parameters
The Boeing-developed points-type profiles were input into the AEDT. An AEDT study containing the Boeing-developed profiles is included as an appendix to this letter. 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.

Section 6 – 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. Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figure 5, Figure 6, and Figure 7.

Aaron Braswell
July 26, 2016
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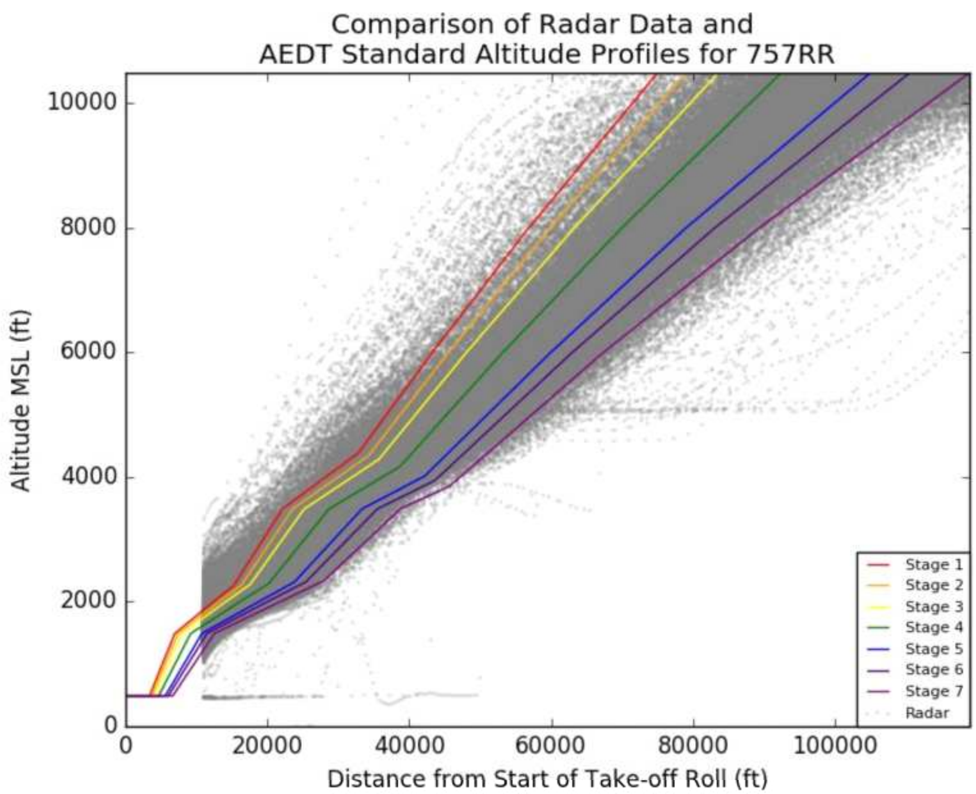

Figure 1 – 757RR AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

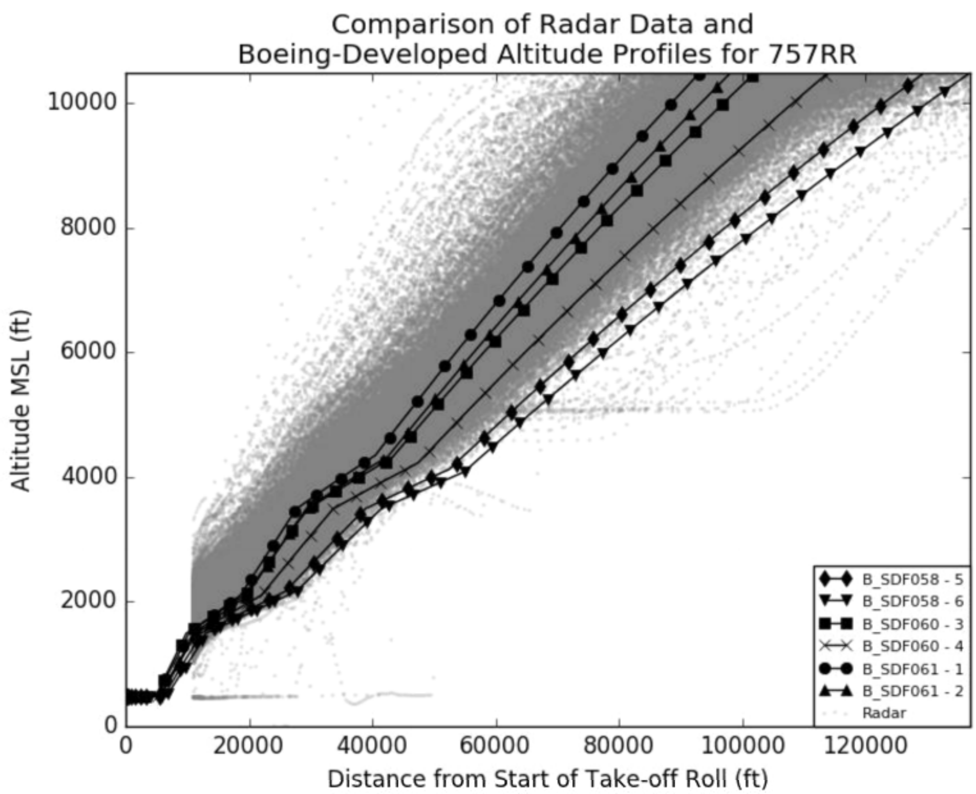

Figure 2 – 757RR Boeing Altitude Profiles Compared to Actual Aircraft Performance

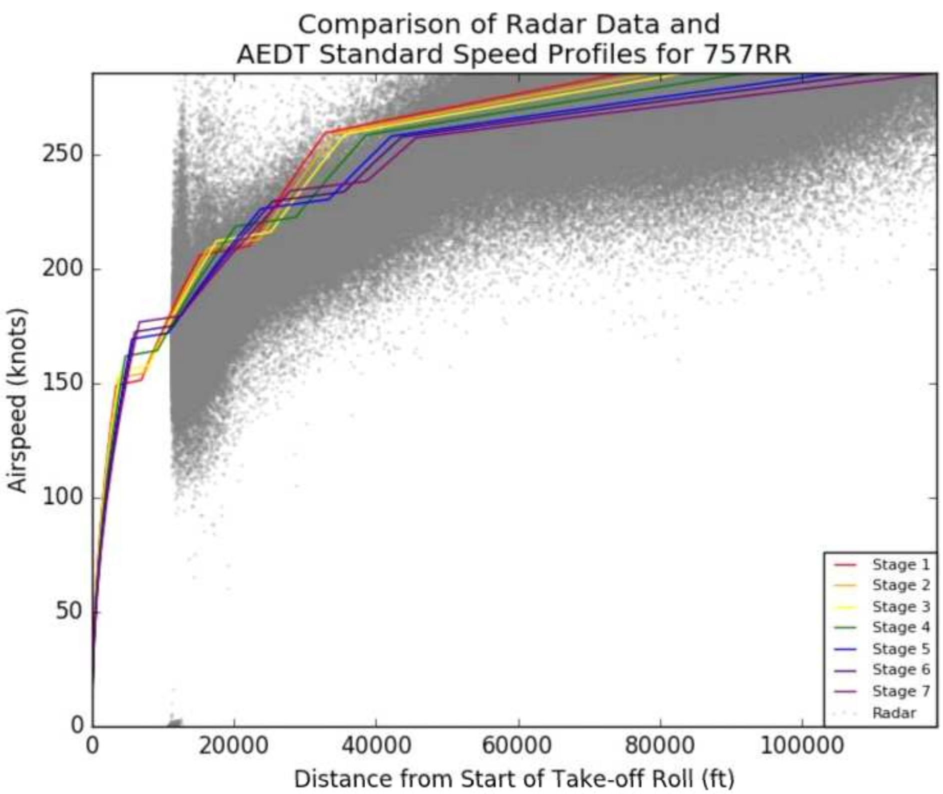

Figure 3 – 757RR AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

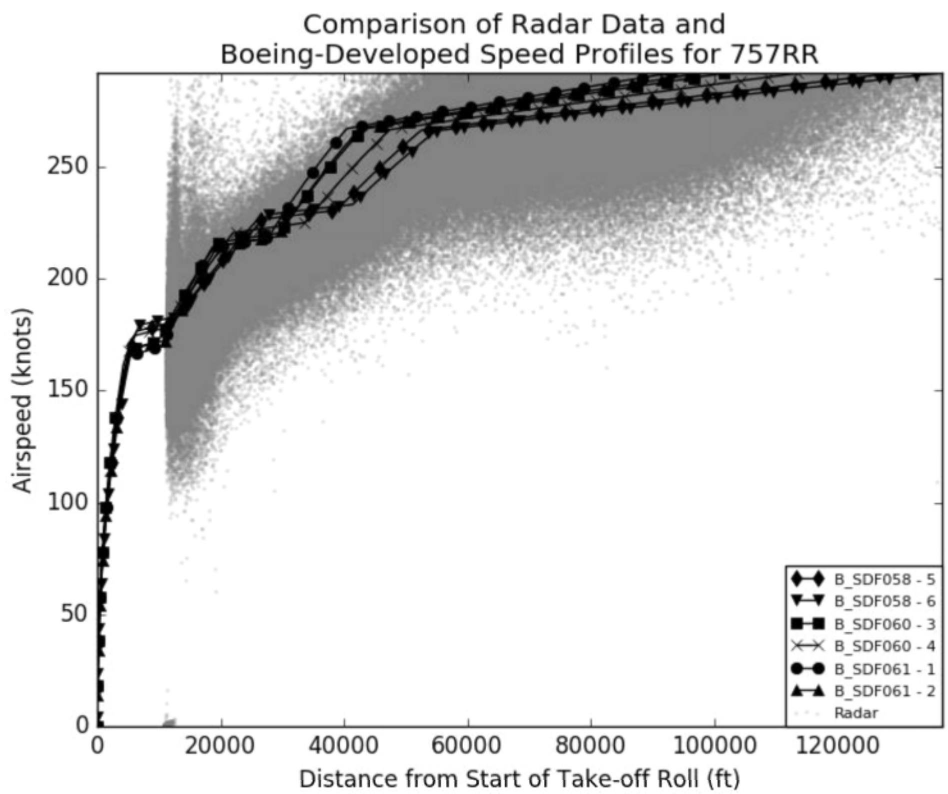

Figure 4 – 757RR Boeing Speed Profiles Compared to Actual Aircraft Performance

Table 1 - Comparison of 757RR Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 757RR
Profile Weight: 183,900 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF061

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.2	131.9	1.7
0.5	118.9	116.9	-2.0
1.0	100.4	105.0	4.6
1.5	93.1	96.6	3.4
2.0	90.6	91.3	0.7
2.5	88.6	89.3	0.7
3.0	86.8	87.8	0.9
3.5	85.3	86.1	0.7
4.0	84.2	84.5	0.3
4.5	83.1	83.2	0.1
5.0	82.1	82.2	0.1
5.5	81.0	81.3	0.4
6.0	80.2	80.5	0.4
6.5	79.4	79.8	0.4
7.0	78.6	79.1	0.5
7.5	78.0	78.3	0.3
8.0	77.4	77.6	0.2
8.5	76.8	77.0	0.2
9.0	76.3	76.5	0.2
9.5	75.7	75.9	0.2
10.0	75.3	75.4	0.1

Table 2 – Comparison of 757RR Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 757RR
Profile Weight: 191,200 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF061

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.1	131.9	1.8
0.5	118.9	118.2	-0.7
1.0	101.0	107.3	6.3
1.5	93.7	97.6	3.9
2.0	91.1	92.0	0.9
2.5	89.2	89.8	0.6
3.0	87.4	88.3	0.8
3.5	85.8	86.6	0.8
4.0	84.6	85.1	0.5
4.5	83.5	83.7	0.3
5.0	82.5	82.7	0.2
5.5	81.5	81.8	0.3
6.0	80.7	81.0	0.3
6.5	79.8	80.3	0.5
7.0	79.1	79.6	0.4
7.5	78.4	78.9	0.5
8.0	77.9	78.2	0.3
8.5	77.3	77.6	0.2
9.0	76.8	77.0	0.2
9.5	76.3	76.4	0.2
10.0	75.7	75.9	0.2

Table 3 – Comparison of 757RR Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 757RR
Profile Weight: 199,100 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF060

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.0	133.8	3.8
0.5	120.0	118.3	-1.7
1.0	102.1	105.4	3.3
1.5	94.4	97.5	3.1
2.0	91.5	91.1	-0.4
2.5	89.7	89.4	-0.3
3.0	88.0	88.0	-0.1
3.5	86.3	86.5	0.1
4.0	85.0	85.0	0.0
4.5	84.0	83.7	-0.3
5.0	83.0	82.7	-0.3
5.5	82.1	81.9	-0.2
6.0	81.1	81.1	0.0
6.5	80.4	80.4	0.1
7.0	79.6	79.8	0.1
7.5	79.0	79.1	0.1
8.0	78.3	78.4	0.1
8.5	77.8	77.8	0.0
9.0	77.3	77.2	0.0
9.5	76.8	76.7	-0.1
10.0	76.3	76.2	-0.1

Table 4 – Comparison of 757RR Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 757RR
Profile Weight: 215,200 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF060

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.3	133.9	3.5
0.5	119.3	118.5	-0.7
1.0	104.7	112.0	7.3
1.5	98.2	99.5	1.3
2.0	92.3	92.6	0.3
2.5	90.5	90.2	-0.3
3.0	89.0	88.8	-0.1
3.5	87.6	87.6	0.0
4.0	86.1	86.3	0.2
4.5	84.9	85.0	0.0
5.0	84.0	83.8	-0.1
5.5	83.0	82.9	-0.1
6.0	82.3	82.1	-0.2
6.5	81.4	81.4	0.0
7.0	80.6	80.8	0.1
7.5	79.9	80.2	0.2
8.0	79.3	79.6	0.2
8.5	78.8	79.0	0.2
9.0	78.2	78.3	0.1
9.5	77.7	77.8	0.1
10.0	77.2	77.3	0.1

Table 5 – Comparison of 757RR Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 757RR
Profile Weight: 234,800 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF058

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.1	134.7	4.6
0.5	119.8	120.8	1.0
1.0	110.7	118.9	8.3
1.5	99.7	101.6	1.9
2.0	93.5	95.5	2.0
2.5	91.5	90.8	-0.7
3.0	90.0	89.5	-0.5
3.5	88.7	88.4	-0.3
4.0	87.5	87.4	-0.1
4.5	86.1	86.3	0.2
5.0	85.0	85.2	0.1
5.5	84.1	84.1	0.0
6.0	83.3	83.2	-0.1
6.5	82.6	82.4	-0.2
7.0	81.8	81.8	0.0
7.5	81.1	81.2	0.1
8.0	80.5	80.7	0.2
8.5	79.9	80.1	0.3
9.0	79.4	79.6	0.2
9.5	78.9	79.1	0.2
10.0	78.3	78.5	0.2

Table 6 – Comparison of 757RR Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 757RR
Profile Weight: 243,200 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF058

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.1	134.8	4.7
0.5	119.7	120.3	0.6
1.0	122.2	120.3	-1.9
1.5	100.7	102.9	2.3
2.0	95.2	97.9	2.7
2.5	91.8	91.2	-0.5
3.0	90.3	89.8	-0.5
3.5	89.1	88.8	-0.3
4.0	88.1	87.8	-0.3
4.5	86.8	86.9	0.1
5.0	85.6	85.8	0.2
5.5	84.6	84.7	0.1
6.0	83.8	83.8	0.0
6.5	83.0	83.0	0.0
7.0	82.4	82.3	-0.1
7.5	81.6	81.7	0.0
8.0	80.9	81.1	0.2
8.5	80.3	80.6	0.3
9.0	79.8	80.1	0.3
9.5	79.3	79.6	0.3
10.0	78.8	79.1	0.3

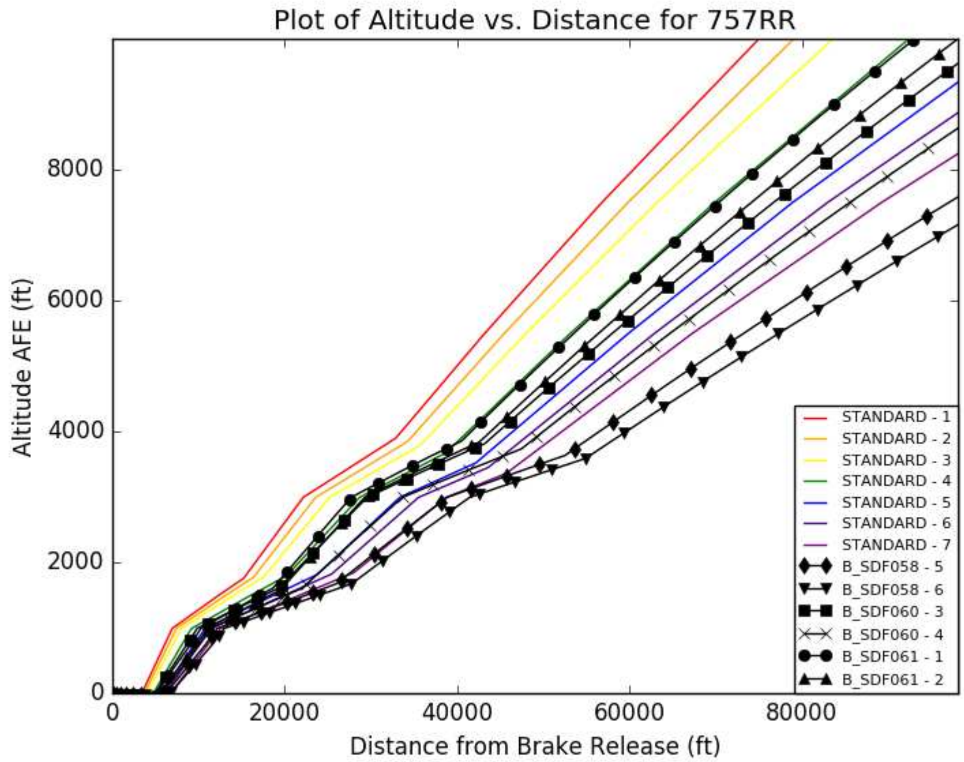

Figure 5 – 757RR Altitude vs. Distance

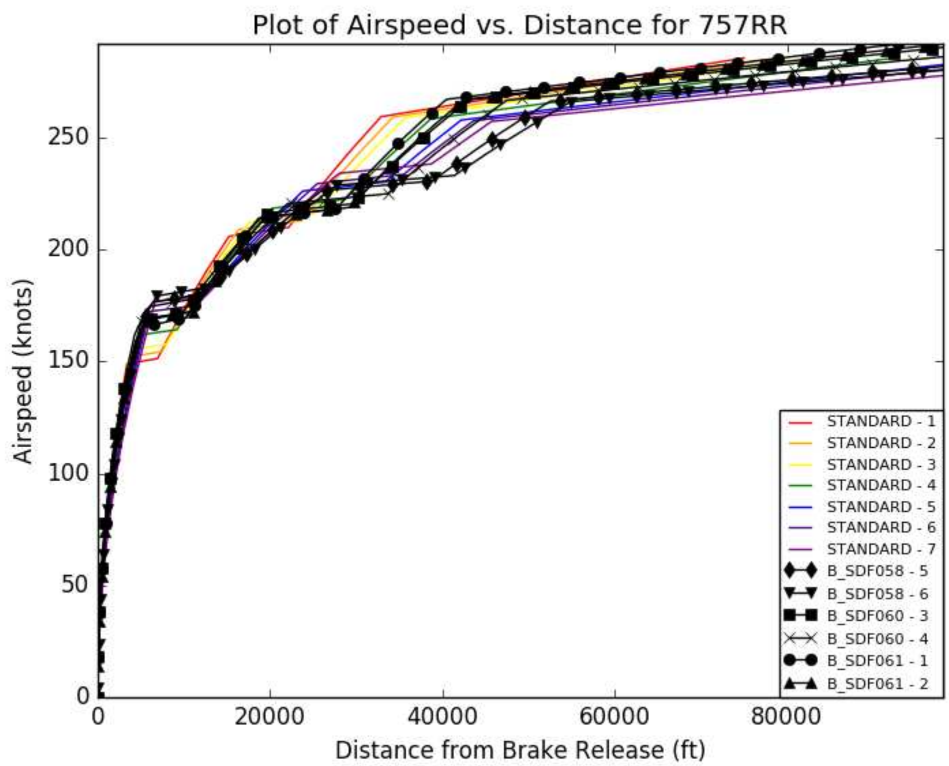

Figure 6 – 757RR Speed vs. Distance

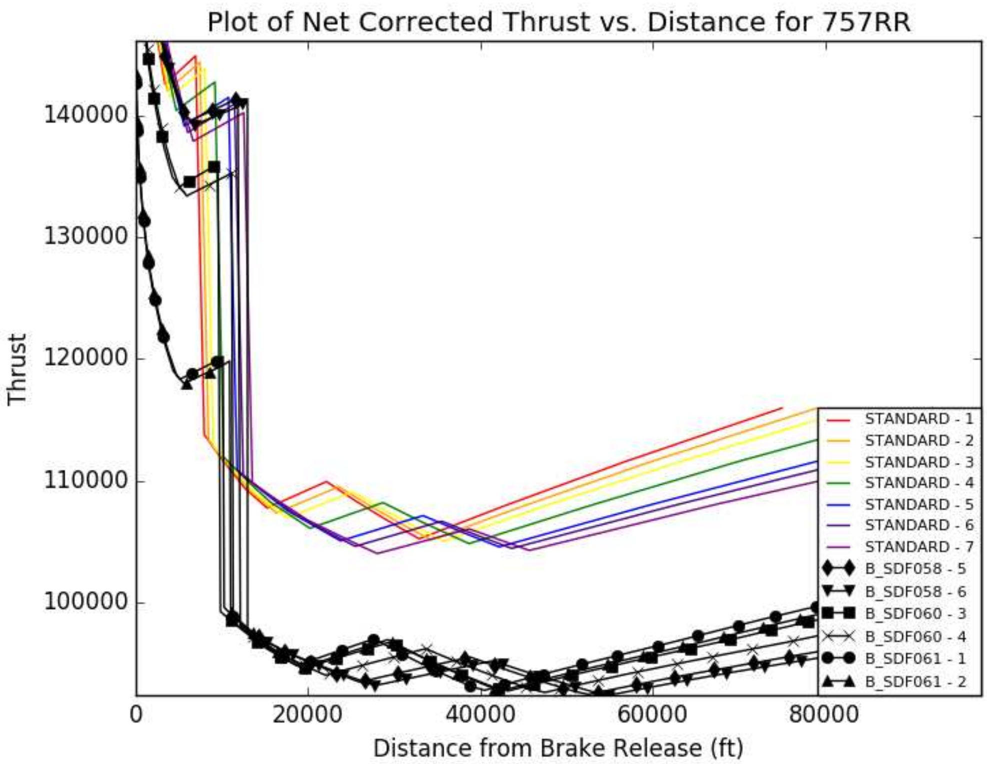

Figure 7 – 757RR Thrust vs. Distance

Appendix C
767300 Profile Review with AEDT 2b

Section 1 – Background
We are submitting this request for written approval of changes to the Aviation Environmental Design Tool, Version 2b (AEDT) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing 767300 operating procedures as provided by The Boeing Company (Boeing) for the 2011 SDF Noise Exposure Map Update modeled with INM 7.0b. The profiles developed for INM 7.0b are assumed to be applicable to AEDT 2b.

Section 2 – Statement of Benefit
AEDT does not contain profiles for the de-rated thrust departure procedures which are utilized by cargo operators at SDF. In addition, operators at SDF use "Climb 2" (CLB2) thrust instead of "Climb". The updated 767300 Boeing 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. Figure 8 and Figure 9 compare the standard AEDT profiles and Boeing profiles to actual aircraft climb performance at SDF. Figure 10 and Figure 11 compare the standard AEDT profiles and Boeing profiles to actual aircraft speed profiles at SDF. The Boeing profiles are presented in the figure legends in the following format: "Name – Stagelength"

Section 3 – Analysis Demonstrating Benefit
The differences between the existing 767300 profiles in AEDT 2b and the recommended Boeing-developed profiles are primarily due to the use of de-rated thrust on departure. Tables 7 through 13 show the SEL results under the flight path from the Boeing-developed departure; the standard AEDT departure profiles are presented for comparison.

The results of the analysis are very similar to the results documented to support the 2011 SDF NEM 767300 profiles. That documentation is reproduced as Appendix G of this letter.

Section 4 – Concurrence on Aircraft Performance
The profiles in this document were created by Boeing for the 2011 SDF Noise Exposure Map Update. Boeing's letter of concurrence from 2010 is attached as Appendix A of this letter. Airline concurrence was also received to verify the current relevance of the user-defined profiles. The airline concurrence letter is attached as Appendix I.

Section 5 – Certification of New Parameters
The Boeing-developed points-type profiles were input into the AEDT. An AEDT study containing the Boeing-developed profiles is included as an appendix to this letter. 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.

Section 6 – Graphical and Tabular Comparison
An accompanying MS Excel file, "Appendix_F_Profile_Performance_Data_20160425.xlsx", contains the profile points as found in the AEDT XML Performance Report Export file for comparison of performance data to the AEDT Standard profiles. Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figure 12, Figure 13, and Figure 14.

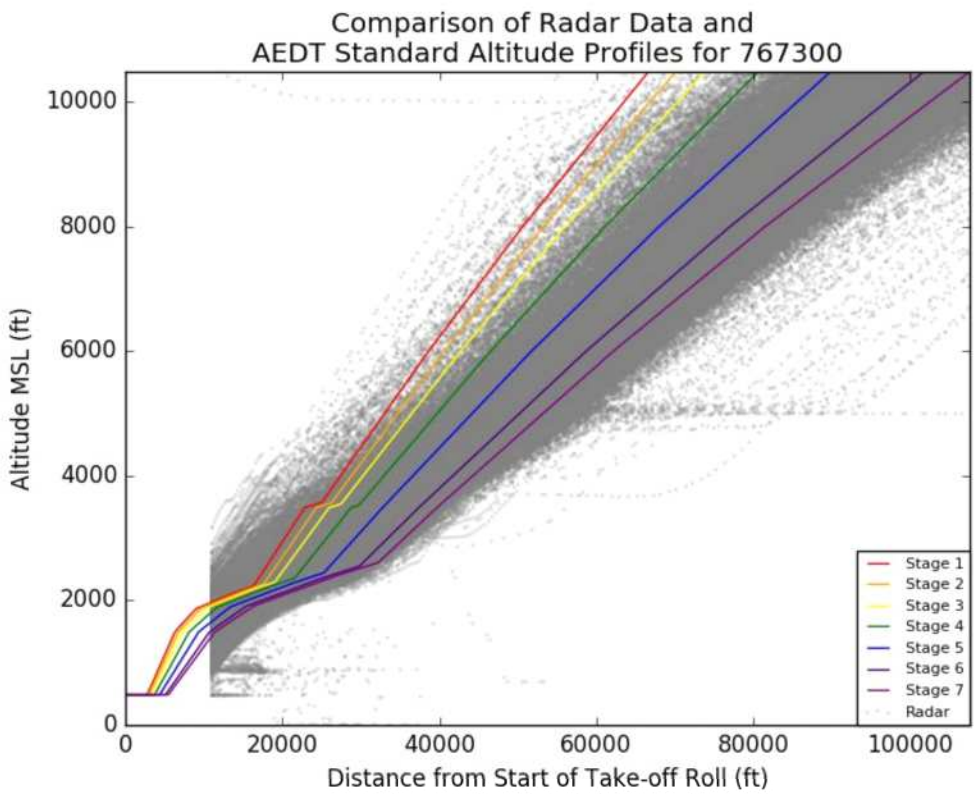

Figure 8 – 767300 AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

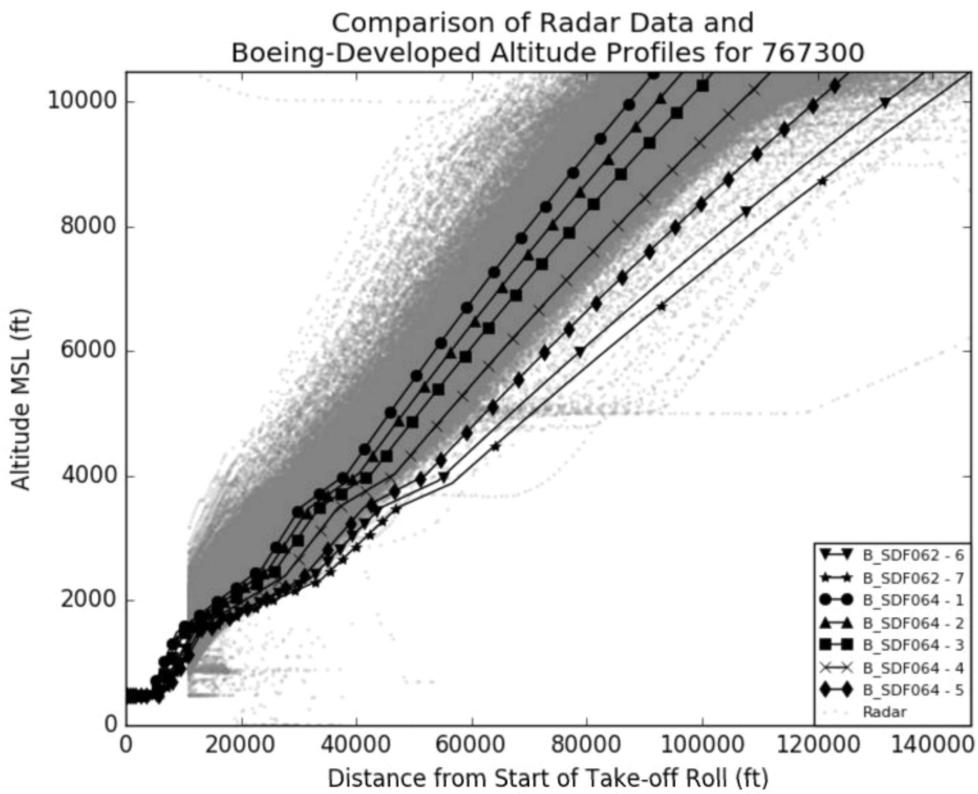

Figure 9 – 767300 Boeing Altitude Profiles Compared to Actual Aircraft Performance

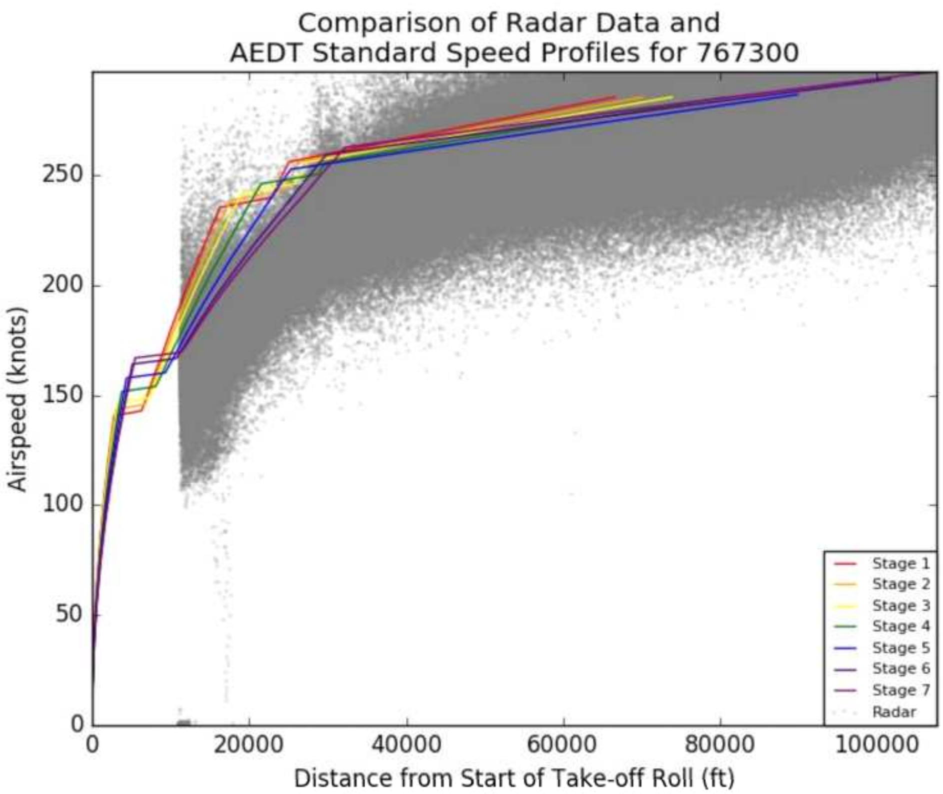

Figure 10 – 767300 AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

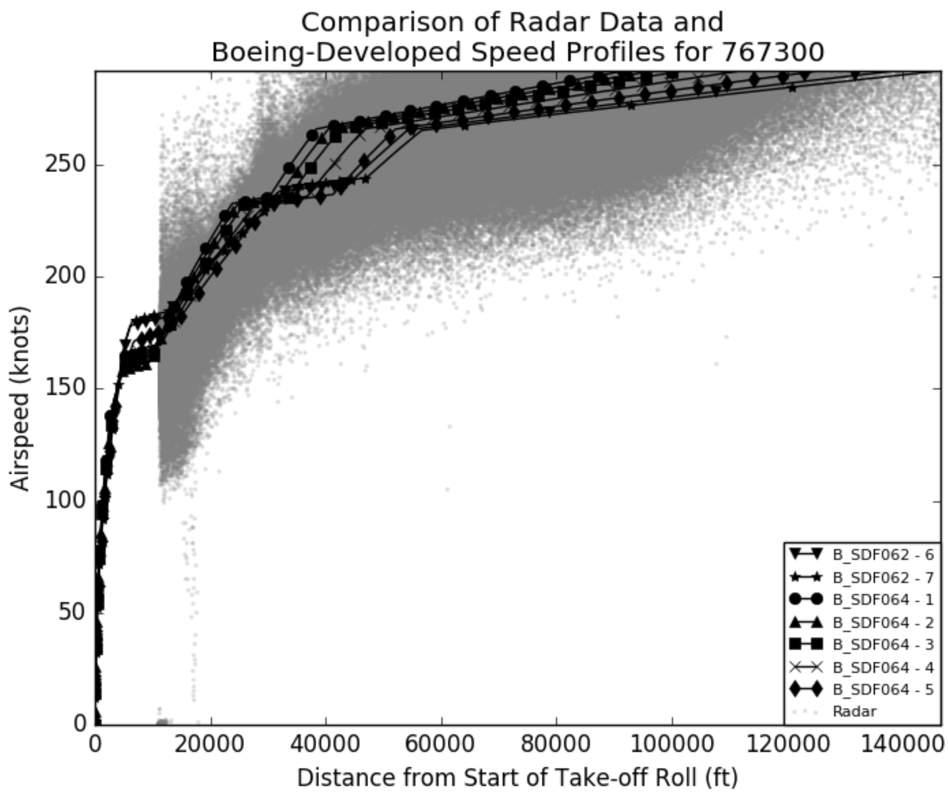

Figure 11 – 767300 Boeing Speed Profiles Compared to Actual Aircraft Performance

Table 7 Comparison of 767300 Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 767300
Profile Weight: 265,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF063

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	132.5	135.4	2.9
0.5	115.6	118.9	3.3
1.0	103.8	104.2	0.4
1.5	100.0	96.9	-3.1
2.0	94.3	92.9	-1.4
2.5	92.4	91.2	-1.2
3.0	90.7	89.8	-0.9
3.5	89.1	88.6	-0.5
4.0	87.7	87.4	-0.3
4.5	86.3	86.1	-0.2
5.0	85.3	85.1	-0.2
5.5	84.3	84.0	-0.3
6.0	83.4	83.1	-0.3
6.5	82.5	82.2	-0.3
7.0	81.8	81.6	-0.2
7.5	81.1	80.8	-0.3
8.0	80.5	80.1	-0.4
8.5	79.9	79.5	-0.4
9.0	79.3	78.9	-0.4
9.5	78.7	78.3	-0.4
10.0	78.2	77.8	-0.3

Table 8 - Comparison of 767300 Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 767300
Profile Weight: 275,500 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	132.5	135.4	3.0
0.5	121.6	118.8	-2.8
1.0	104.2	105.4	1.2
1.5	100.5	99.8	-0.7
2.0	94.7	93.3	-1.4
2.5	92.8	91.6	-1.2
3.0	91.1	90.2	-0.9
3.5	89.6	89.0	-0.5
4.0	88.4	87.9	-0.5
4.5	86.7	86.7	0.0
5.0	85.8	85.5	-0.3
5.5	84.8	84.6	-0.2
6.0	83.9	83.6	-0.2
6.5	83.0	82.8	-0.3
7.0	82.3	82.0	-0.2
7.5	81.6	81.4	-0.2
8.0	80.9	80.7	-0.3
8.5	80.4	80.0	-0.3
9.0	79.8	79.4	-0.4
9.5	79.2	78.9	-0.4
10.0	78.7	78.4	-0.4

Table 9 – Comparison of 767300 Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 767300
Profile Weight: 286,400 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	132.4	135.5	3.1
0.5	120.9	119.8	-1.0
1.0	104.6	106.7	2.1
1.5	100.9	100.8	-0.1
2.0	95.2	93.6	-1.6
2.5	93.2	92.0	-1.2
3.0	91.7	90.6	-1.1
3.5	90.2	89.5	-0.7
4.0	88.7	88.4	-0.4
4.5	87.4	87.3	-0.1
5.0	86.2	86.1	-0.2
5.5	85.3	85.1	-0.2
6.0	84.4	84.2	-0.2
6.5	83.6	83.4	-0.2
7.0	82.8	82.5	-0.3
7.5	82.1	81.9	-0.2
8.0	81.4	81.2	-0.2
8.5	80.8	80.6	-0.3
9.0	80.3	80.0	-0.3
9.5	79.7	79.4	-0.3
10.0	79.2	78.9	-0.4

Table 10 – Comparison of 767300 Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 767300
Profile Weight: 305,700 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	132.2	135.6	3.3
0.5	120.8	120.5	-0.3
1.0	105.6	110.8	5.2
1.5	101.7	102.1	0.4
2.0	98.0	94.4	-3.6
2.5	93.7	92.6	-1.1
3.0	92.4	91.3	-1.1
3.5	91.0	90.2	-0.8
4.0	89.7	89.1	-0.5
4.5	88.4	88.1	-0.3
5.0	87.1	87.1	0.0
5.5	86.1	86.0	-0.1
6.0	85.3	85.2	-0.1
6.5	84.4	84.3	-0.1
7.0	83.6	83.5	-0.1
7.5	82.9	82.8	-0.2
8.0	82.3	82.1	-0.1
8.5	81.7	81.6	-0.1
9.0	81.1	80.9	-0.2
9.5	80.6	80.4	-0.2
10.0	80.1	79.8	-0.3

Table 11 – Comparison of 767300 Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 767300
Profile Weight: 330,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	132.1	135.7	3.6
0.5	121.4	119.5	-1.9
1.0	107.1	124.0	16.9
1.5	102.6	103.8	1.2
2.0	99.9	99.7	-0.3
2.5	94.7	93.4	-1.4
3.0	93.1	92.1	-1.0
3.5	92.0	91.0	-1.0
4.0	90.9	90.0	-0.9
4.5	89.6	89.1	-0.5
5.0	88.4	88.2	-0.2
5.5	87.3	87.3	0.0
6.0	86.3	86.3	0.0
6.5	85.5	85.4	-0.1
7.0	84.7	84.7	0.0
7.5	84.0	83.9	0.0
8.0	83.3	83.3	0.0
8.5	82.7	82.6	0.0
9.0	82.1	82.1	0.0
9.5	81.5	81.6	0.0
10.0	81.1	81.0	0.0

Table 12 – Comparison of 767300 Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 767300
Profile Weight: 355,900 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF062

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	132.4	138.2	5.8
0.5	121.8	121.7	-0.1
1.0	109.7	118.1	8.4
1.5	103.6	105.0	1.4
2.0	100.9	94.9	-6.0
2.5	98.7	92.8	-5.9
3.0	93.8	91.8	-2.0
3.5	92.7	90.7	-1.9
4.0	91.7	89.9	-1.8
4.5	90.7	89.1	-1.6
5.0	89.6	88.4	-1.2
5.5	88.5	87.7	-0.8
6.0	87.5	86.7	-0.8
6.5	86.7	85.9	-0.8
7.0	85.8	85.1	-0.7
7.5	85.1	84.4	-0.6
8.0	84.4	83.8	-0.6
8.5	83.7	83.2	-0.5
9.0	83.2	82.6	-0.6
9.5	82.6	82.1	-0.5
10.0	82.1	81.7	-0.4

Table 13 – Comparison of 767300 Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: 767300
Profile Weight: 367,700 lbs. (PROF_ID2 = 7)
User PROF_ID1: B_SDF062

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	132.3	138.3	5.9
0.5	121.8	121.8	0.0
1.0	112.1	122.2	10.1
1.5	104.1	105.7	1.6
2.0	101.3	98.6	-2.7
2.5	99.2	93.1	-6.2
3.0	94.4	92.0	-2.3
3.5	93.0	91.1	-1.9
4.0	92.0	90.2	-1.8
4.5	91.1	89.5	-1.6
5.0	90.2	88.8	-1.5
5.5	89.2	88.0	-1.1
6.0	88.1	87.4	-0.7
6.5	87.2	86.5	-0.7
7.0	86.4	85.7	-0.7
7.5	85.6	85.0	-0.6
8.0	84.9	84.3	-0.6
8.5	84.2	83.7	-0.5
9.0	83.6	83.2	-0.4
9.5	83.1	82.6	-0.5
10.0	82.5	82.2	-0.4

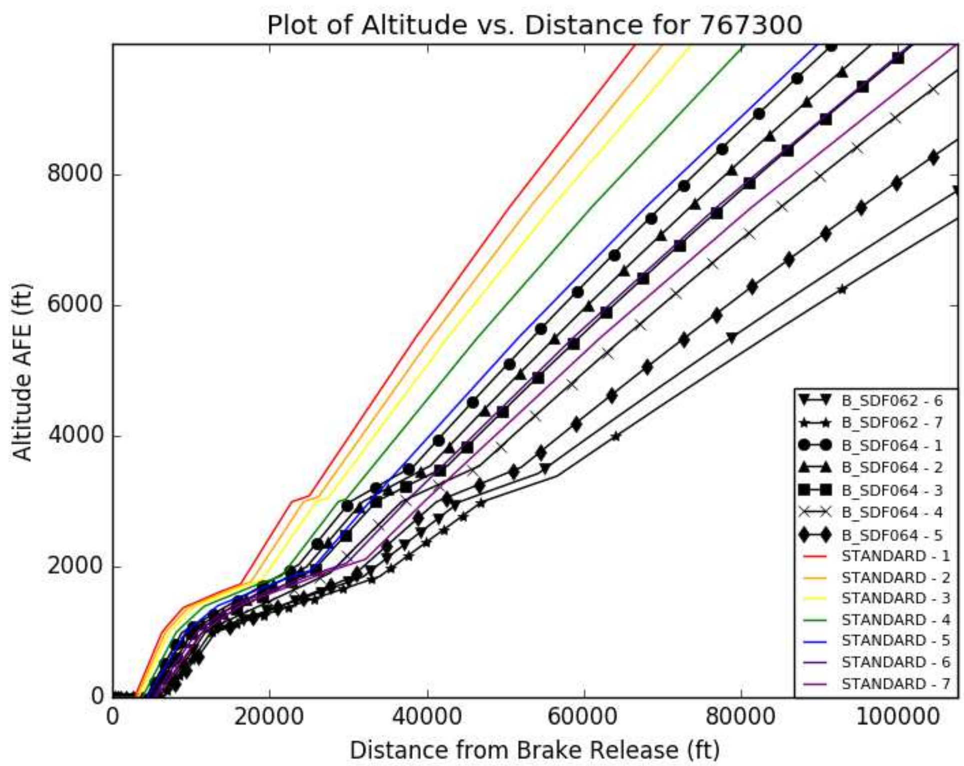

Figure 12 – 767300 Altitude vs. Distance

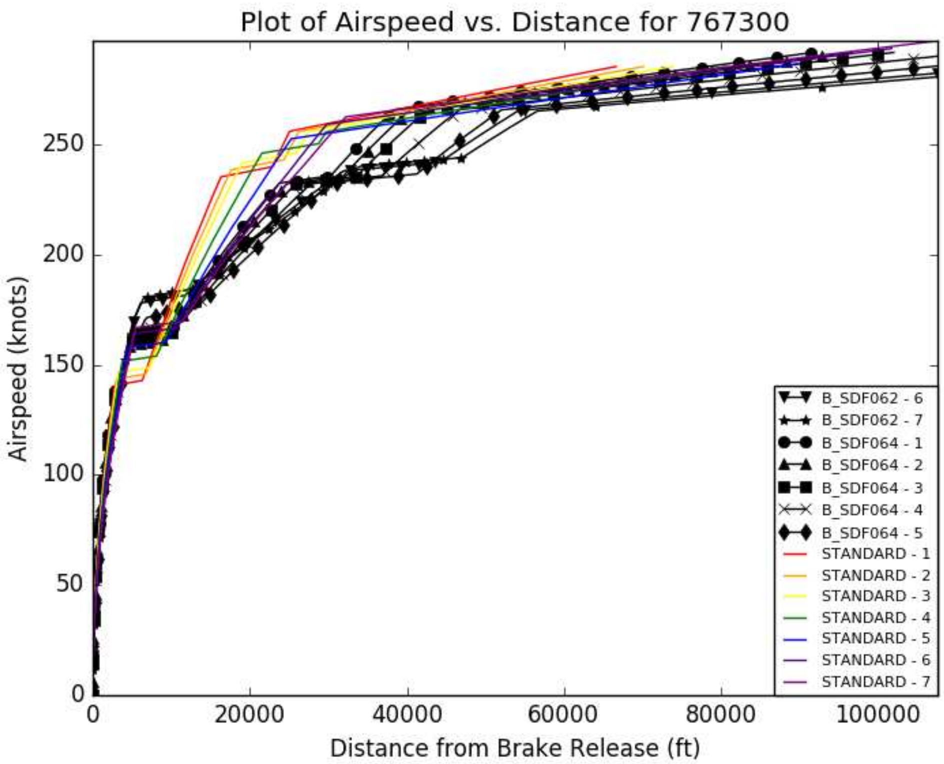

Figure 13 – 767300 Speed vs. Distance

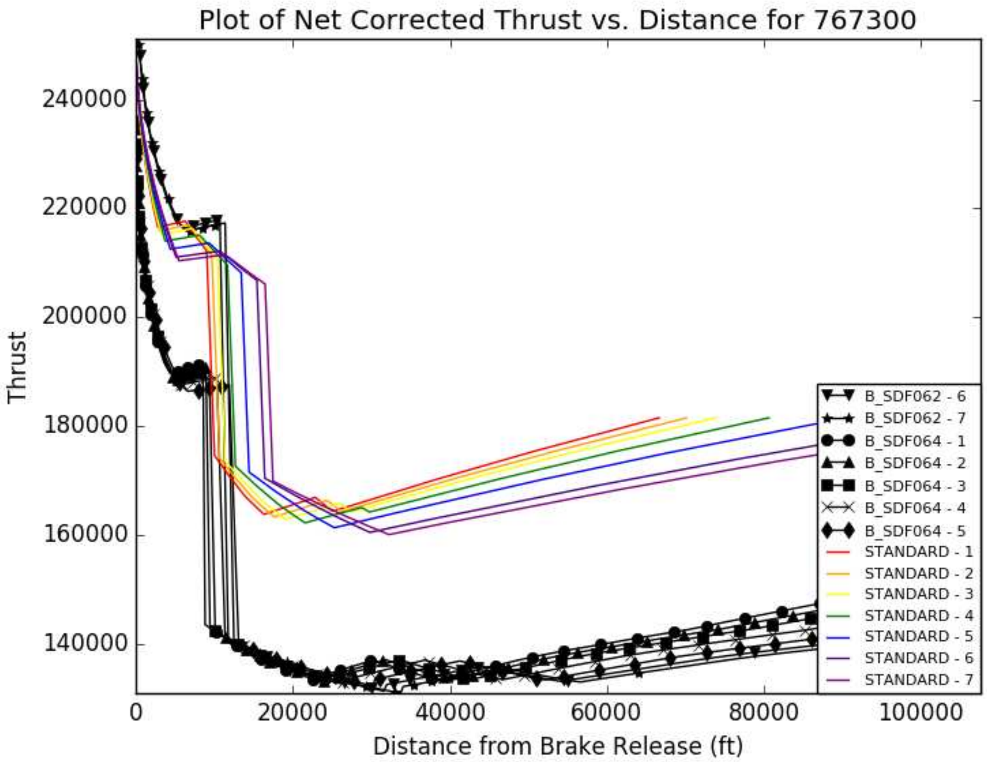

Figure 14 – 767300 Thrust vs. Distance

Appendix D
MD11GE Profile Review with AEDT 2b

Section 1 – Background
We are submitting this request for written approval of changes to the Aviation Environmental Design Tool, Version 2b (AEDT profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing (formerly McDonnell Douglas) MD11GE operating procedures as provided by The Boeing Company (Boeing) for the 2011 SDF Noise Exposure Map Update modeled with INM 7.0b. The profiles developed for INM 7.0b are assumed to be applicable to AEDT 2b.

Section 2 – Statement of Benefit
Our discussions with operators at SDF indicate that MD11GE operations use a procedure similar to ICAO A. The AEDT 2bdoes not include a MD11GE departure procedure similar to ICAO A. The updated MD11GE Boeing 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. Figure 15 and Figure 16 compare the standard AEDT profiles and Boeing profiles to actual aircraft climb performance at SDF. Figure 17 and Figure 18 compare the standard AEDT profiles and Boeing profiles to actual aircraft speed profiles at SDF. The Boeing profiles are presented in the figure legends in the following format: "Name – Stagelength"

Section 3 – Analysis Demonstrating Benefit
The differences between the existing MD11GE departure profiles in AEDT 2b and the recommended Boeing-developed profiles are primarily due to the location of transition from take-off thrust to climb thrust at 1,500 ft. Above Field Elevation (AFE) in the Boeing developed profiles compared to 1,000 ft. AFE in the AEDT standard profiles. In addition, the Boeing-developed profiles maintain speed until 3,000 ft. AFE, and then begin acceleration and flap retraction, whereas the AEDT standard profile accelerate and retract the flaps after the thrust cutback at 1,000 ft. AFE. Tables 14 through 19 show the SEL results under the flight path from the Boeing-developed departure; the standard AEDT departure profiles are presented for comparison.

The results of the analysis are very similar to the results documented to support the 2011 SDF NEM MD11GE profiles. That documentation is reproduced as Appendix G of this letter.

Section 4 – Concurrence on Aircraft Performance
The profiles in this document were created by Boeing for the 2011 SDF Noise Exposure Map Update. Boeing's letter of concurrence from 2010 is attached as Appendix A of this letter. Airline concurrence was also received to verify the current relevance of the user-defined profiles. The airline concurrence letter is attached as Appendix I.

Section 5 – Certification of New Parameters
The Boeing-developed points-type profiles were input into the AEDT. An AEDT study containing the Boeing-developed profiles is included as an appendix to this letter. 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.

Section 6 – Graphical and Tabular Comparison
An accompanying MS Excel file, "Appendix_F_Profile_Performance_Data_20160425.xlsx", contains the profile points as found in the AEDT XML Performance Report Export file for comparison of performance data to the AEDT Standard profiles. Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figure 19, Figure 20, and Figure 21.

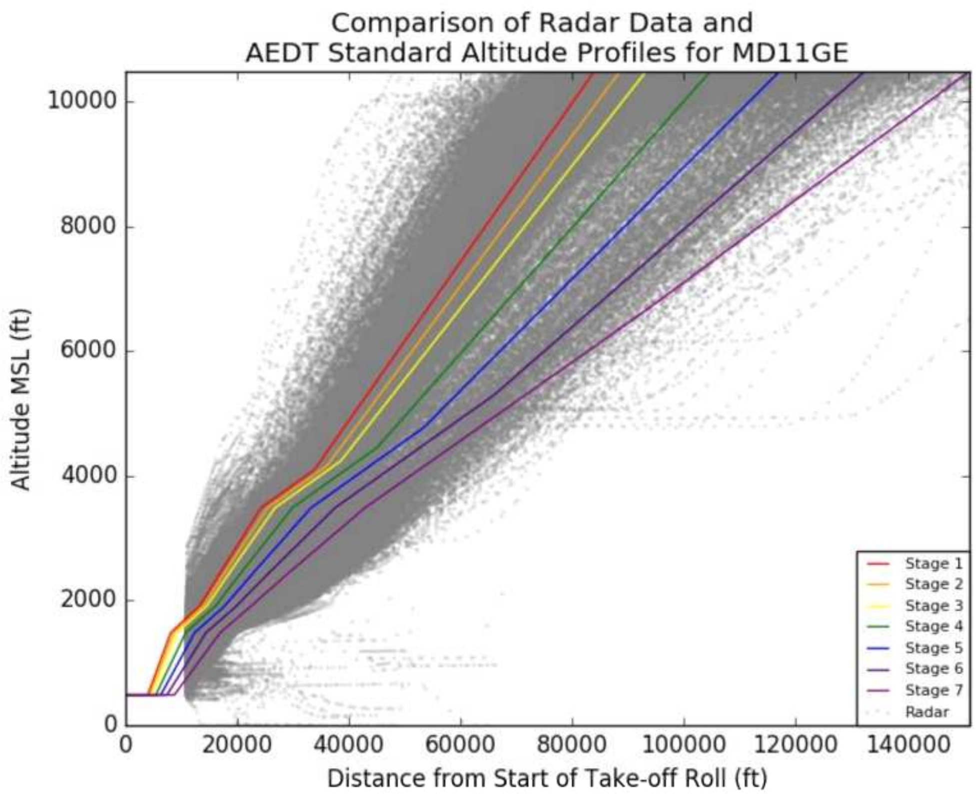

Figure 15 MD11GE AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

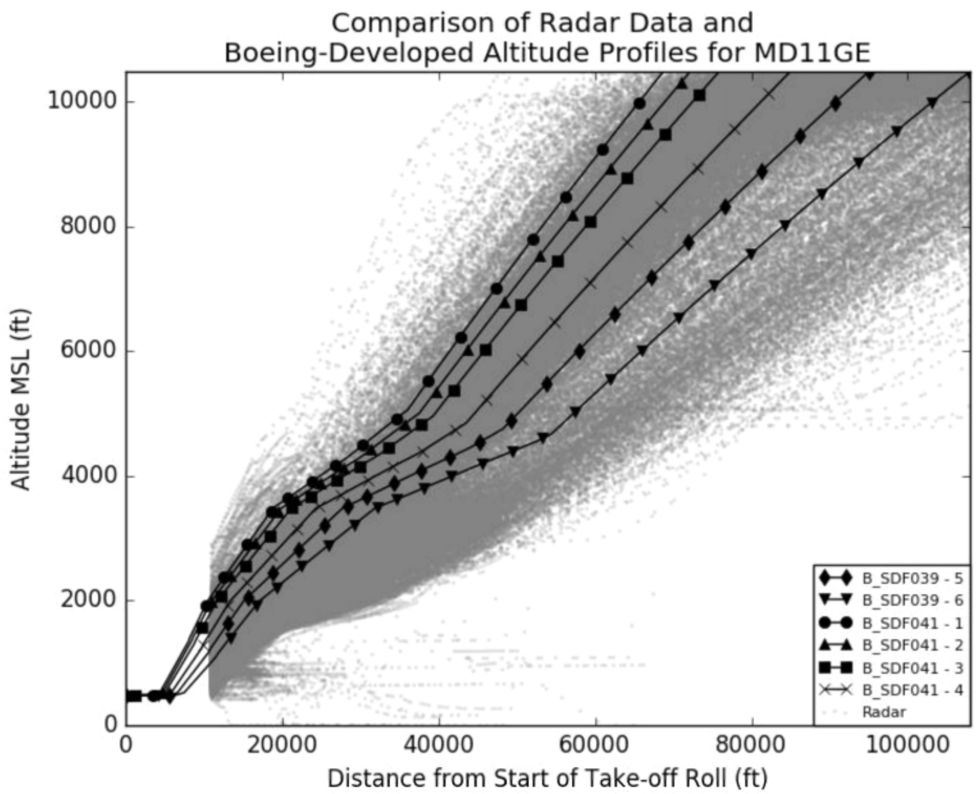

Figure 16 MD11GE Boeing Altitude Profiles Compared to Actual Aircraft Performance

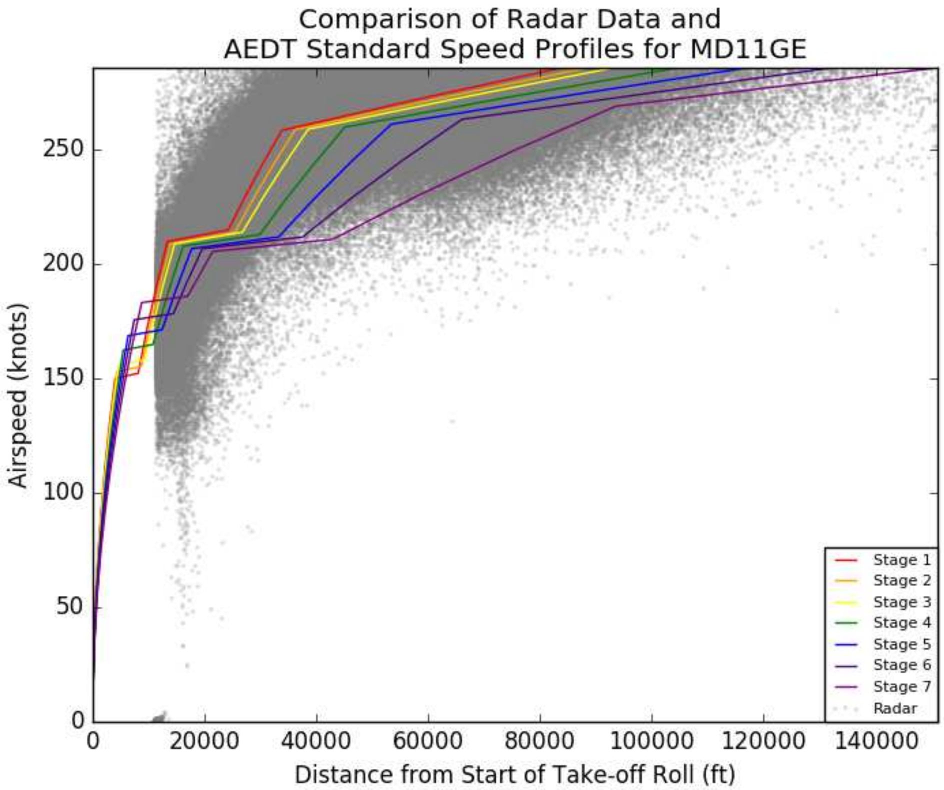

Figure 17 MD11GE AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

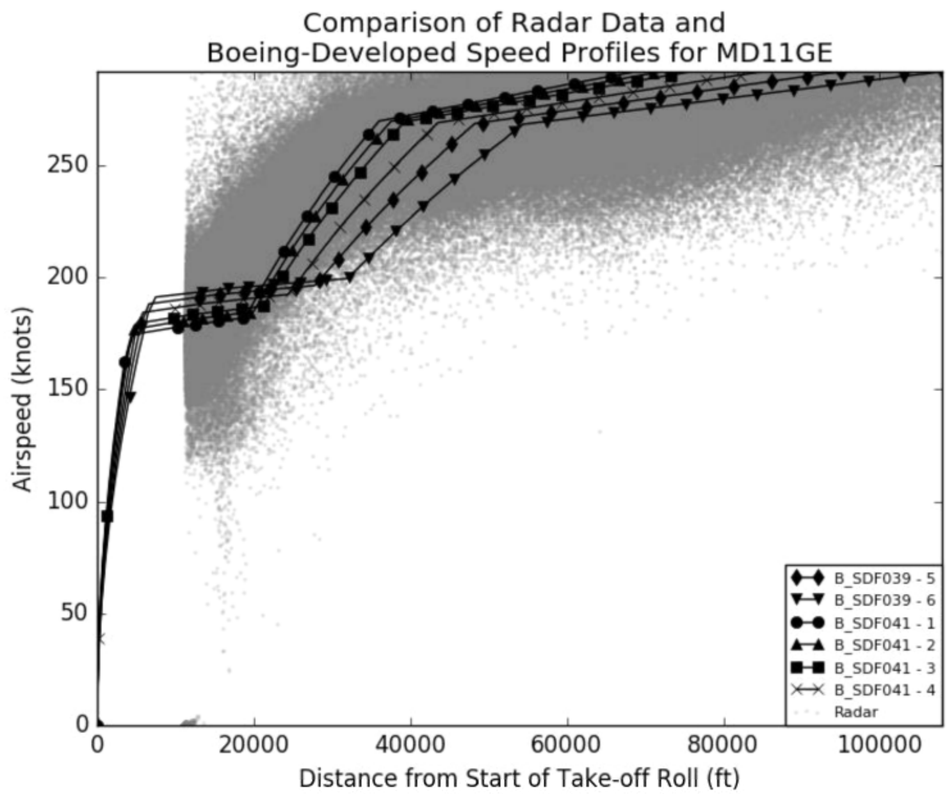

Figure 18 MD11GE Boeing Speed Profiles Compared to Actual Aircraft Performance

Table 14 - Comparison of MD11GE Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11GE
Profile Weight: 395,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.1	136.0	4.9
0.5	120.9	121.1	0.1
1.0	103.6	105.3	1.7
1.5	98.9	99.6	0.7
2.0	96.2	93.3	-2.8
2.5	90.5	91.2	0.7
3.0	88.4	89.8	1.4
3.5	86.8	88.4	1.6
4.0	85.8	87.1	1.3
4.5	84.6	86.0	1.3
5.0	83.7	85.0	1.3
5.5	82.7	83.9	1.1
6.0	82.0	82.7	0.7
6.5	81.1	81.8	0.7
7.0	80.3	81.0	0.6
7.5	79.6	80.2	0.6
8.0	78.9	79.5	0.6
8.5	78.2	78.9	0.6
9.0	77.6	78.3	0.7
9.5	77.0	77.8	0.8
10.0	76.4	77.3	0.9

Table 15 - Comparison of MD11GE Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11GE
Profile Weight: 410,000 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.0	136.0	5.0
0.5	120.7	121.0	0.3
1.0	104.8	106.4	1.6
1.5	99.5	100.1	0.6
2.0	96.6	94.0	-2.6
2.5	91.5	91.5	0.0
3.0	88.8	90.0	1.2
3.5	87.3	88.8	1.6
4.0	86.2	87.5	1.4
4.5	85.2	86.4	1.3
5.0	84.2	85.4	1.2
5.5	83.3	84.5	1.1
6.0	82.3	83.4	1.1
6.5	81.7	82.4	0.7
7.0	80.9	81.5	0.7
7.5	80.1	80.7	0.6
8.0	79.5	80.0	0.6
8.5	78.8	79.4	0.6
9.0	78.2	78.8	0.6
9.5	77.6	78.2	0.7
10.0	77.0	77.8	0.8

Table 16 - Comparison of MD11GE Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11GE
Profile Weight: 425,000 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.9	135.9	5.0
0.5	120.7	121.6	0.9
1.0	106.2	108.0	1.8
1.5	99.9	100.7	0.8
2.0	97.1	95.6	-1.5
2.5	93.4	91.9	-1.5
3.0	89.3	90.4	1.1
3.5	87.8	89.3	1.5
4.0	86.5	88.0	1.5
4.5	85.6	86.9	1.3
5.0	84.5	85.9	1.4
5.5	83.7	85.0	1.3
6.0	83.0	84.1	1.1
6.5	82.1	83.0	0.9
7.0	81.4	82.1	0.7
7.5	80.6	81.3	0.7
8.0	80.0	80.6	0.6
8.5	79.3	79.9	0.6
9.0	78.7	79.3	0.6
9.5	78.1	78.7	0.6
10.0	77.6	78.2	0.7

Table 17 - Comparison of MD11GE Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11GE
Profile Weight: 460,000 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.3	135.7	4.5
0.5	121.1	121.6	0.5
1.0	111.0	113.5	2.6
1.5	101.2	102.3	1.1
2.0	98.1	98.5	0.3
2.5	95.9	93.0	-2.9
3.0	90.5	91.3	0.8
3.5	88.8	90.0	1.2
4.0	87.5	89.1	1.6
4.5	86.5	88.0	1.5
5.0	85.6	87.0	1.4
5.5	84.7	86.1	1.4
6.0	84.0	85.3	1.3
6.5	83.2	84.6	1.3
7.0	82.5	83.6	1.1
7.5	81.7	82.7	1.0
8.0	81.1	82.0	0.8
8.5	80.5	81.2	0.8
9.0	79.9	80.6	0.7
9.5	79.3	80.0	0.6
10.0	78.7	79.4	0.7

Table 18 - Comparison of MD11GE Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11GE
Profile Weight: 495,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF039

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.1	135.6	4.5
0.5	121.0	122.2	1.2
1.0	119.1	125.4	6.3
1.5	103.2	104.3	1.1
2.0	99.2	99.9	0.6
2.5	96.9	96.1	-0.9
3.0	93.6	92.1	-1.5
3.5	89.7	90.8	1.1
4.0	88.6	89.8	1.2
4.5	87.4	88.9	1.5
5.0	86.5	88.0	1.5
5.5	85.7	87.1	1.4
6.0	84.9	86.3	1.5
6.5	84.2	85.6	1.4
7.0	83.5	85.0	1.4
7.5	82.8	84.3	1.4
8.0	82.3	83.4	1.1
8.5	81.6	82.7	1.1
9.0	80.9	81.9	1.0
9.5	80.4	81.2	0.9
10.0	79.8	80.6	0.8

Table 19 - Comparison of MD11GE Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11GE
Profile Weight: 535,000 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF039

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.9	136.0	5.1
0.5	121.6	122.7	1.1
1.0	119.0	120.1	1.0
1.5	106.8	107.2	0.4
2.0	100.7	101.4	0.8
2.5	98.2	98.5	0.3
3.0	96.2	93.6	-2.7
3.5	91.0	91.8	0.7
4.0	89.5	90.7	1.2
4.5	88.6	89.8	1.2
5.0	87.5	89.0	1.5
5.5	86.7	88.3	1.6
6.0	86.0	87.5	1.5
6.5	85.2	86.8	1.5
7.0	84.6	86.1	1.5
7.5	84.0	85.5	1.5
8.0	83.3	84.9	1.6
8.5	82.8	84.4	1.6
9.0	82.3	83.6	1.3
9.5	81.6	83.0	1.3
10.0	81.0	82.3	1.2

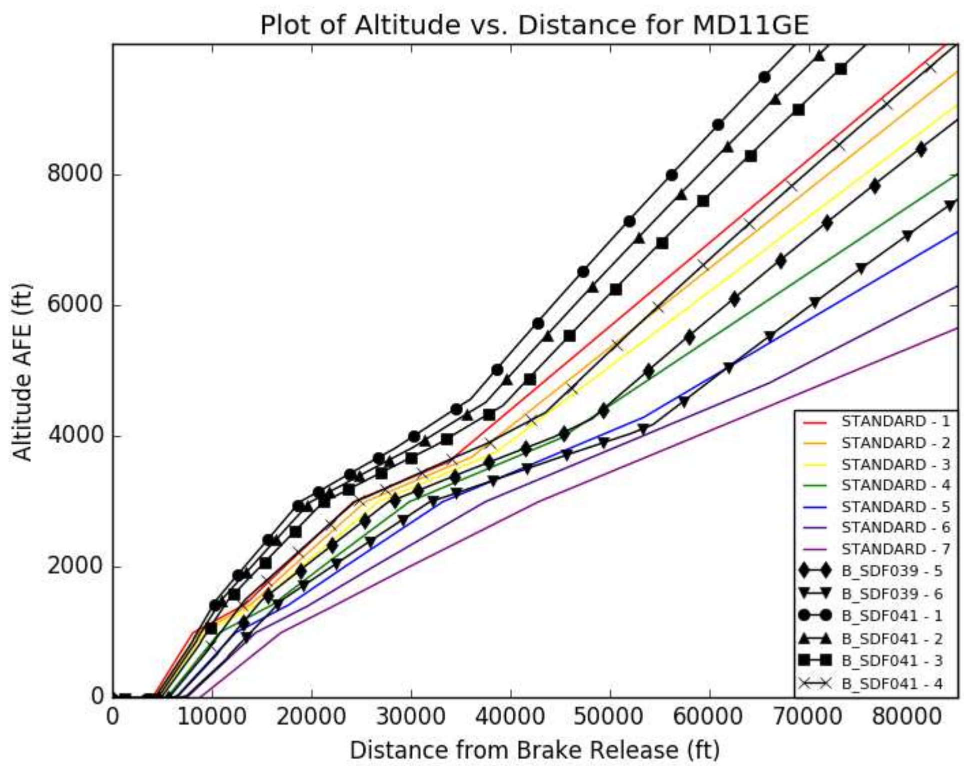

Figure 19 MD11GE Altitude vs. Distance

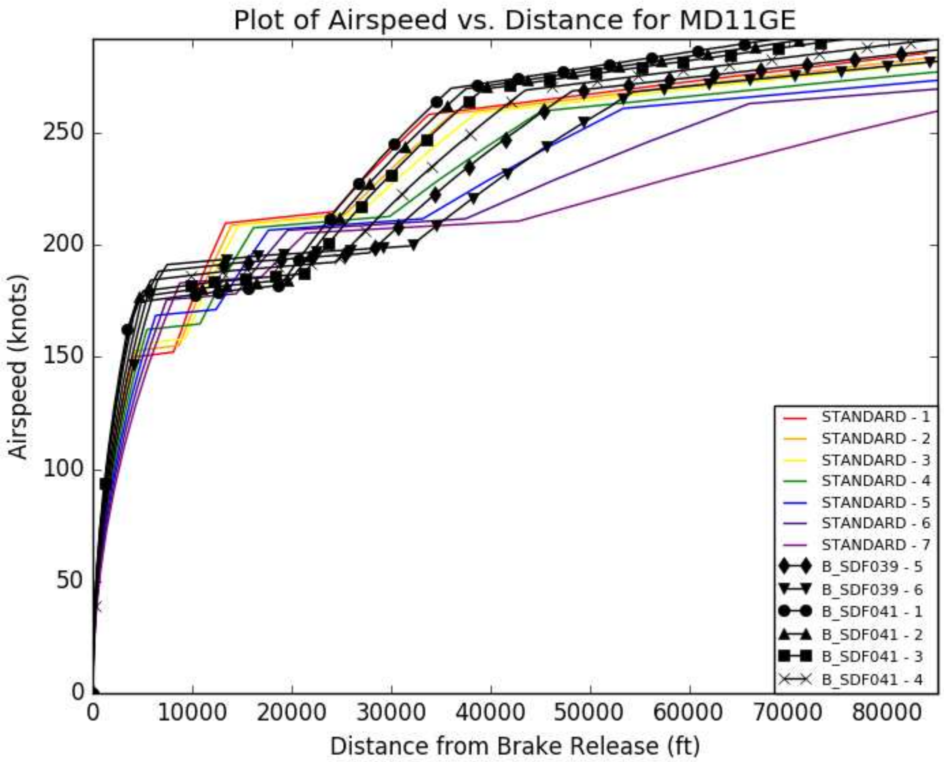

Figure 20 MD11GE Speed vs. Distance

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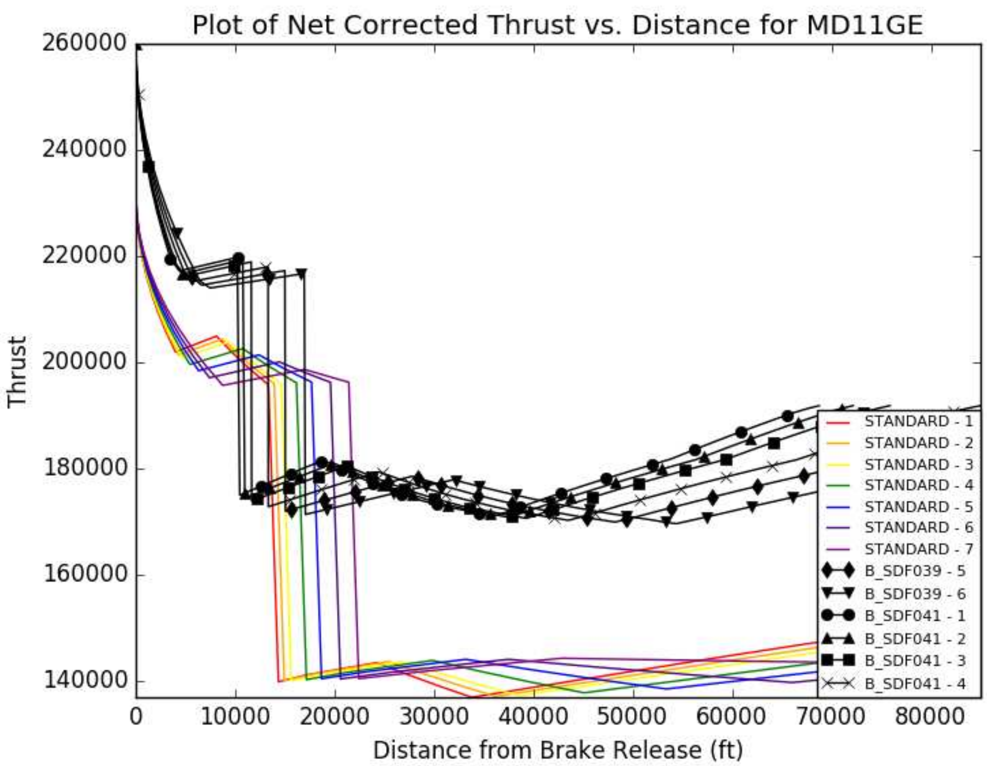

Figure 21 MD11GE Thrust vs. Distance

Appendix E

MD11PW Profile Review with AEDT 2b

Section 1 – Background

We are submitting this request for written approval of changes to the Aviation Environmental Design Tool, Version 2b (AEDT) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing (formerly McDonnell Douglas) MD11PW operating procedures as provided by The Boeing Company (Boeing) for the 2011 SDF Noise Exposure Map Update modeled with INM 7.0b. The profiles developed for INM 7.0b are assumed to be applicable to AEDT 2b.

Section 2 – Statement of Benefit

Our discussions with operators at SDF indicate that MD11PW operations use a procedure similar to ICAO A. The AEDT 2b does not include a MD11PW departure procedure similar to ICAO A. The updated MD11PW Boeing 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. Figure 22 and Figure 23 compare the standard AEDT profiles and Boeing profiles to actual aircraft climb performance at SDF. Figure 24 and Figure 25 compare the standard AEDT profiles and Boeing profiles to actual aircraft speed profiles at SDF. The Boeing profiles are presented in the figure legends in the following format: "Name – Stagelength"

Section 3 – Analysis Demonstrating Benefit

The differences between the AEDT standard MD11PW departure profiles in AEDT 2b and the recommended Boeing-developed profiles are primarily due to the location of transition from take-off thrust to climb thrust at 1,500 ft. Above Field Elevation (AFE) in the Boeing developed profiles compared to 1,000 ft. AFE in the AEDT standard profiles. In addition, the Boeing-developed profiles maintain speed until 3,000 ft. AFE, and then begin acceleration and flap retraction, whereas the AEDT standard profile accelerate and retract the flaps after the thrust cutback at 1,000 ft. AFE. Tables 20 through 25 show the SEL results under the flight path from the Boeing-developed departure; the standard AEDT departure profiles are presented for comparison.

The results of the analysis are very similar to the results documented to support the 2011 SDF NEM MD11GE profiles. That documentation is reproduced as Appendix G of this letter.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing for the 2011 SDF Noise Exposure Map Update. Boeing's letter of concurrence from 2010 is attached as Appendix A of this letter. Airline concurrence was also received to verify the current relevance of the user-defined profiles. The airline concurrence letter is attached as Appendix I.

Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the AEDT. An AEDT study containing the Boeing-developed profiles is included as an appendix to this letter. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Performance_Data_20160425.xlsx", contains the profile points as found in the AEDT XML Performance Report Export file for comparison of performance data to the AEDT Standard profiles. Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figure 26, Figure 27, and Figure 28

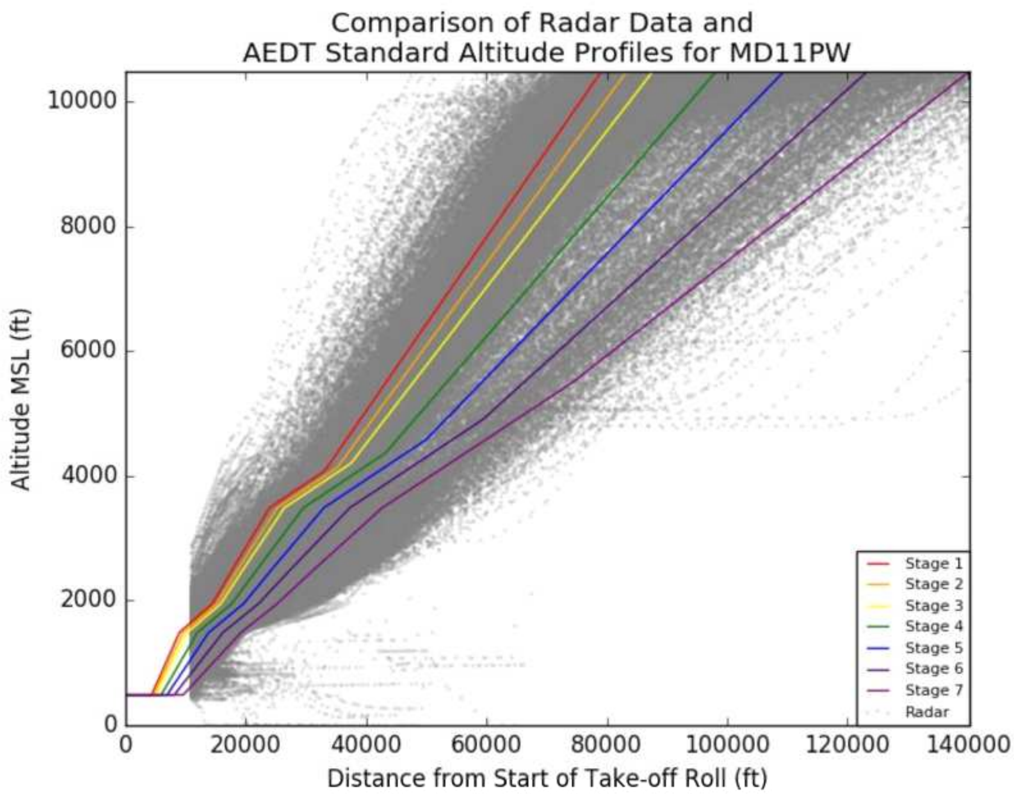

Figure 22 MD11PW AEDT Standard Altitude Profiles Compared to Actual Aircraft Performance

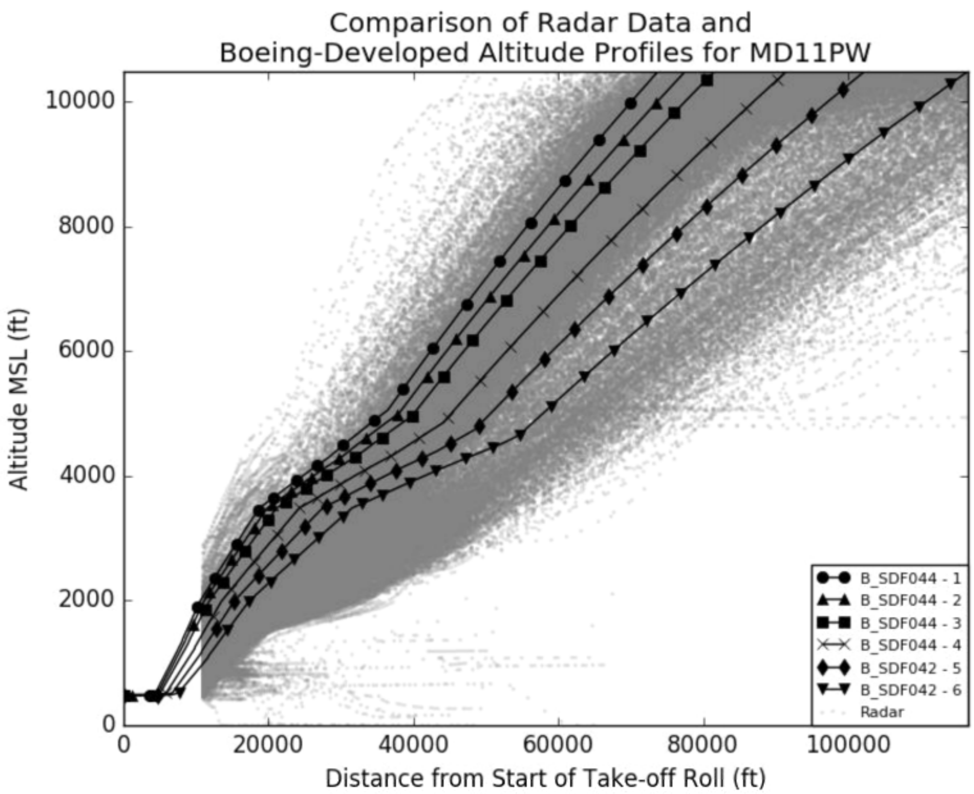

Figure 23 MD11PW Boeing-Developed Altitude Profiles Compared to Actual Aircraft Performance

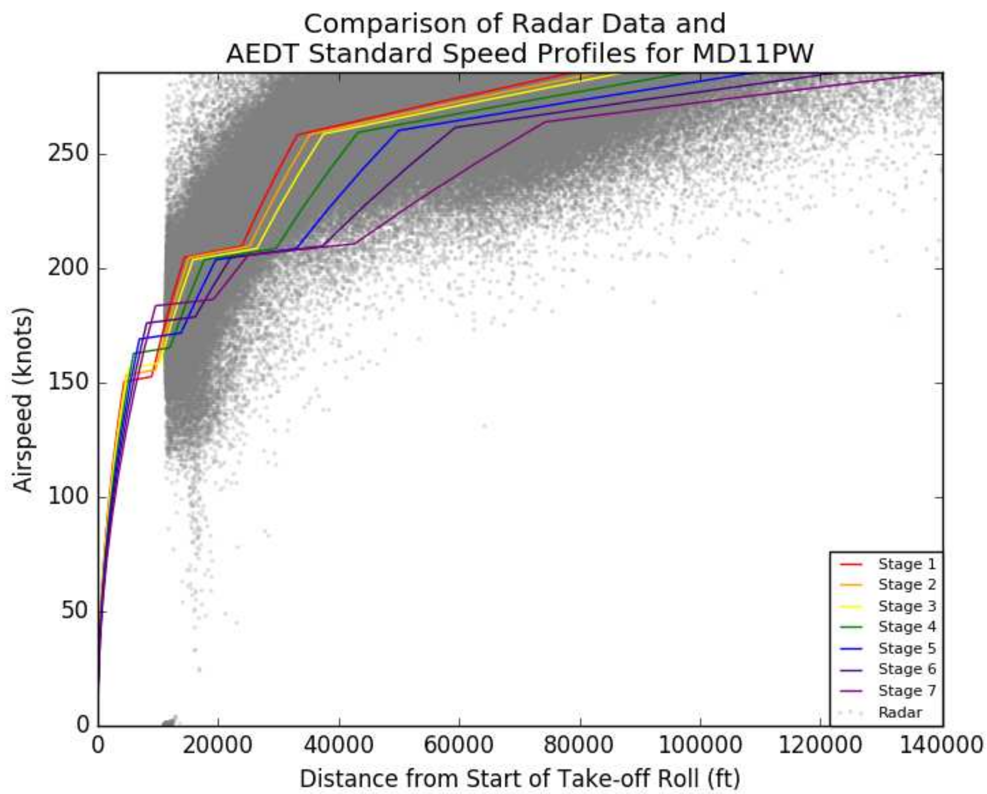

Figure 24 MD11PW AEDT Standard Speed Profiles Compared to Actual Aircraft Performance

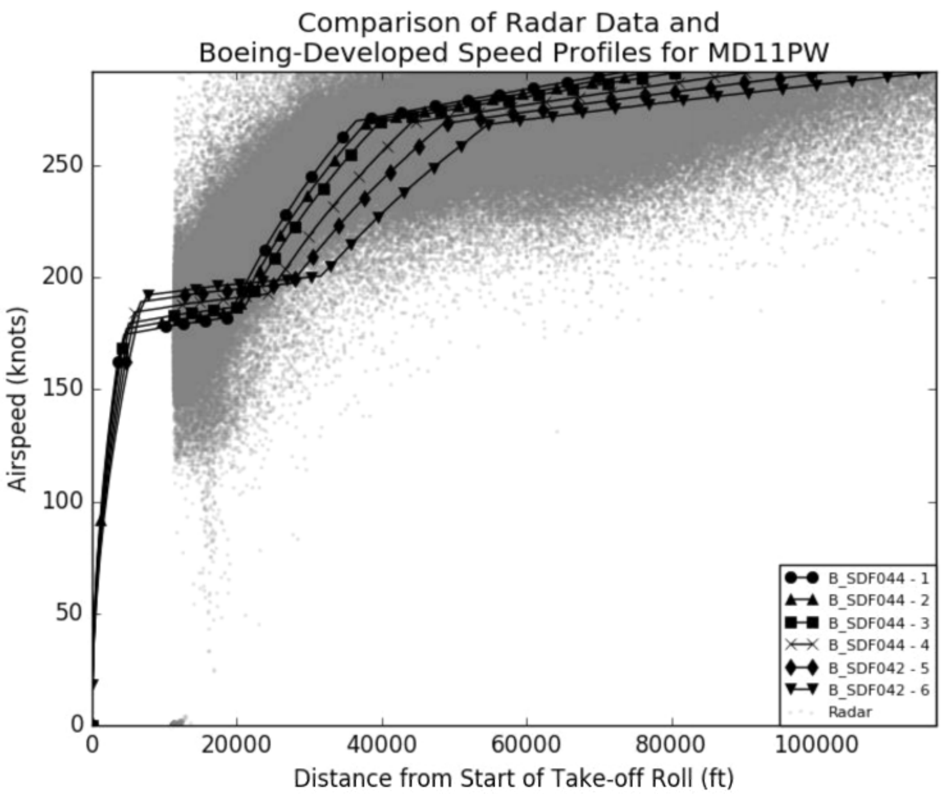

Figure 25 MD11PW Boeing-Developed Speed Profiles Compared to Actual Aircraft Performance

Table 20 - Comparison of MD11PW Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11PW
Profile Weight: 395,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.3	134.1	3.8
0.5	120.2	120.8	0.6
1.0	104.3	105.0	0.7
1.5	98.0	98.7	0.8
2.0	95.0	92.9	-2.1
2.5	91.6	90.6	-1.0
3.0	88.7	89.1	0.4
3.5	87.0	87.6	0.6
4.0	85.9	86.3	0.4
4.5	84.5	85.0	0.5
5.0	83.5	83.8	0.3
5.5	82.3	82.6	0.3
6.0	81.6	81.4	-0.2
6.5	80.7	80.6	-0.1
7.0	79.9	79.8	-0.2
7.5	79.2	79.0	-0.2
8.0	78.5	78.3	-0.2
8.5	77.9	77.6	-0.3
9.0	77.3	77.0	-0.3
9.5	76.7	76.4	-0.3
10.0	76.1	75.8	-0.3

Table 21 - Comparison of MD11PW Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11PW
Profile Weight: 410,000 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.2	134.0	3.8
0.5	120.2	121.5	1.4
1.0	106.0	106.2	0.2
1.5	98.5	99.4	0.8
2.0	95.5	93.6	-1.9
2.5	92.8	90.9	-1.9
3.0	89.2	89.4	0.2
3.5	87.5	88.1	0.6
4.0	86.3	86.8	0.5
4.5	85.1	85.5	0.4
5.0	84.0	84.3	0.3
5.5	83.0	83.2	0.2
6.0	82.0	82.1	0.1
6.5	81.2	81.1	-0.2
7.0	80.4	80.3	-0.1
7.5	79.7	79.6	-0.2
8.0	79.1	78.9	-0.2
8.5	78.4	78.2	-0.2
9.0	77.8	77.5	-0.3
9.5	77.3	76.9	-0.3
10.0	76.7	76.4	-0.3

Table 22 - Comparison of MD11PW Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11PW
Profile Weight: 425,000 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.1	133.9	3.8
0.5	120.1	121.4	1.2
1.0	108.1	108.0	-0.1
1.5	99.2	100.0	0.7
2.0	96.0	94.7	-1.2
2.5	93.6	91.4	-2.2
3.0	89.7	89.7	0.0
3.5	88.0	88.6	0.6
4.0	86.7	87.3	0.6
4.5	85.7	86.1	0.4
5.0	84.4	84.9	0.5
5.5	83.5	83.8	0.4
6.0	82.5	82.8	0.2
6.5	81.7	81.7	0.0
7.0	80.9	80.9	-0.1
7.5	80.2	80.1	-0.1
8.0	79.6	79.4	-0.2
8.5	78.9	78.8	-0.1
9.0	78.3	78.1	-0.2
9.5	77.8	77.5	-0.3
10.0	77.2	76.9	-0.3

Table 23 - Comparison of MD11PW Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11PW
Profile Weight: 460,000 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.4	133.8	3.3
0.5	120.5	121.4	0.9
1.0	120.5	114.1	-6.4
1.5	101.4	101.8	0.4
2.0	97.2	97.6	0.4
2.5	94.9	92.4	-2.4
3.0	92.2	90.7	-1.5
3.5	89.2	89.3	0.2
4.0	87.7	88.4	0.6
4.5	86.6	87.2	0.6
5.0	85.7	86.2	0.5
5.5	84.6	85.1	0.5
6.0	83.8	84.2	0.4
6.5	82.9	83.3	0.3
7.0	82.0	82.3	0.3
7.5	81.4	81.4	0.0
8.0	80.7	80.7	0.1
8.5	80.0	80.1	0.0
9.0	79.5	79.4	-0.1
9.5	78.9	78.8	-0.1
10.0	78.4	78.3	-0.1

Table 24 - Comparison of MD11PW Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11PW
Profile Weight: 495,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF042

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.3	134.1	3.8
0.5	121.1	121.9	0.8
1.0	118.6	129.9	11.3
1.5	104.5	104.1	-0.4
2.0	98.7	99.1	0.4
2.5	96.0	95.5	-0.5
3.0	94.0	91.5	-2.5
3.5	90.5	90.2	-0.3
4.0	88.9	89.1	0.2
4.5	87.6	88.2	0.6
5.0	86.6	87.2	0.6
5.5	85.7	86.3	0.5
6.0	84.8	85.3	0.5
6.5	84.0	84.5	0.4
7.0	83.3	83.6	0.4
7.5	82.5	82.9	0.4
8.0	81.8	82.0	0.2
8.5	81.1	81.3	0.2
9.0	80.5	80.7	0.2
9.5	79.9	80.1	0.1
10.0	79.4	79.5	0.0

Table 25 - Comparison of MD11PW Noise Impacts from Brake Release for AEDT Standard and Boeing-Developed Departure Procedures
AEDT Aircraft Model: MD11PW
Profile Weight: 535,000 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF042

Distance from Brake Release (nmi)	AEDT Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.1	134.0	3.9
0.5	121.0	122.6	1.6
1.0	119.1	119.7	0.7
1.5	109.5	107.3	-2.2
2.0	101.2	100.9	-0.2
2.5	97.5	97.6	0.1
3.0	95.4	93.3	-2.1
3.5	93.6	91.2	-2.4
4.0	90.1	90.1	-0.1
4.5	88.9	89.1	0.2
5.0	87.7	88.2	0.5
5.5	86.8	87.4	0.7
6.0	86.0	86.6	0.6
6.5	85.2	85.8	0.6
7.0	84.5	85.0	0.5
7.5	83.7	84.3	0.5
8.0	83.1	83.6	0.5
8.5	82.4	82.9	0.5
9.0	81.8	82.2	0.4
9.5	81.2	81.6	0.4
10.0	80.5	81.0	0.4

Aaron Braswell
June 7, 2016
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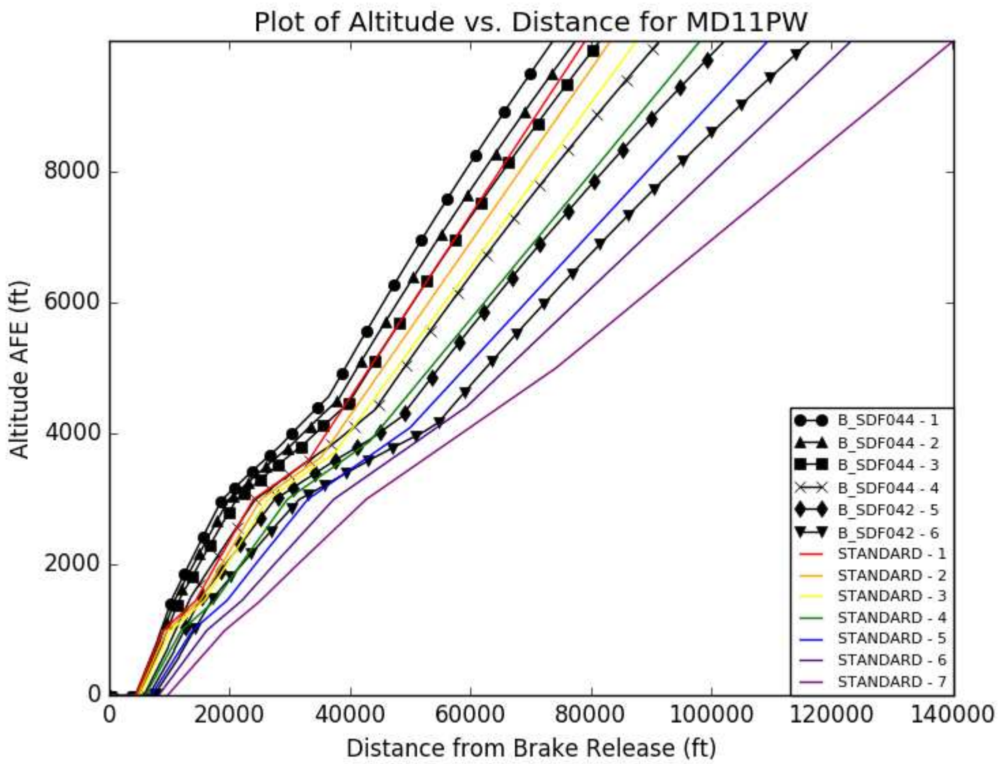

Figure 26 MD11 PW Altitude vs. Distance

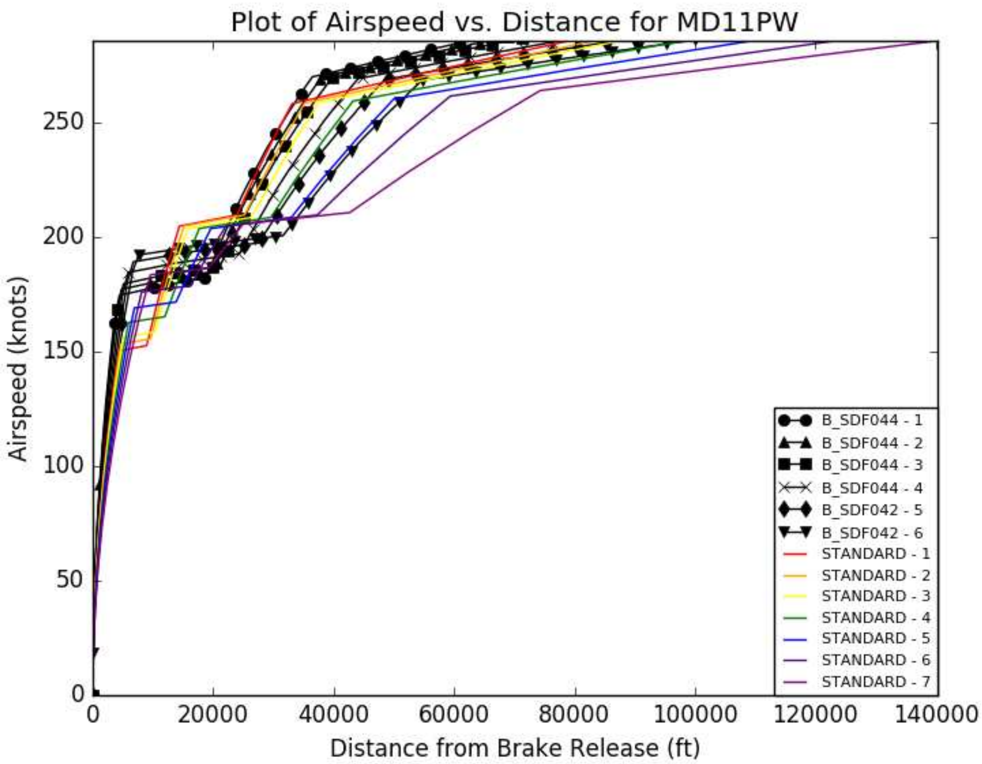

Figure 27 MD11PW Speed vs. Distance

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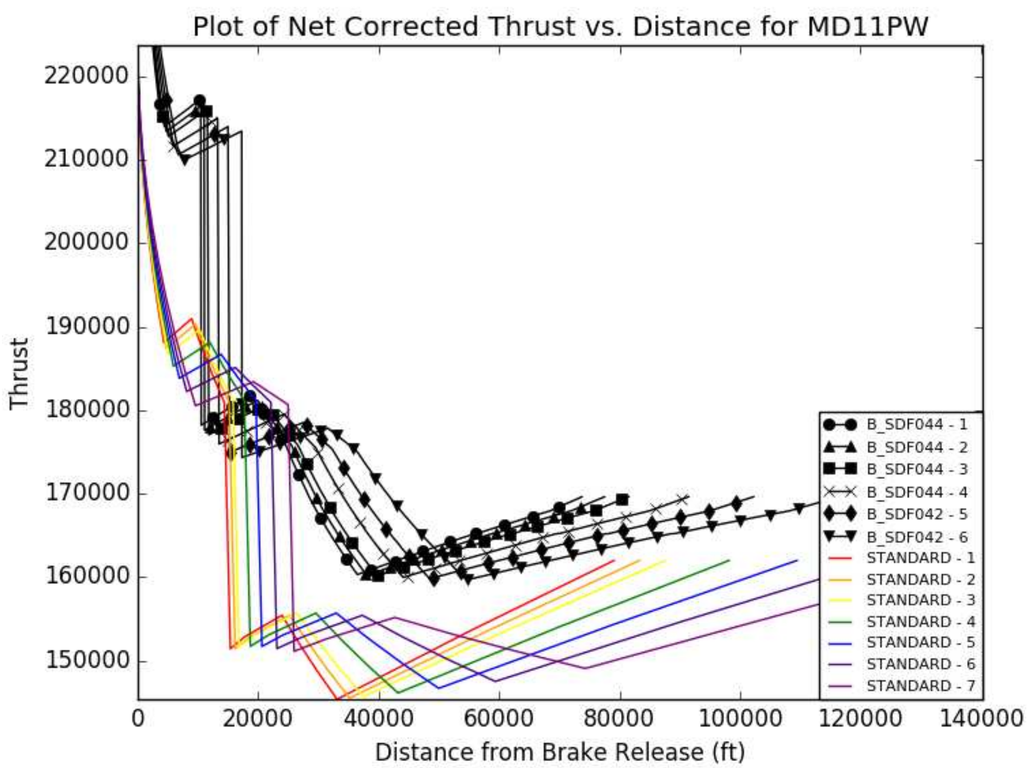

Figure 28 MD11 PW Thrust vs. Distance

Appendix F

AEDT 2b Profile Performance Data Excel file

Available as electronic file "Appendix_F_Profile_Performance_Data_20160425.xlsx"

Approximately 1.3 Mb in file size

Appendix G

2011 Noise Exposure Map Update
Louisville International Airport
Appendix G:
Submittals to FAA for Approval of Non-standard Aircraft Profiles Modeling Request

Available as electronic file "Appendix_G_2011_SDF_NEM_Appendix_G.pdf"
Approximately 2 Mb in file size

Appendix G
Submittals to FAA for Approval of Non-standard Aircraft Profiles Modeling Request
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Appendix G Submittals to FAA for Approval of Non-standard Aircraft Profiles Modeling Request

G.1 Initial Submittal June 17, 2010

HARRIS MILLER MILLER & HANSON INC.
77 South Bedford Street
Burlington, MA 01803
T 781.229.0707
F 781.229.7939
www.hmmh.com

June 17, 2010

Sent via email

Mr. Stephen Wilson
Community Planner
Federal Aviation Administration
Memphis Airports District Office
2862 Business Park Drive, Bldg. G
Memphis, TN 38118-1555
Stephen.Wilson@faa.gov

Subject: Request for INM 7.0b User Defined Profiles for SDF NEM Update

Reference: SDF NEM Update, HMMH Project No. 304060.004 (001)

Dear Mr. Wilson:

Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority (LRAA) to prepare the Noise Exposure Map (NEM) Update for Louisville International Airport (SDF). In addition to our previous request for approval of substitute aircraft types (letter dated May 22, 2010), we are also requesting approval of user-defined profiles for several aircraft. As we have discussed The Boeing Company (Boeing) is a member of the NEM contractor team. These user-defined flight profiles were developed by Boeing for several Boeing aircraft types. See Attachment A for Boeing's Letter of Concurrence. The user-defined profiles for these aircraft types are submitted for FAA/AEE review in accordance with the INM 7.0 User's Guide, "Appendix B: FAA Profile Review and Checklist." The profile information submitted for FAA review and approval is included as the following attachments:

- Attachment B – Boeing 757RR
- Attachment C – Boeing 767300
- Attachment D – McDonnell Douglas MD11GE
- Attachment E – McDonnell Douglas MD11PW
- Attachment F – Profile Graphs MS Excel file

The grid point analyses were conducted for departures from Runway 17R, which has an end point elevation 15 feet below the study reference point and the detailed grid. This difference results in some non-intuitive results for a few grid points 0-1.5 nm from the brake release point. The INM study and inputs files are provided in an attached zip file to the email transmitting this request.

On behalf of the Louisville Regional Airport Authority, we request that the FAA approve these INM 7.0b user-defined profiles for use in the Louisville NEM Update. We would be pleased to answer any questions that either FAA/AEE or you have regarding this request.

HARRIS MILLER MILLER & HANSON INC.

Thank you for your assistance on this matter.

Sincerely yours,

HARRIS MILLER MILLER & HANSON INC.

Eugene M. Reindel
Vice President

c:

Ms. Karen Scott (LRAA)
Mr. Robert Slattery (LRAA)
Mr. Tommy Dupree (FAA, Memphis ADO)

Attch: Appendix A: Boeing Letter of Concurrence
Appendix B: Boeing 757RR Profile Review
Appendix C: Boeing 767300 Profile Review
Appendix D: McDonnell Douglas MD11GE Profile Review
Appendix E: McDonnell Douglas MD11PW Profile Review
Appendix F: Profile Graphs Excel File

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Appendix A

Boeing Letter of Concurrence

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SDF Noise Exposure Map Update
Appendices

The Boeing Company (Boeing) is assisting, as a subcontractor to Harris Miller Miller & Hanson Inc., the Louisville Regional Airport Authority with the Noise Exposure Map Update for Louisville International Airport (FAA designator SDF). Boeing's work was related to custom flight profiles (user-defined INM profiles) for the Integrated Noise Model version 7.0b (INM).

User-Defined Profiles

Boeing supplied custom flight profiles for this study to assist in accounting for the effects of reduced thrust takeoff typically in use under the average day conditions at SDF. The Assumed Temperature Method is a common way to reduce takeoff thrust. If the takeoff weight is lower than the performance limited weight at the ambient temperature (OAT), it is possible to assume a higher temperature that meets all the takeoff performance requirements.

Boeing Performance Software (BPS) was used to calculate the maximum weight, by runway, for an assumed temperature and compared to the standard INM weights for the relevant portion of the Boeing fleet. These temperatures were then fed into the Boeing Climb Out Program (BCOP) to get the custom flight profiles. These profiles were verified by Boeing Performance Software group.

In each case the climb thrust was picked such that it is not higher than the assumed temperature takeoff thrust at the cutback point. For very light airplanes this can be "CLB2" (the deepest cutback). For the highest weight condition, Max Climb is used. In between, "CLB1" is used. Sometimes the climb thrust is barely lower than the assumed temperature takeoff thrust. Also, the climb thrust available isn't 'smooth' with takeoff weight and it isn't constant.

For the 757-200 and the 767-300, CLB2 is used, as it is low enough for all takeoff weights and thrusts. The MD-11 profiles were all based on the ambient temperature and did not model the assumed temperature.

These profiles are defined in INM profile point format (profile.dbf, prof_pts.dbf). In particular:

* the altitudes have been entered in terms of altitude above field elevation in units of feet
* the speed has been entered in terms of true airspeed in units of knots
* thrust has been entered in units of pounds, which matches the thrust-setting parameters used in the INM aircraft's associated noise-power-distance curves

David W. Forsyth, Lead Engineer
Airport Noise Engineering

Magaly Cruz, Lead Engineer
Performance Software Engineering

Appendix G
Submittals to FAA for Approval of Non-standard Aircraft Profiles Modeling Request
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HARRIS MILLER MILLER & HANSON INC.

Appendix B
757RR Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing 757RR operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

The INM does not contain profiles for the de-rated thrust departure procedures which are utilized by cargo operators at SDF. In addition, operators at SDF use "Climb 2" (CLB2) thrust instead of "Climb". The updated 757RR Boeing 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. Figures B1 and B2 compare the standard INM profiles and Boeing profiles to actual aircraft climb performance at SDF. Figures B3 and B4 compare the standard INM profiles and Boeing profiles to actual aircraft speed profiles at SDF.

Section 3 – Analysis Demonstrating Benefit

The differences between the existing 757RR profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the use of de-rated thrust on departure. Tables B1 through B6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

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Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, “Appendix_F_Profile_Plots.xls”, contains the profile points as found in the INM’s flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures B5, B6, and B7.

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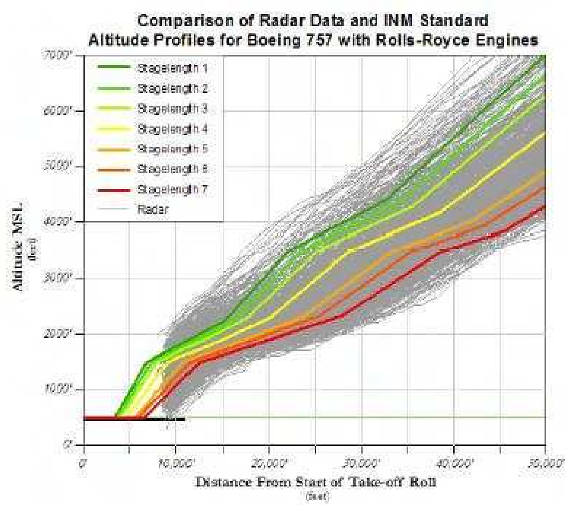

Figure B1 757RR INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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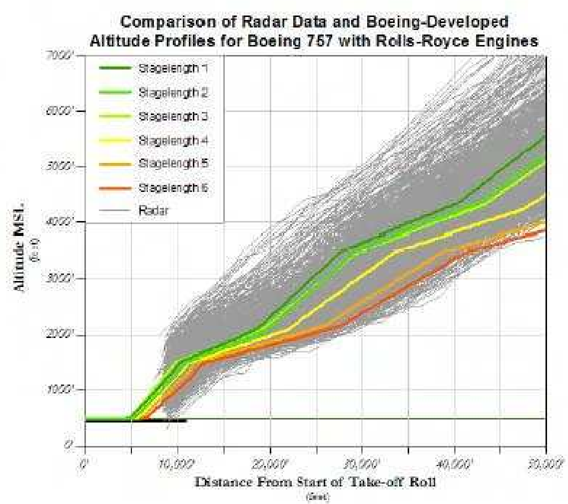

Figure B2 757RR Boeing-Developed Altitude Profiles Compared to Actual Aircraft Performance

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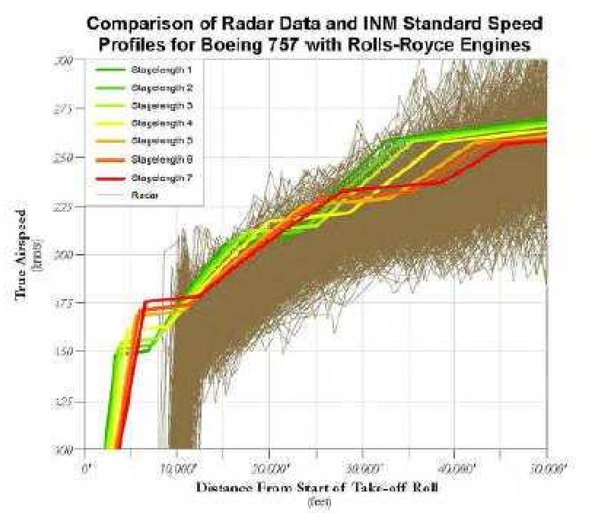

Figure B3 757RR INM Standard Speed Profiles Compared to Actual Aircraft Performance

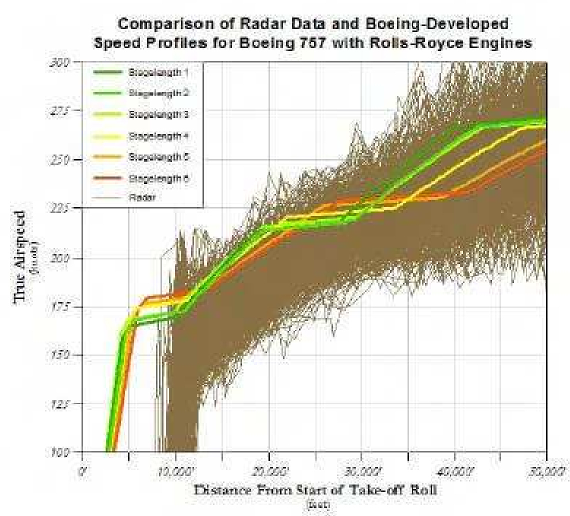

Figure B4 757RR Boeing-Developed Speed Profiles Compared to Actual Aircraft Performance

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Table B1. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 183,900 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF061

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	129.8	0.9
0.5	117.6	115.6	-2.0
1.0	100.3	105.1	4.8
1.5	92.9	96.5	3.6
2.0	90.4	91.2	0.8
2.5	88.3	89.2	0.9
3.0	86.4	87.5	1.1
3.5	84.9	85.8	0.9
4.0	83.7	84.1	0.4
4.5	82.6	82.8	0.2
5.0	81.6	81.8	0.2
5.5	80.5	80.9	0.4
6.0	79.6	80.1	0.5
6.5	78.8	79.3	0.5
7.0	78.1	78.6	0.5
7.5	77.5	77.8	0.3
8.0	76.8	77.1	0.3
8.5	76.3	76.5	0.2
9.0	75.7	75.9	0.2
9.5	75.2	75.4	0.2
10.0	74.7	74.9	0.2

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Table B2. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 191,200 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF061

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.8	129.8	1.0
0.5	117.6	117.1	-0.5
1.0	100.8	107.5	6.7
1.5	93.4	97.6	4.2
2.0	90.9	91.8	0.9
2.5	88.9	89.6	0.7
3.0	87.1	88.0	0.9
3.5	85.4	86.4	1.0
4.0	84.1	84.7	0.6
4.5	83.0	83.4	0.4
5.0	82.0	82.3	0.3
5.5	81.0	81.4	0.4
6.0	80.2	80.6	0.4
6.5	79.3	79.8	0.5
7.0	78.6	79.1	0.5
7.5	77.9	78.4	0.5
8.0	77.3	77.7	0.4
8.5	76.7	77.1	0.4
9.0	76.2	76.5	0.3
9.5	75.7	75.9	0.2
10.0	75.2	75.4	0.2

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Table B3. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 199,100 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF060

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.7	131.7	3.0
0.5	117.6	117.0	-0.6
1.0	102.0	105.6	3.6
1.5	94.1	97.4	3.3
2.0	91.3	91.0	-0.3
2.5	89.4	89.2	-0.2
3.0	87.7	87.7	0.0
3.5	85.9	86.2	0.3
4.0	84.6	84.7	0.1
4.5	83.6	83.4	-0.2
5.0	82.5	82.3	-0.2
5.5	81.6	81.5	-0.1
6.0	80.7	80.7	0.0
6.5	79.8	80.0	0.2
7.0	79.1	79.3	0.2
7.5	78.5	78.6	0.1
8.0	77.8	78.0	0.2
8.5	77.3	77.3	0.0
9.0	76.7	76.7	0.0
9.5	76.2	76.2	0.0
10.0	75.7	75.7	0.0

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Table B4. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 215,200 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF060

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.1	131.8	2.7
0.5	118.0	117.2	-0.8
1.0	104.6	112.4	7.8
1.5	98.0	99.5	1.5
2.0	92.1	92.5	0.4
2.5	90.2	90.0	-0.2
3.0	88.7	88.6	-0.1
3.5	87.3	87.4	0.1
4.0	85.7	86.0	0.3
4.5	84.5	84.6	0.1
5.0	83.5	83.5	0.0
5.5	82.5	82.5	0.0
6.0	81.8	81.7	-0.1
6.5	80.9	81.0	0.1
7.0	80.1	80.3	0.2
7.5	79.4	79.7	0.3
8.0	78.8	79.1	0.3
8.5	78.2	78.5	0.3
9.0	77.7	77.9	0.2
9.5	77.2	77.3	0.1
10.0	76.6	76.8	0.2

Table B5. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 234,800 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF058

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	132.6	3.7
0.5	118.5	119.4	0.9
1.0	110.2	120.5	10.3
1.5	99.6	101.6	2.0
2.0	93.3	95.4	2.1
2.5	91.3	90.6	-0.7
3.0	89.7	89.3	-0.4
3.5	88.4	88.2	-0.2
4.0	87.2	87.1	-0.1
4.5	85.7	86.0	0.3
5.0	84.6	84.9	0.3
5.5	83.7	83.8	0.1
6.0	82.9	82.8	-0.1
6.5	82.2	82.0	-0.2
7.0	81.3	81.4	0.1
7.5	80.6	80.8	0.2
8.0	79.9	80.2	0.3
8.5	79.3	79.7	0.4
9.0	78.8	79.1	0.3
9.5	78.3	78.6	0.3
10.0	77.8	78.0	0.2

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Table B6. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 243,200 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF058

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.8	132.7	3.9
0.5	118.5	119.4	0.9
1.0	122.0	118.0	-4.0
1.5	100.5	103.0	2.5
2.0	94.7	97.8	3.1
2.5	91.5	91.1	-0.4
3.0	90.0	89.7	-0.3
3.5	88.8	88.6	-0.2
4.0	87.8	87.6	-0.2
4.5	86.4	86.6	0.2
5.0	85.2	85.5	0.3
5.5	84.2	84.4	0.2
6.0	83.4	83.4	0.0
6.5	82.5	82.6	0.1
7.0	81.8	81.9	0.1
7.5	81.1	81.3	0.2
8.0	80.4	80.7	0.3
8.5	79.8	80.2	0.4
9.0	79.3	79.7	0.4
9.5	78.8	79.1	0.3
10.0	78.3	78.6	0.3

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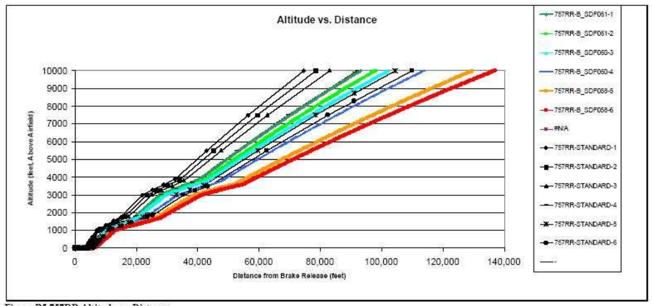

Figure B5 757RR Altitude vs. Distance

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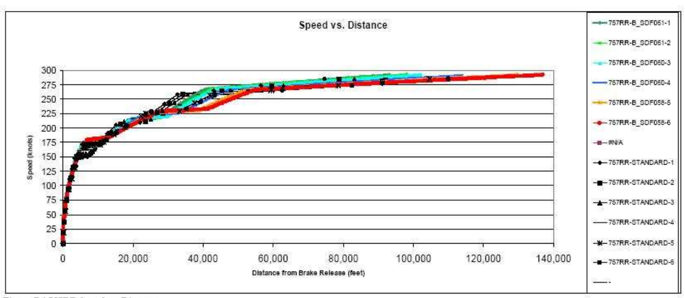

Figure B6 757RR Speed vs. Distance

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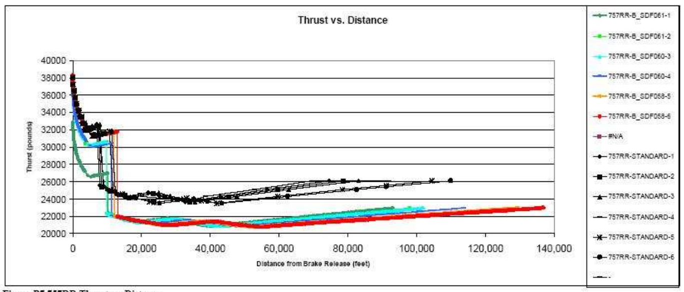

Figure B7 757RR Thrust vs. Distance

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Appendix C
767300 Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing 767300 operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

The INM does not contain profiles for the de-rated thrust departure procedures which are utilized by cargo operators at SDF. In addition, operators at SDF use "Climb 2" (CLB2) thrust instead of "Climb". The updated 767300 Boeing 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. Figures C1 and C2 compare the standard INM profiles and Boeing profiles to actual aircraft climb performance at SDF. Figures C3 and C4 compare the standard INM profiles and Boeing profiles to actual aircraft speed profiles at SDF.

Section 3 – Analysis Demonstrating Benefit

The differences between the existing 767300 profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the use of de-rated thrust on departure. Tables C1 through C6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Plots.xls", contains the profile points as found in the INM's flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures C5, C6, and C7.

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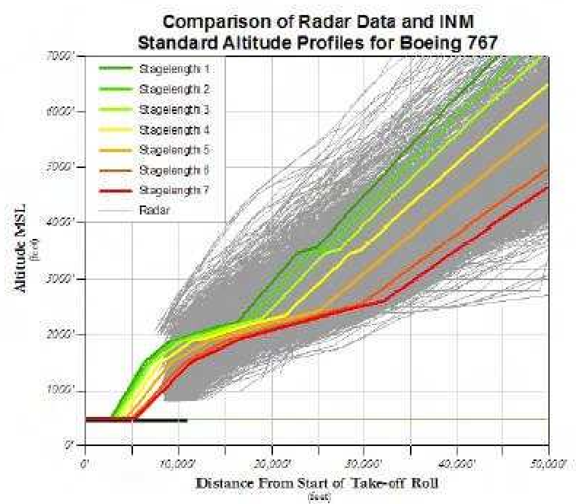

Figure C1 767300 INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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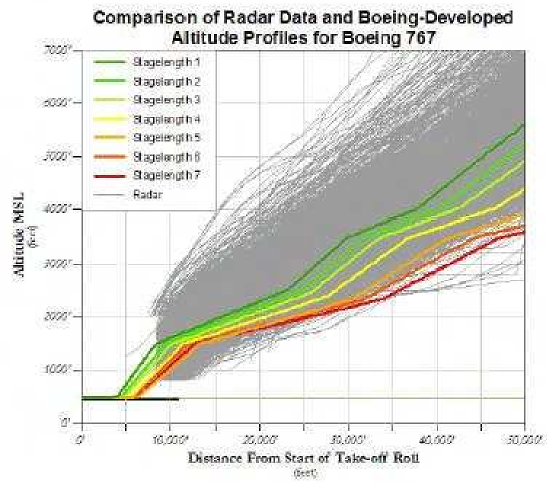

Figure C2 767300 Boeing Altitude Profiles Compared to Actual Aircraft Performance

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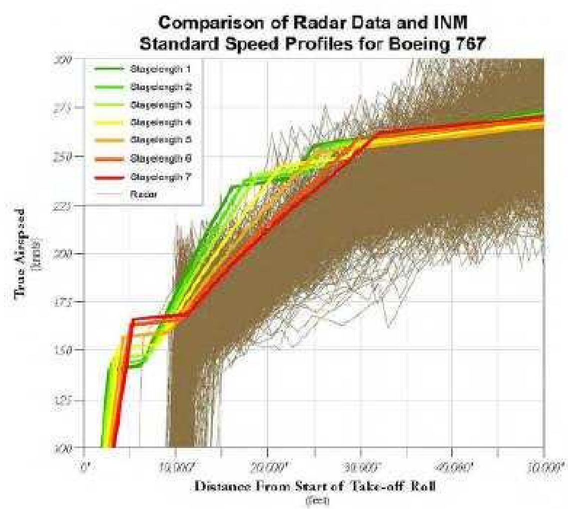

Figure C3 767300 INM Standard Speed Profiles Compared to Actual Aircraft Performance

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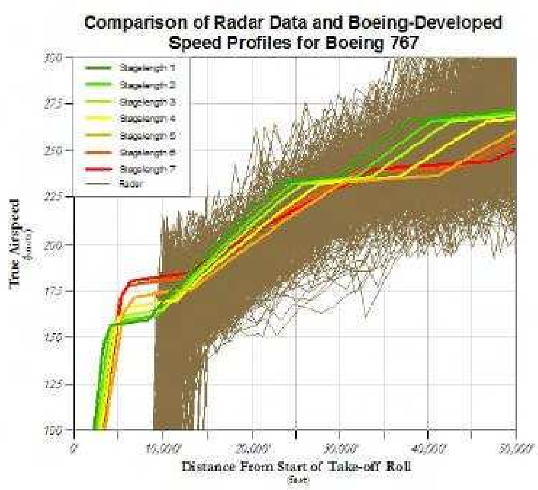

Figure C4 767300 Boeing Speed Profiles Compared to Actual Aircraft Performance

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Table C1. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 265,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF063

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.7	133.8	3.1
0.5	114.9	118.1	3.2
1.0	103.6	104.4	0.8
1.5	99.6	96.4	-3.2
2.0	94.0	92.5	-1.5
2.5	92.1	90.8	-1.3
3.0	90.4	89.4	-1.0
3.5	88.7	88.2	-0.5
4.0	87.1	86.9	-0.2
4.5	85.8	85.6	-0.2
5.0	84.8	84.5	-0.3
5.5	83.8	83.4	-0.4
6.0	82.9	82.5	-0.4
6.5	82.0	81.7	-0.3
7.0	81.2	81.0	-0.2
7.5	80.5	80.2	-0.3
8.0	79.9	79.5	-0.4
8.5	79.3	78.9	-0.4
9.0	78.7	78.3	-0.4
9.5	78.2	77.8	-0.4
10.0	77.6	77.2	-0.4

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Table C2. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 275,500 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.2	133.3	2.1
0.5	127.4	117.5	-9.9
1.0	104.0	105.5	1.5
1.5	100.3	99.7	-0.6
2.0	94.4	93.1	-1.3
2.5	92.6	91.4	-1.2
3.0	90.8	90.0	-0.8
3.5	89.2	88.8	-0.4
4.0	87.9	87.6	-0.3
4.5	86.2	86.4	0.2
5.0	85.2	85.1	-0.1
5.5	84.3	84.2	-0.1
6.0	83.4	83.2	-0.2
6.5	82.5	82.3	-0.2
7.0	81.7	81.6	-0.1
7.5	81.0	80.9	-0.1
8.0	80.4	80.2	-0.2
8.5	79.8	79.5	-0.3
9.0	79.2	78.9	-0.3
9.5	78.7	78.4	-0.3
10.0	78.2	77.8	-0.4

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Table C3. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 286,400 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.1	133.4	2.3
0.5	119.6	118.3	-1.3
1.0	104.5	106.8	2.3
1.5	100.6	100.7	0.1
2.0	94.9	93.5	-1.4
2.5	92.9	91.8	-1.1
3.0	91.4	90.4	-1.0
3.5	89.8	89.2	-0.6
4.0	88.3	88.1	-0.2
4.5	86.8	87.0	0.2
5.0	85.7	85.7	0.0
5.5	84.8	84.7	-0.1
6.0	83.9	83.7	-0.2
6.5	83.0	82.9	-0.1
7.0	82.2	82.1	-0.1
7.5	81.5	81.4	-0.1
8.0	80.9	80.8	-0.1
8.5	80.3	80.1	-0.2
9.0	79.7	79.5	-0.2
9.5	79.2	78.9	-0.3
10.0	78.7	78.4	-0.3

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Table C4. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 305,700 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.0	133.5	2.5
0.5	119.5	119.4	-0.1
1.0	105.5	111.0	5.5
1.5	101.5	102.1	0.6
2.0	97.5	94.3	-3.2
2.5	93.5	92.5	-1.0
3.0	92.1	91.1	-1.0
3.5	90.6	89.9	-0.7
4.0	89.3	88.9	-0.4
4.5	88.0	87.8	-0.2
5.0	86.6	86.8	0.2
5.5	85.6	85.6	0.0
6.0	84.8	84.8	0.0
6.5	83.9	83.8	-0.1
7.0	83.1	83.1	0.0
7.5	82.4	82.3	-0.1
8.0	81.7	81.7	0.0
8.5	81.1	81.1	0.0
9.0	80.5	80.5	0.0
9.5	80.0	79.9	-0.1
10.0	79.5	79.3	-0.2

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Table C5. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 330,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF064

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.8	133.6	2.8
0.5	120.1	118.2	-1.9
1.0	107.0	128.1	21.1
1.5	102.5	103.9	1.4
2.0	99.7	99.6	-0.1
2.5	94.4	93.2	-1.2
3.0	92.8	91.9	-0.9
3.5	91.7	90.8	-0.9
4.0	90.6	89.8	-0.8
4.5	89.2	88.9	-0.3
5.0	87.9	87.9	0.0
5.5	86.8	87.0	0.2
6.0	85.8	85.9	0.1
6.5	85.0	85.0	0.0
7.0	84.2	84.3	0.1
7.5	83.4	83.5	0.1
8.0	82.8	82.9	0.1
8.5	82.1	82.2	0.1
9.0	81.5	81.7	0.2
9.5	81.0	81.1	0.1
10.0	80.5	80.5	0.0

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Table C6. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 355,900 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF062

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.1	136.1	5.0
0.5	120.6	120.4	-0.2
1.0	109.5	118.8	9.3
1.5	103.5	105.0	1.5
2.0	100.7	94.7	-6.0
2.5	98.5	92.7	-5.8
3.0	93.5	91.6	-1.9
3.5	92.4	90.5	-1.9
4.0	91.4	89.7	-1.7
4.5	90.4	88.9	-1.5
5.0	89.3	88.1	-1.2
5.5	88.1	87.4	-0.7
6.0	87.1	86.4	-0.7
6.5	86.1	85.5	-0.6
7.0	85.3	84.7	-0.6
7.5	84.6	84.0	-0.6
8.0	83.9	83.4	-0.5
8.5	83.2	82.8	-0.4
9.0	82.6	82.2	-0.4
9.5	82.1	81.7	-0.4
10.0	81.5	81.2	-0.3

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Table C7. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 367,700 lbs. (PROF_ID2 = 7)
User PROF_ID1: B_SDF062

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.1	136.2	5.1
0.5	120.5	120.5	0.0
1.0	111.8	124.3	12.5
1.5	103.9	105.7	1.8
2.0	101.1	98.5	-2.6
2.5	99.0	92.9	-6.1
3.0	94.0	91.9	-2.1
3.5	92.7	90.9	-1.8
4.0	91.7	90.0	-1.7
4.5	90.8	89.2	-1.6
5.0	89.9	88.5	-1.4
5.5	88.8	87.8	-1.0
6.0	87.7	87.1	-0.6
6.5	86.7	86.1	-0.6
7.0	85.8	85.3	-0.5
7.5	85.1	84.6	-0.5
8.0	84.4	83.9	-0.5
8.5	83.7	83.3	-0.4
9.0	83.1	82.8	-0.3
9.5	82.6	82.2	-0.4
10.0	82.0	81.7	-0.3

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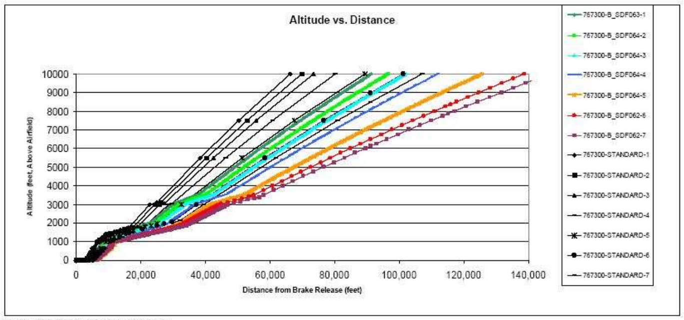

Figure C5 767300 Altitude vs. Distance

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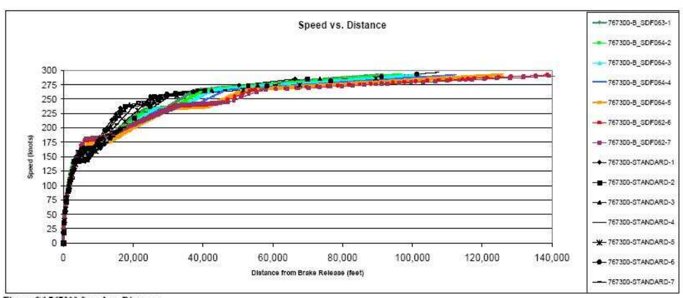

Figure C6 767300 Speed vs. Distance

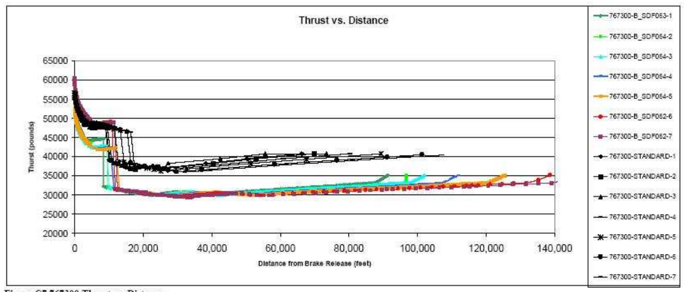

Figure C7 767300 Thrust vs. Distance

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MD11GE Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the McDonnell Douglas MD11GE operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

Our discussions with operators at SDF indicate that MD11GE operations use a procedure similar to ICAO A. INM 7.0b does not include a MD11GE departure procedure similar to ICAO A. The updated MD11GE Boeing 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. Figures D1 and D2 compare the standard INM profiles and Boeing profiles to actual aircraft climb performance at SDF. Figures D3 and D4 compare the standard INM profiles and Boeing profiles to actual aircraft speed profiles at SDF.

Section 3 – Analysis Demonstrating Benefit

The differences between the INM standard MD11GE departure profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the location of transition from take-off thrust to climb thrust at 1,500 ft Above Field Elevation (AFE) in the Boeing developed profiles compared to 1,000 ft AFE in the INM standard profiles. In addition, the Boeing developed profiles maintain speed until 3,000 ft AFE, and then begin acceleration and flap retraction, where as the INM standard profile accelerate and retract the flaps after the thrust cutback at 1,000 ft AFE. Tables D1 through D6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

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Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Plots.xls", contains the profile points as found in the INM's flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures D5, D6, and D7.

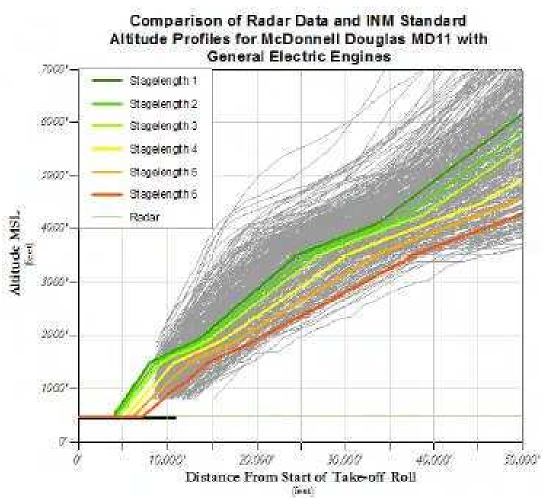

Figure D1 MD11GE INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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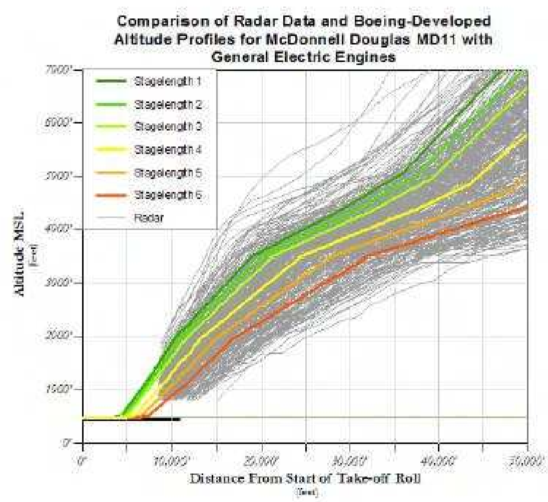

Figure D2 MD11GE Boeing-Developed Altitude Profiles Compared to Actual Aircraft Performance

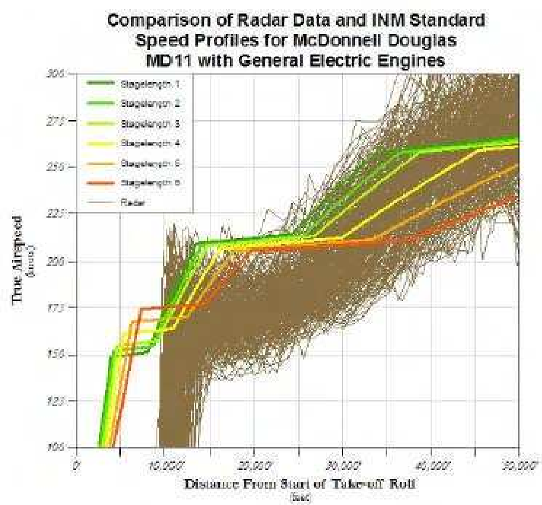

Figure D3 MD11GE INM Standard Speed Profiles Compared to Actual Aircraft Performance

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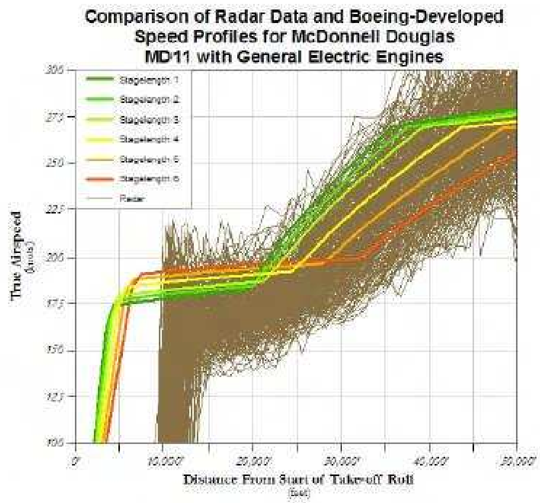

Figure D4 MD11GE Boeing-Developed Speed Profiles Compared to Actual Aircraft Performance

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Table D1. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 395,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.6	134.7	5.1
0.5	119.0	119.8	0.8
1.0	103.5	105.4	1.9
1.5	98.7	99.5	0.8
2.0	95.9	93.0	-2.9
2.5	90.0	90.8	0.8
3.0	88.0	89.4	1.4
3.5	86.4	88.0	1.6
4.0	85.3	86.7	1.4
4.5	84.2	85.5	1.3
5.0	83.2	84.5	1.3
5.5	82.2	83.4	1.2
6.0	81.4	82.2	0.8
6.5	80.6	81.3	0.7
7.0	79.8	80.5	0.7
7.5	79.0	79.7	0.7
8.0	78.3	79.0	0.7
8.5	77.7	78.4	0.7
9.0	77.1	77.8	0.7
9.5	76.5	77.3	0.8
10.0	75.8	76.8	1.0

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Table D2. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 410,000 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.6	134.6	5.0
0.5	119.4	119.8	0.4
1.0	104.7	106.4	1.7
1.5	99.3	100.0	0.7
2.0	96.3	93.7	-2.6
2.5	90.9	91.2	0.3
3.0	88.5	89.6	1.1
3.5	86.9	88.4	1.5
4.0	85.7	87.1	1.4
4.5	84.7	86.0	1.3
5.0	83.7	84.9	1.2
5.5	82.8	84.0	1.2
6.0	81.8	82.9	1.1
6.5	81.1	81.9	0.8
7.0	80.3	81.0	0.7
7.5	79.6	80.2	0.6
8.0	78.9	79.5	0.6
8.5	78.2	78.8	0.6
9.0	77.6	78.3	0.7
9.5	77.1	77.7	0.6
10.0	76.5	77.3	0.8

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Table D3. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 425,000 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.5	134.6	5.1
0.5	119.3	120.3	1.0
1.0	106.0	108.1	2.1
1.5	99.7	100.6	0.9
2.0	96.8	95.4	-1.4
2.5	93.3	91.6	-1.7
3.0	88.9	90.0	1.1
3.5	87.4	88.9	1.5
4.0	86.1	87.6	1.5
4.5	85.1	86.4	1.3
5.0	84.1	85.4	1.3
5.5	83.3	84.5	1.2
6.0	82.5	83.6	1.1
6.5	81.5	82.5	1.0
7.0	80.9	81.6	0.7
7.5	80.1	80.8	0.7
8.0	79.4	80.1	0.7
8.5	78.8	79.4	0.6
9.0	78.2	78.8	0.6
9.5	77.6	78.2	0.6
10.0	77.1	77.7	0.6

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Table D4. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 460,000 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF041

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.8	134.4	4.6
0.5	119.8	120.3	0.5
1.0	110.7	113.7	3.0
1.5	101.0	102.3	1.3
2.0	97.9	98.3	0.4
2.5	95.7	92.7	-3.0
3.0	90.1	90.9	0.8
3.5	88.5	89.6	1.1
4.0	87.1	88.7	1.6
4.5	86.1	87.5	1.4
5.0	85.2	86.5	1.3
5.5	84.3	85.7	1.4
6.0	83.5	84.8	1.3
6.5	82.7	84.1	1.4
7.0	82.0	83.1	1.1
7.5	81.2	82.2	1.0
8.0	80.6	81.5	0.9
8.5	79.9	80.7	0.8
9.0	79.3	80.0	0.7
9.5	78.7	79.4	0.7
10.0	78.2	78.9	0.7

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Table D5. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 495,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF039

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.7	134.3	4.6
0.5	119.7	120.9	1.2
1.0	117.8	132.0	14.2
1.5	103.1	104.4	1.3
2.0	99.0	99.8	0.8
2.5	96.7	95.9	-0.8
3.0	93.5	91.8	-1.7
3.5	89.4	90.5	1.1
4.0	88.2	89.4	1.2
4.5	87.0	88.5	1.5
5.0	86.1	87.6	1.5
5.5	85.2	86.7	1.5
6.0	84.4	85.9	1.5
6.5	83.7	85.2	1.5
7.0	83.0	84.5	1.5
7.5	82.4	83.8	1.4
8.0	81.8	82.9	1.1
8.5	81.1	82.2	1.1
9.0	80.4	81.4	1.0
9.5	79.8	80.7	0.9
10.0	79.2	80.1	0.9

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Table D6. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 535,000 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF039

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.5	134.7	5.2
0.5	120.3	121.4	1.1
1.0	117.7	118.8	1.1
1.5	106.7	107.2	0.5
2.0	100.5	101.4	0.9
2.5	98.0	98.3	0.3
3.0	96.0	93.3	-2.7
3.5	90.8	91.5	0.7
4.0	89.2	90.4	1.2
4.5	88.2	89.4	1.2
5.0	87.1	88.6	1.5
5.5	86.3	87.9	1.6
6.0	85.5	87.0	1.5
6.5	84.8	86.3	1.5
7.0	84.1	85.7	1.6
7.5	83.5	85.0	1.5
8.0	82.9	84.5	1.6
8.5	82.3	83.9	1.6
9.0	81.8	83.1	1.3
9.5	81.1	82.5	1.4
10.0	80.5	81.8	1.3

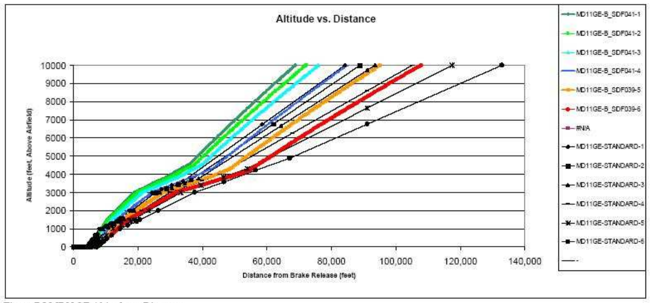

Figure D5 MD11GE Altitude vs. Distance

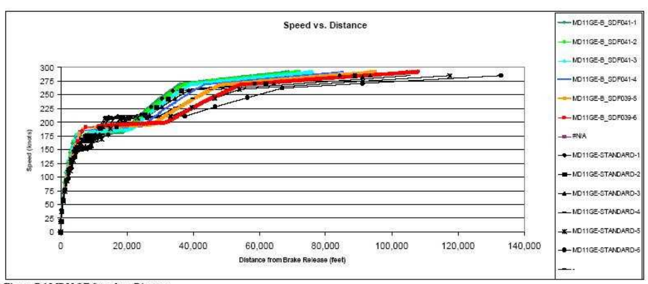

Figure D6 MD11GE Speed vs. Distance

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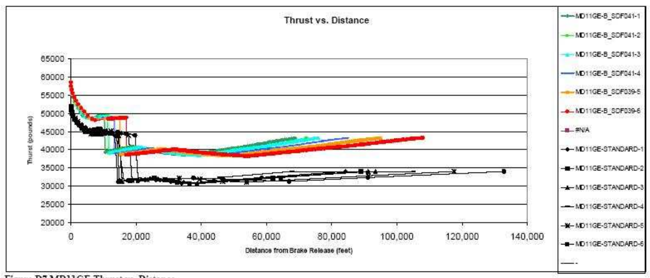

Figure D7 MD11GE Thrust vs. Distance

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Appendix E
MD11PW Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the McDonnell Douglas MD11PW operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

Our discussions with operators at SDF indicate that MD11PW operations use a procedure similar to ICAO A. INM 7.0b does not include a MD11PW departure procedure similar to ICAO A. The updated MD11PW Boeing 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. Figures E1 and E2 compare the standard INM profiles and Boeing-developed profiles to actual aircraft climb performance at SDF. Figures E3 and E4 compare the standard INM profiles and Boeing profiles to actual aircraft speed profiles at SDF.

Section 3 – Analysis Demonstrating Benefit

The differences between the INM standard MD11PW departure profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the location of transition from take-off thrust to climb thrust at 1,500 ft Above Field Elevation (AFE) in the Boeing developed profiles compared to 1,000 ft AFE in the INM standard profiles. In addition, the Boeing developed profiles maintain speed until 3,000 ft AFE, and then begin acceleration and flap retraction, where as the INM standard profile accelerate and retract the flaps after the thrust cutback at 1,000 ft AFE. Tables E1 through E6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

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Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Plots.xls", contains the profile points as found in the INM's flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures E5, E6, and E7.

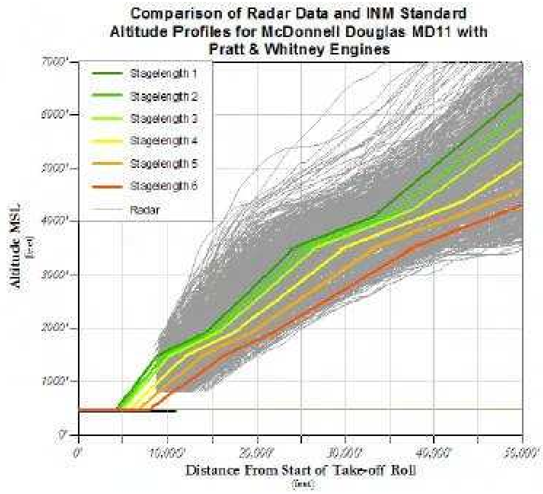

Figure E1 MD11PW INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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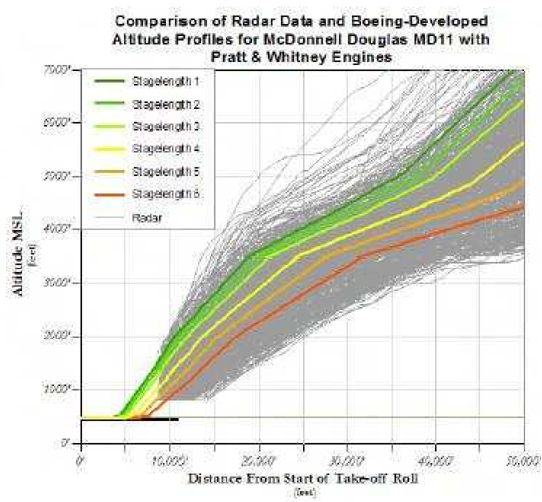

Figure E2 MD11PW Boeing-Developed Altitude Profiles Compared to Actual Aircraft Performance

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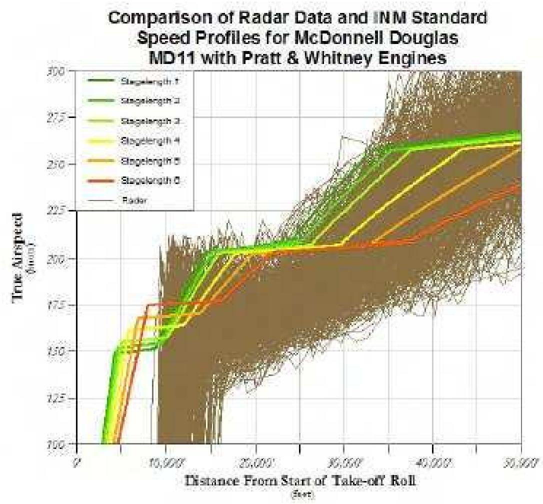

Figure E3 MD11PW INM Standard Speed Profiles Compared to Actual Aircraft Performance

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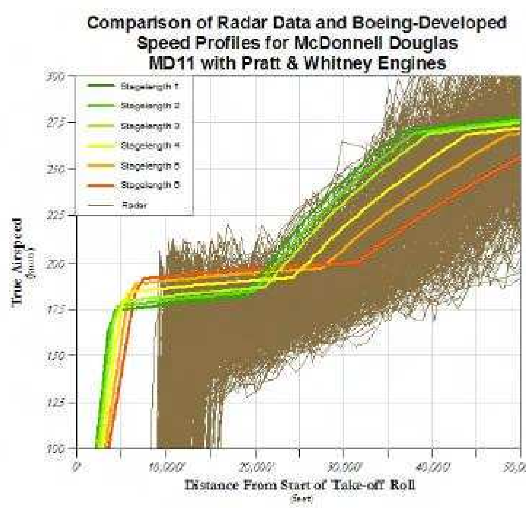

Figure E4 MD11PW Boeing-Developed Speed Profiles Compared to Actual Aircraft Performance

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Table E1. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 395,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	132.8	3.9
0.5	118.9	119.5	0.6
1.0	104.2	105.0	0.8
1.5	97.7	98.6	0.9
2.0	94.7	92.6	-2.1
2.5	91.2	90.2	-1.0
3.0	88.3	88.7	0.4
3.5	86.6	87.2	0.6
4.0	85.4	85.9	0.5
4.5	84.1	84.5	0.4
5.0	83.0	83.3	0.3
5.5	81.7	82.1	0.4
6.0	81.0	80.9	-0.1
6.5	80.1	80.1	0.0
7.0	79.4	79.3	-0.1
7.5	78.6	78.5	-0.1
8.0	78.0	77.8	-0.2
8.5	77.4	77.1	-0.3
9.0	76.8	76.5	-0.3
9.5	76.1	75.9	-0.2
10.0	75.5	75.3	-0.2

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Table E2. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 410,000 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.8	132.7	3.9
0.5	118.8	120.1	1.3
1.0	105.9	106.3	0.4
1.5	98.4	99.2	0.8
2.0	95.3	93.3	-2.0
2.5	92.7	90.6	-2.1
3.0	88.8	89.0	0.2
3.5	87.1	87.7	0.6
4.0	85.8	86.3	0.5
4.5	84.6	85.1	0.5
5.0	83.5	83.9	0.4
5.5	82.5	82.7	0.2
6.0	81.4	81.6	0.2
6.5	80.7	80.6	-0.1
7.0	79.9	79.8	-0.1
7.5	79.1	79.1	0.0
8.0	78.5	78.4	-0.1
8.5	77.9	77.7	-0.2
9.0	77.3	77.0	-0.3
9.5	76.7	76.4	-0.3
10.0	76.1	75.8	-0.3

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Table E3. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 425,000 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.7	132.6	3.9
0.5	118.8	120.1	1.3
1.0	108.0	108.1	0.1
1.5	99.1	99.9	0.8
2.0	95.7	94.5	-1.2
2.5	93.4	91.1	-2.3
3.0	89.4	89.4	0.0
3.5	87.7	88.2	0.5
4.0	86.2	86.8	0.6
4.5	85.2	85.6	0.4
5.0	84.0	84.5	0.5
5.5	83.0	83.4	0.4
6.0	82.1	82.3	0.2
6.5	81.2	81.2	0.0
7.0	80.4	80.4	0.0
7.5	79.6	79.6	0.0
8.0	79.0	78.9	-0.1
8.5	78.4	78.3	-0.1
9.0	77.8	77.6	-0.2
9.5	77.3	77.0	-0.3
10.0	76.7	76.4	-0.3

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Table E4. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 460,000 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF044

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.1	132.5	3.4
0.5	119.2	120.1	0.9
1.0	119.2	114.4	-4.8
1.5	101.3	101.8	0.5
2.0	97.0	97.5	0.5
2.5	94.6	92.2	-2.4
3.0	92.0	90.4	-1.6
3.5	88.8	89.0	0.2
4.0	87.4	88.0	0.6
4.5	86.2	86.8	0.6
5.0	85.2	85.7	0.5
5.5	84.1	84.7	0.6
6.0	83.3	83.7	0.4
6.5	82.4	82.8	0.4
7.0	81.6	81.8	0.2
7.5	80.8	80.9	0.1
8.0	80.1	80.2	0.1
8.5	79.5	79.5	0.0
9.0	78.9	78.9	0.0
9.5	78.3	78.3	0.0
10.0	77.8	77.7	-0.1

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Table E5. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 495,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF042

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	132.8	3.9
0.5	120.9	120.6	-0.3
1.0	117.3	124.8	7.5
1.5	104.4	104.2	-0.2
2.0	98.6	99.0	0.4
2.5	95.8	95.3	-0.5
3.0	93.8	91.3	-2.5
3.5	90.1	89.9	-0.2
4.0	88.5	88.7	0.2
4.5	87.2	87.8	0.6
5.0	86.2	86.8	0.6
5.5	85.3	85.8	0.5
6.0	84.4	84.9	0.5
6.5	83.5	84.0	0.5
7.0	82.8	83.2	0.4
7.5	82.0	82.4	0.4
8.0	81.3	81.5	0.2
8.5	80.5	80.8	0.3
9.0	79.9	80.2	0.3
9.5	79.3	79.5	0.2
10.0	78.8	79.0	0.2

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Table E6. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 535,000 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF042

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.7	132.7	4.0
0.5	119.7	121.3	1.6
1.0	117.7	118.4	0.7
1.5	109.5	107.4	-2.1
2.0	101.1	100.9	-0.2
2.5	97.4	97.5	0.1
3.0	95.2	93.0	-2.2
3.5	93.4	90.9	-2.5
4.0	89.8	89.7	-0.1
4.5	88.5	88.7	0.2
5.0	87.4	87.8	0.4
5.5	86.4	87.0	0.6
6.0	85.6	86.2	0.6
6.5	84.7	85.4	0.7
7.0	84.0	84.6	0.6
7.5	83.2	83.8	0.6
8.0	82.6	83.1	0.5
8.5	81.9	82.5	0.6
9.0	81.3	81.7	0.4
9.5	80.7	81.1	0.4
10.0	80.0	80.5	0.5

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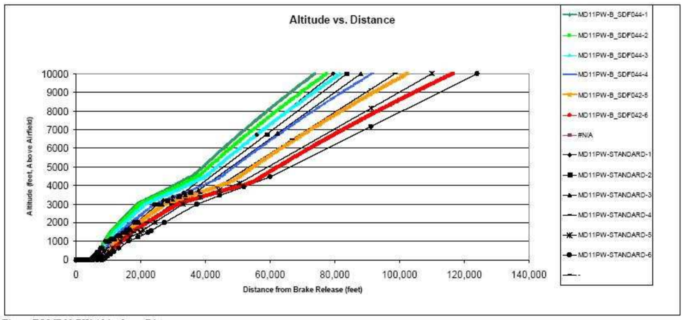

Figure E5 MD11 PW Altitude vs. Distance

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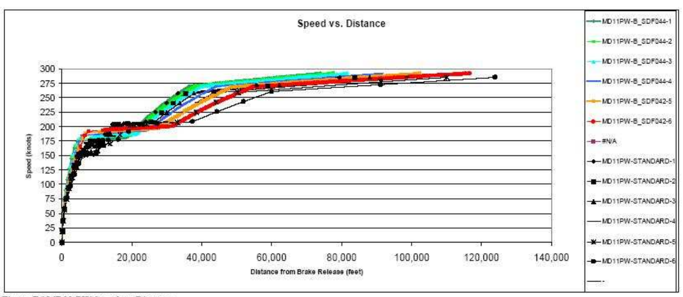

Figure E6 MD11 PW Speed vs. Distance

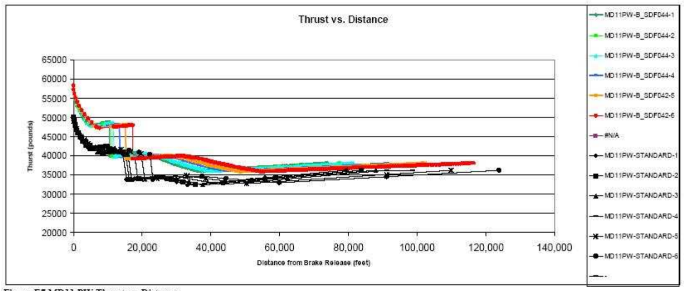

Figure E7 MD11 PW Thrust vs. Distance

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G.2 Follow-up Action Items September 10, 2010

HARRIS MILLER MILLER & HANSON INC.
77 South Bedford Street
Burlington, Massachusetts 01803
T 781.229.0707
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info@hmmh.com
www.hmmh.com

MEMORANDUM

To:	Bill He, Joe Dipardo
From:	Brad Nicholas
Date:	September 10, 2010
Subject:	Action Items for Updating of the SDF Non-Standard Profiles Request
Reference:	HMMH Job No. 304060

This memorandum describes the action items that Harris Miller Miller & Hanson Inc. (HMMH) proposes in order to update our request for approval of non-standard Integrated Noise Model (INM) profiles for the Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). We provide this memorandum prior to the submittal of our changes for the sake of efficiency in addressing your previous comments. Please respond as soon as possible whether or not the items we outline on the following page are sufficient to address your concerns. Thank you for your continued attention to this matter.

Sincerely,

HARRIS MILLER MILLER &HANSON INC.

Brad Nicholas

HMMH Action Items:

Demonstrate the importance of the non-standard profiles

We will lay out the importance of these cargo aircraft relative to their contribution to the total operations and noise exposure at SDF. Additionally, we will relay the scrutiny and expectations the surrounding residents and their representatives at the Community Noise Forum place on the most accurate available modeling techniques for these important aircraft. Finally we will briefly summarize the history of non-standard profile modeling at SDF which contributes to these high expectations.

Demonstrate the agreement between the non-standard profiles and actual aircraft performance

We will demonstrate that the use of the non-standard profiles results in better agreement with actual aircraft performance at SDF relative to INM standard profiles using quantitative measures. These measures will include comparisons of altitude vs. ground track distance and speeds. The existing profile plots and text will be modified to indicate the proportions of various profiles that are used in the modeling and to otherwise clarify the comparison of the proposed non-standard profiles to the actual radar profiles from SDF.

Add Sound Exposure Level Graphics

We will add single-event contour graphics from the INM to demonstrate the differences between the standard and non-standard profiles using the Sound Exposure Level (SEL) metric.

Document temperature assumptions

We will add notes relating to the temperature assumptions for the Assumed Temperature Method (ATM) for each profile.

Update the Boeing letter of concurrence

Boeing will update their letter of concurrence to contain:

- Date of transmittal
- Description of the software used for profile development
- Language connecting the letter of concurrence to the HMMH approval request
- Further information on the source of the profile procedures

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G.3 Addendum Submittal September 20, 2010

HARRIS MILLER MILLER & HANSON INC.
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F 781.229.7939
www.hmmh.com

September 20, 2010 Sent via email

Dr. Hua He
Office of Environment and Energy
Federal Aviation Administration
Hua.He@faa.gov

Subject: Addendum to Request for INM 7.0b User Defined Profiles for SDF NEM Update

Reference: SDF NEM Update, HMMH Project No. 304060.004 (001)

Dear Mr. He:

Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority to prepare a Noise Exposure Map (NEM) update for Louisville International Airport (SDF). At your request HMMH is submitting this addendum to our previous non-standard INM input approval request for user-defined profiles dated June 17, 2010. The contents of this addendum are consistent with telephone conversations between you and HMMH and the action items memo that HMMH submitted to you via email on September 10, 2010.

Activity by the cargo aircraft in this submittal represents a very important segment of operations at SDF. Though they constitute over approximately 8% of total jet departures, they account for over 28% of jet departures with an INM stage length of 4 or higher. Additionally, and importantly from a noise perspective, their activity is more heavily weighted toward the nighttime hours than other aircraft. Approximately 70% of departures by these aircraft occur during the nighttime period as compared to a nighttime departure rate of 36% for all other jet aircraft at SDF.

Given the prominence of these aircraft, local residents and their representatives on the Community Noise Forum place a great deal of scrutiny on the modeling techniques used to account for the noise generated by their operations. Additionally, the expectations for detailed and sometime non-standard analyses have been raised by past studies. For example, the most recent Part 150 Update examined aircraft performance using radar data to determine the assigned INM profile (stage length). It is in this context that we seek to provide the most accurate noise modeling results for these aircraft operations.

See Attachment A for Boeing's revised Letter of Concurrence. The User-defined profiles for these aircraft types are submitted for FAA/AEE review in accordance with the INM 7.0 User's Guide, "Appendix B: FAA Profile Review and Checklist." The profile information submitted for FAA review and approval is included as the following attachments:

- Revised Attachment B – Boeing 757RR
- Revised Attachment C – Boeing 767300
- Revised Attachment D – McDonnell Douglas MD11GE
- Revised Attachment E – McDonnell Douglas MD11PW

Neither Attachment F, an Excel file containing profile graphs, nor the INM study and inputs files have changed since our previous submittal. As such, they are not repeated in this submittal package.

On behalf of the Louisville Regional Airport Authority, we request that the FAA approve these INM 7.0b user-defined profiles for the Boeing-owned aircraft for use in the Louisville NEM Update. We would be pleased to answer any questions that either FAA/AEE or you have regarding this request.

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HARRIS MILLER MILLER & HANSON INC.

Thank you for your assistance on this matter.

Sincerely yours,

HARRIS MILLER MILLER & HANSON INC.

Bradley Nicholas
Senior Consultant

c: ,

Ms. Karen Scott (LRAA)
Mr. Robert Slattery (LRAA)
Mr. Tommy Dupree (FAA, Memphis ADO)
Mr. Gene Reindel (HMMH)

Attch: Appendix A: Revised Boeing Letter of Concurrence
Appendix B: Revised Boeing 757RR Profile Review
Appendix C: Revised Boeing 767300 Profile Review
Appendix D: Revised McDonnell Douglas MD11GE Profile Review
Appendix E: Revised McDonnell Douglas MD11PW Profile Review

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September 20, 2010

Appendix A
Boeing Letter of Concurrence

BOEING

The Boeing Company
P.O. Box 3707
Seattle WA 98124-2207

September 18, 2010

The Boeing Company (Boeing) is assisting, as a subcontractor to Harris Miller Miller & Hanson Inc., the Louisville Regional Airport Authority with the Noise Exposure Map Update for Louisville International Airport (FAA designator SDF). Boeing's work was related to custom flight profiles (user-defined INM profiles) for the Integrated Noise Model version 7.0b (INM).

User-Defined Profiles

Boeing supplied custom flight profiles for this study to account for the effects of reduced thrust takeoff typically in use under the average day conditions at SDF. The Assumed Temperature Method is a common way to reduce takeoff thrust. If the takeoff weight is lower than the performance limited weight at the ambient temperature (OAT), it is possible to assume a higher temperature that meets all the takeoff performance requirements.

Boeing Performance Software (BPS Standard Takeoff Software Version 2.14) was used to calculate the maximum weight, by runway, for an assumed temperature and compared to the standard INM weights for the relevant portion of the Boeing fleet. These temperatures were then fed into the Boeing Climb Out Program (BCOP Version 1.1) to get the custom flight profiles. This BCOP version was the same version shared with the FAA under a cooperative agreement with Boeing. These profiles were verified by Boeing Performance Software group.

In each case the climb thrust was chosen to be lower than the assumed temperature takeoff thrust at cutback. For very light airplanes this can be "CLB2" (the deepest cutback). For the highest weights, Max Climb is used. In between, "CLB1" is used. Sometimes climb thrust is barely lower than assumed temperature takeoff thrust. Also, climb thrust available is not smooth with takeoff weight and is not constant.

For the 757-200 and the 767-300, CLB2 is used, as it is low enough for all takeoff weights and thrusts. The MD 11 profiles were all based on the ambient temperature and did not model the assumed temperature.

These profiles are defined in INM profile point format (profile.dbf, prof_pts.dbf). In particular:

* the altitudes have been entered in terms of altitude above field elevation in units of feet
* the speed has been entered in terms of true airspeed in units of knots
* thrust has been entered in units of pounds, which matches the thrust-setting parameters used in the INM aircraft's associated noise-power-distance curves

These profiles are based on airline input and extensive consultation with HMMH to match radar track data. Boeing believes these profiles are the best fit for the conditions specified in Louisville.

David W. Forsyth, Lead Engineer
Airport Noise Engineering

Magaly Cruz, Lead Engineer
Performance Software Engineering

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Appendix B
757RR Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing 757RR operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

The INM does not contain profiles for the de-rated thrust departure procedures which are utilized by cargo operators at SDF. In addition, operators at SDF use "Climb 2" (CLB2) thrust instead of "Climb". The updated 757RR Boeing 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. Figures B1 and B2 compare the standard INM altitude profiles and Boeing altitude profiles to actual aircraft climb performance at SDF. Figures B3 and B4 compare the standard INM speed profiles and Boeing speed profiles to actual aircraft speed profiles at SDF.

Comparisons of the Boeing 757RR user-defined profiles and the INM standard profiles to a 1,106 track sample of radar data using a least squares calculation shows that using the user-defined profile results in improved agreement in the altitude profile for 87% of the radar tracks. A similar least squares analysis of the speed profiles showed improved agreement when the INM standard profiles were replaced by the user-defined profiles for 94% of the radar tracks. In total, 98% of tracks showed greater agreement in either the altitude or speed profile when the radar track was compared to the user-defined profile instead of the INM standard profile.

Section 3 – Analysis Demonstrating Benefit

The differences between the existing 757RR profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the use of de-rated thrust on departure. Tables B1 through B6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

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Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Plots.xls", contains the profile points as found in the INM's flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures B5, B6, and B7. Comparisons of SEL contours for the user-defined and INM Standard profiles are shown in Figures B8 through B12.

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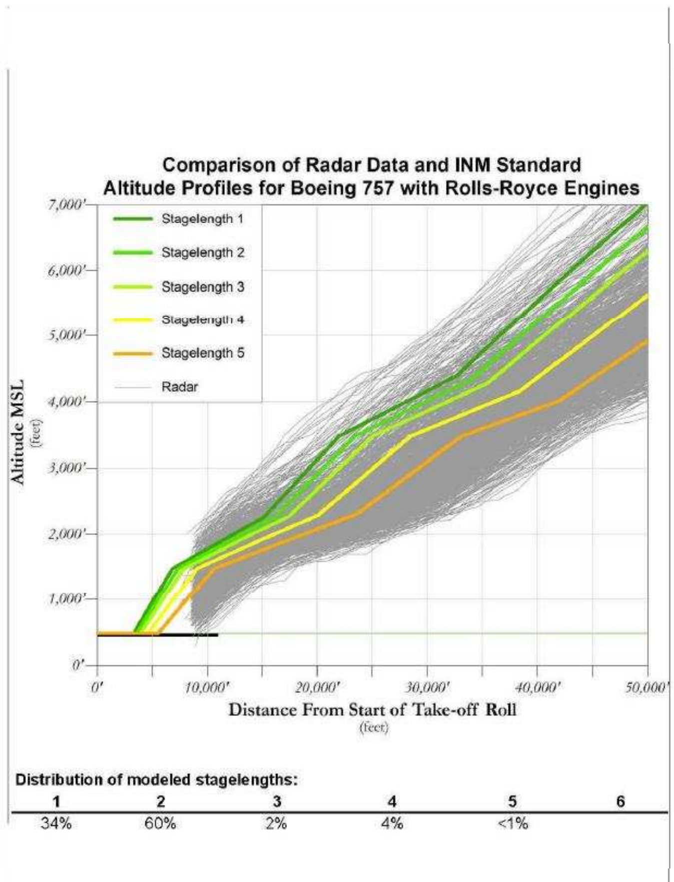

Figure B1 757RR INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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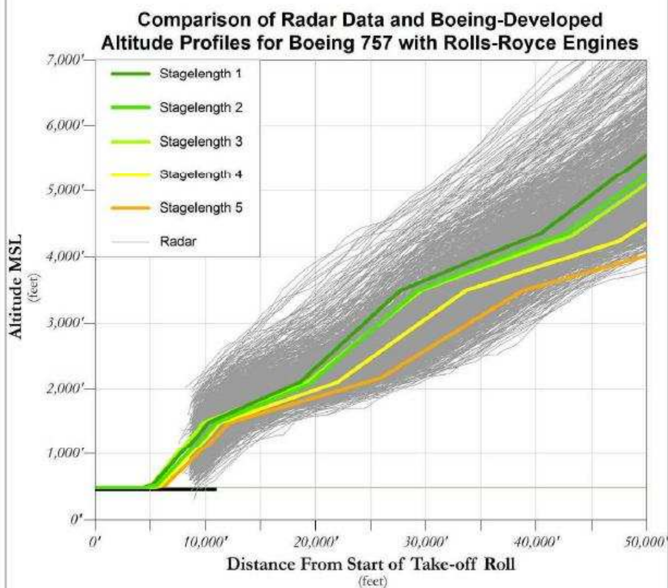

Distribution of modeled stagelengths:

1	2	3	4	5	6
34%	60%	2%	4%	<1%	

Figure B2 757RR Boeing Altitude Profiles Compared to Actual Aircraft Performance

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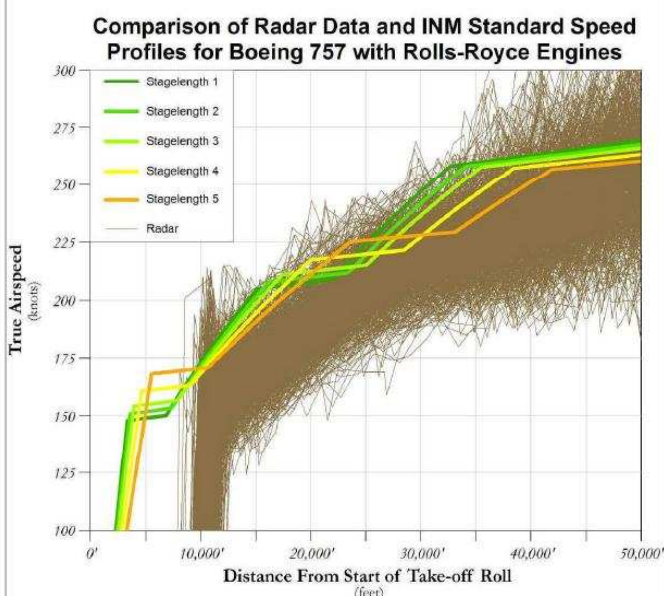

Distribution of modeled stagelengths:

1	2	3	4	5	6
34%	60%	2%	4%	<1%	

Figure B3 757RR INM Standard Speed Profiles Compared to Actual Aircraft Performance

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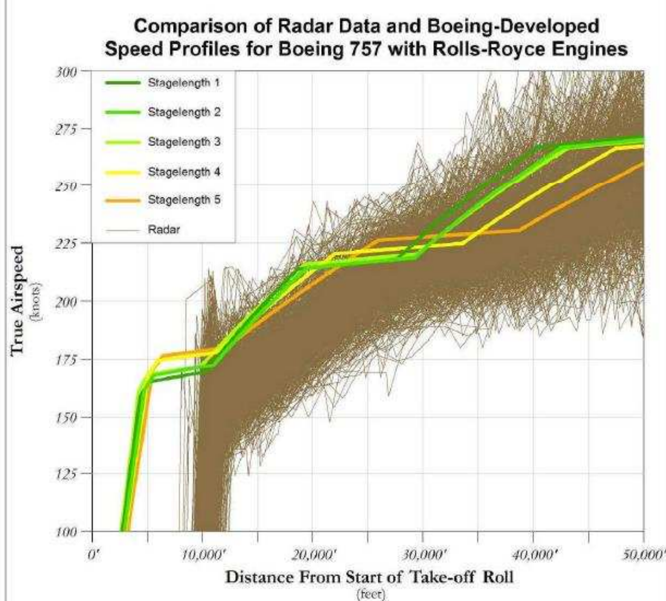

Distribution of modeled stagelengths:

1	2	3	4	5	6
34%	60%	2%	4%	<1%	

Figure B4 757RR Boeing Speed Profiles Compared to Actual Aircraft Performance

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Table B1. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 183,900 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF061
Reference Temperature: 17ºC
Assumed Temperature: 48ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	129.8	0.9
0.5	117.6	115.6	-2.0
1.0	100.3	105.1	4.8
1.5	92.9	96.5	3.6
2.0	90.4	91.2	0.8
2.5	88.3	89.2	0.9
3.0	86.4	87.5	1.1
3.5	84.9	85.8	0.9
4.0	83.7	84.1	0.4
4.5	82.6	82.8	0.2
5.0	81.6	81.8	0.2
5.5	80.5	80.9	0.4
6.0	79.6	80.1	0.5
6.5	78.8	79.3	0.5
7.0	78.1	78.6	0.5
7.5	77.5	77.8	0.3
8.0	76.8	77.1	0.3
8.5	76.3	76.5	0.2
9.0	75.7	75.9	0.2
9.5	75.2	75.4	0.2
10.0	74.7	74.9	0.2

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Table B2. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 191,200 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF061
Reference Temperature: 17ºC
Assumed Temperature: 48ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.8	129.8	1.0
0.5	117.6	117.1	-0.5
1.0	100.8	107.5	6.7
1.5	93.4	97.6	4.2
2.0	90.9	91.8	0.9
2.5	88.9	89.6	0.7
3.0	87.1	88.0	0.9
3.5	85.4	86.4	1.0
4.0	84.1	84.7	0.6
4.5	83.0	83.4	0.4
5.0	82.0	82.3	0.3
5.5	81.0	81.4	0.4
6.0	80.2	80.6	0.4
6.5	79.3	79.8	0.5
7.0	78.6	79.1	0.5
7.5	77.9	78.4	0.5
8.0	77.3	77.7	0.4
8.5	76.7	77.1	0.4
9.0	76.2	76.5	0.3
9.5	75.7	75.9	0.2
10.0	75.2	75.4	0.2

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Table B3. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 199,100 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF060
Reference Temperature: 17ºC
Assumed Temperature: 34ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.7	131.7	3.0
0.5	117.6	117.0	-0.6
1.0	102.0	105.6	3.6
1.5	94.1	97.4	3.3
2.0	91.3	91.0	-0.3
2.5	89.4	89.2	-0.2
3.0	87.7	87.7	0.0
3.5	85.9	86.2	0.3
4.0	84.6	84.7	0.1
4.5	83.6	83.4	-0.2
5.0	82.5	82.3	-0.2
5.5	81.6	81.5	-0.1
6.0	80.7	80.7	0.0
6.5	79.8	80.0	0.2
7.0	79.1	79.3	0.2
7.5	78.5	78.6	0.1
8.0	77.8	78.0	0.2
8.5	77.3	77.3	0.0
9.0	76.7	76.7	0.0
9.5	76.2	76.2	0.0
10.0	75.7	75.7	0.0

HARRIS MILLER MILLER & HANSON INC.

Table B4. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 215,200 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF060
Reference Temperature: 17ºC
Assumed Temperature: 34ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.1	131.8	2.7
0.5	118.0	117.2	-0.8
1.0	104.6	112.4	7.8
1.5	98.0	99.5	1.5
2.0	92.1	92.5	0.4
2.5	90.2	90.0	-0.2
3.0	88.7	88.6	-0.1
3.5	87.3	87.4	0.1
4.0	85.7	86.0	0.3
4.5	84.5	84.6	0.1
5.0	83.5	83.5	0.0
5.5	82.5	82.5	0.0
6.0	81.8	81.7	-0.1
6.5	80.9	81.0	0.1
7.0	80.1	80.3	0.2
7.5	79.4	79.7	0.3
8.0	78.8	79.1	0.3
8.5	78.2	78.5	0.3
9.0	77.7	77.9	0.2
9.5	77.2	77.3	0.1
10.0	76.6	76.8	0.2

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Table B5. Comparison of 757RR Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 757RR
Profile Weight: 234,800 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF058
Reference Temperature: 17ºC
Assumed Temperature: 17ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	132.6	3.7
0.5	118.5	119.4	0.9
1.0	110.2	120.5	10.3
1.5	99.6	101.6	2.0
2.0	93.3	95.4	2.1
2.5	91.3	90.6	-0.7
3.0	89.7	89.3	-0.4
3.5	88.4	88.2	-0.2
4.0	87.2	87.1	-0.1
4.5	85.7	86.0	0.3
5.0	84.6	84.9	0.3
5.5	83.7	83.8	0.1
6.0	82.9	82.8	-0.1
6.5	82.2	82.0	-0.2
7.0	81.3	81.4	0.1
7.5	80.6	80.8	0.2
8.0	79.9	80.2	0.3
8.5	79.3	79.7	0.4
9.0	78.8	79.1	0.3
9.5	78.3	78.6	0.3
10.0	77.8	78.0	0.2

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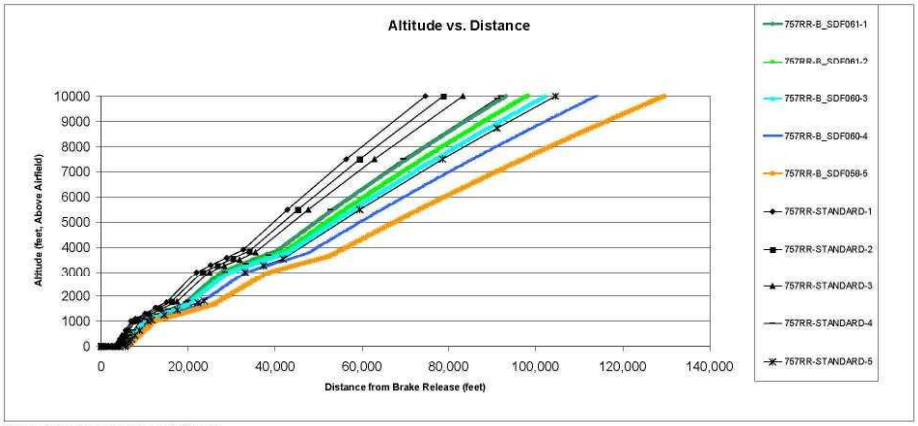

Figure B5 757RR Altitude vs. Distance

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Figure B6 757RR Speed vs. Distance

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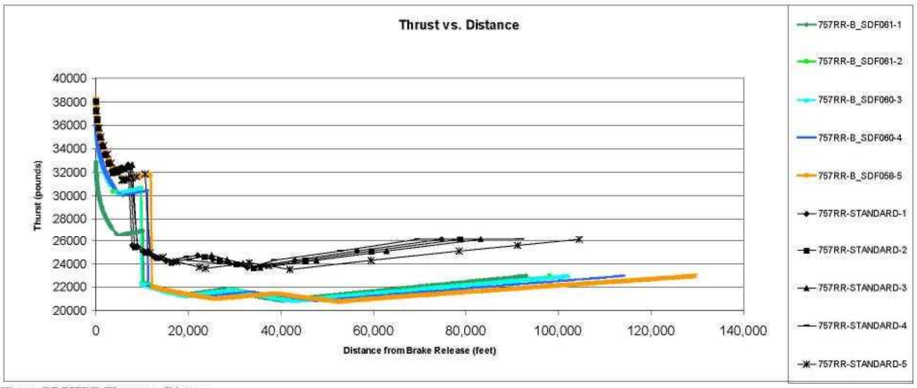

Figure B7 757RR Thrust vs. Distance

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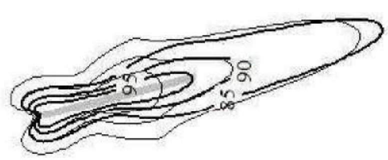

Figure B8 757RR Stage Length 1 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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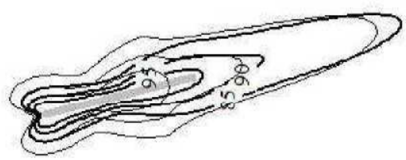

Figure B9 757RR Stage Length 2 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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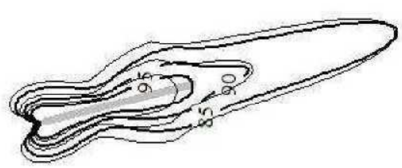

Figure B10 757RR Stage Length 3 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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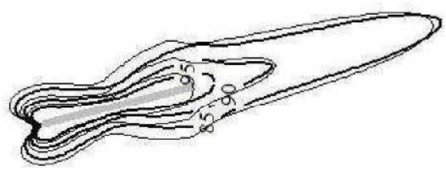

Figure B11 757RR Stage Length 4 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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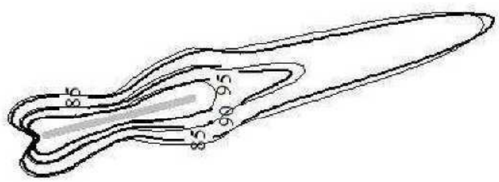

Figure B12 757RR Stage Length 5 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

Appendix C
767300 Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the Boeing 767300 operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

The INM does not contain profiles for the de-rated thrust departure procedures which are utilized by cargo operators at SDF. In addition, operators at SDF use "Climb 2" (CLB2) thrust instead of "Climb". The updated 767300 Boeing 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. Figures C1 and C2 compare the standard INM altitude profiles and Boeing altitude profiles to actual aircraft climb performance at SDF. Figures C3 and C4 compare the standard INM speed profiles and Boeing speed profiles to actual aircraft speed profiles at SDF.

Comparisons of the Boeing 767300 user-defined profiles and the INM standard profiles to a 1,635 track sample of radar data using a least squares calculation shows that using the user-defined profile results in improved agreement in the altitude profile for 55% of the radar tracks. A similar least squares analysis of the speed profiles showed improved agreement when the INM standard profiles were replaced by the user-defined profiles for 95% of the radar tracks. In total, 98% of tracks showed greater agreement in either the altitude or speed profile when the radar track was compared to the user-defined profile instead of the INM standard profile.

Section 3 – Analysis Demonstrating Benefit

The differences between the existing 767300 profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the use of de-rated thrust on departure. Tables C1 through C6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Plots.xls", contains the profile points as found in the INM's flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures C5, C6, and C7. Comparisons of SEL contours for the user-defined and INM Standard profiles are shown in Figures C8 through C10.

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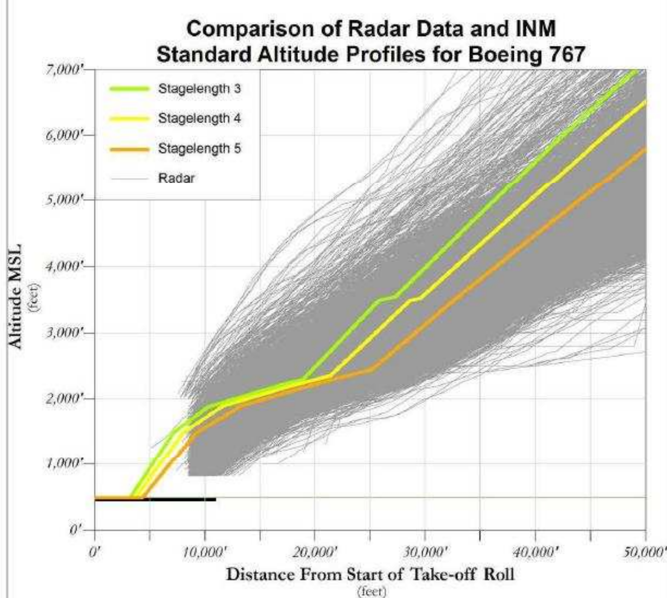

Distribution of modeled stagelengths:

1	2	3	4	5	6
		17%	33%	50%	

Figure C1 767300 INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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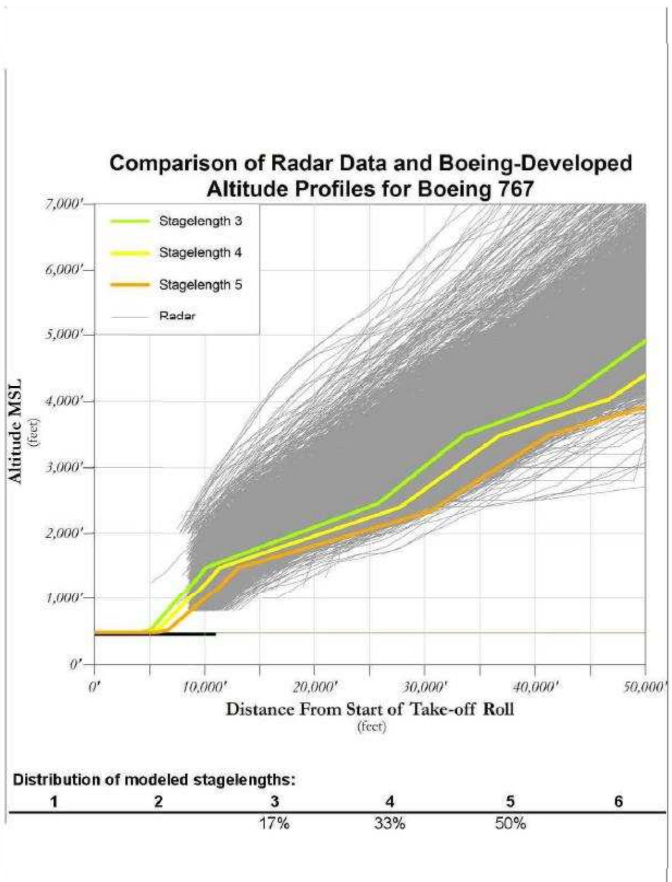

Figure C2 767300 Boeing Altitude Profiles Compared to Actual Aircraft Performance

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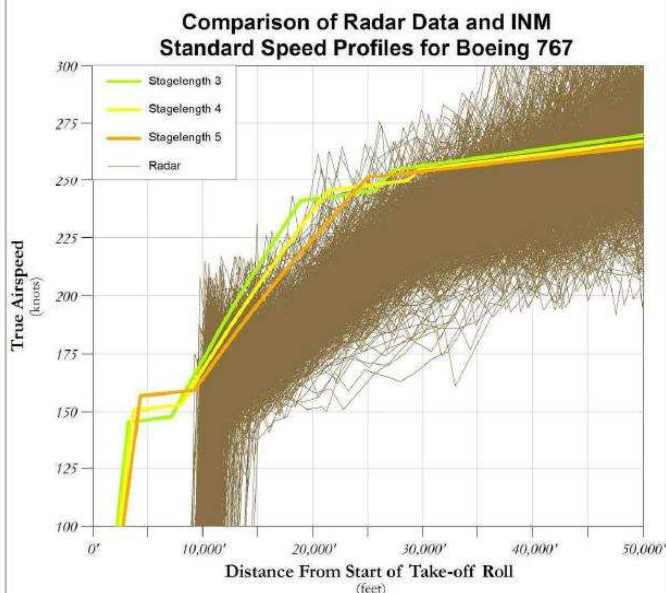

Distribution of modeled stagelengths:

1	2	3	4	5	6
		17%	33%	50%	

Figure C3 767300 INM Standard Speed Profiles Compared to Actual Aircraft Performance

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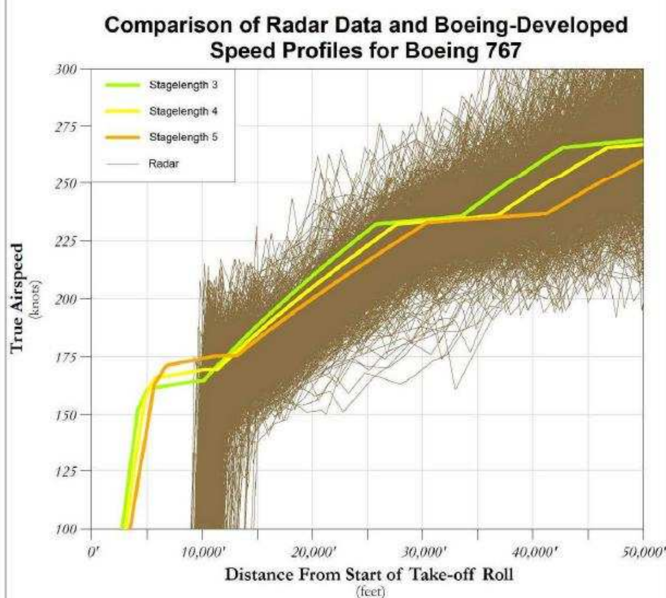

Distribution of modeled stagelengths:

1	2	3	4	5	6
		17%	33%	50%	

Figure C4 767300 Boeing Speed Profiles Compared to Actual Aircraft Performance

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Table C1. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 286,400 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF064
Reference Temperature: 17ºC
Assumed Temperature: 47ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.1	133.4	2.3
0.5	119.6	118.3	-1.3
1.0	104.5	106.8	2.3
1.5	100.6	100.7	0.1
2.0	94.9	93.5	-1.4
2.5	92.9	91.8	-1.1
3.0	91.4	90.4	-1.0
3.5	89.8	89.2	-0.6
4.0	88.3	88.1	-0.2
4.5	86.8	87.0	0.2
5.0	85.7	85.7	0.0
5.5	84.8	84.7	-0.1
6.0	83.9	83.7	-0.2
6.5	83.0	82.9	-0.1
7.0	82.2	82.1	-0.1
7.5	81.5	81.4	-0.1
8.0	80.9	80.8	-0.1
8.5	80.3	80.1	-0.2
9.0	79.7	79.5	-0.2
9.5	79.2	78.9	-0.3
10.0	78.7	78.4	-0.3

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Table C2. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 305,700 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF064
Reference Temperature: 17ºC
Assumed Temperature: 47ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	131.0	133.5	2.5
0.5	119.5	119.4	-0.1
1.0	105.5	111.0	5.5
1.5	101.5	102.1	0.6
2.0	97.5	94.3	-3.2
2.5	93.5	92.5	-1.0
3.0	92.1	91.1	-1.0
3.5	90.6	89.9	-0.7
4.0	89.3	88.9	-0.4
4.5	88.0	87.8	-0.2
5.0	86.6	86.8	0.2
5.5	85.6	85.6	0.0
6.0	84.8	84.8	0.0
6.5	83.9	83.8	-0.1
7.0	83.1	83.1	0.0
7.5	82.4	82.3	-0.1
8.0	81.7	81.7	0.0
8.5	81.1	81.1	0.0
9.0	80.5	80.5	0.0
9.5	80.0	79.9	-0.1
10.0	79.5	79.3	-0.2

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Table C5. Comparison of 767300 Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: 767300
Profile Weight: 330,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF064
Reference Temperature: 17ºC
Assumed Temperature: 47ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	130.8	133.6	2.8
0.5	120.1	118.2	-1.9
1.0	107.0	128.1	21.1
1.5	102.5	103.9	1.4
2.0	99.7	99.6	-0.1
2.5	94.4	93.2	-1.2
3.0	92.8	91.9	-0.9
3.5	91.7	90.8	-0.9
4.0	90.6	89.8	-0.8
4.5	89.2	88.9	-0.3
5.0	87.9	87.9	0.0
5.5	86.8	87.0	0.2
6.0	85.8	85.9	0.1
6.5	85.0	85.0	0.0
7.0	84.2	84.3	0.1
7.5	83.4	83.5	0.1
8.0	82.8	82.9	0.1
8.5	82.1	82.2	0.1
9.0	81.5	81.7	0.2
9.5	81.0	81.1	0.1
10.0	80.5	80.5	0.0

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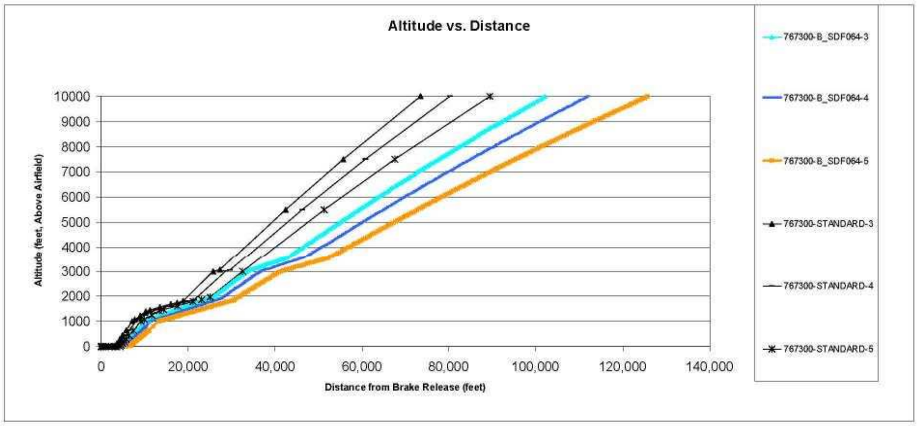

Figure C5 767300 Altitude vs. Distance

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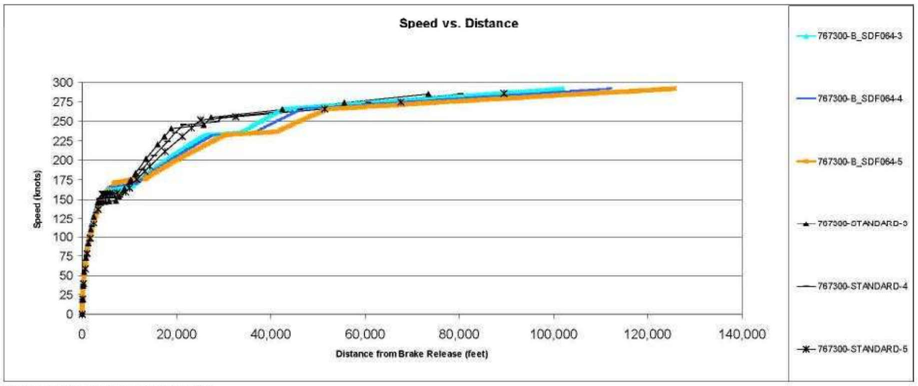

Figure C6 767300 Speed vs. Distance

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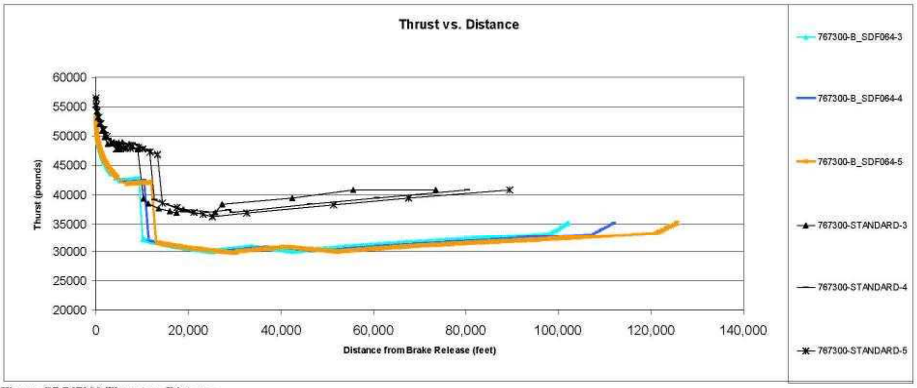

Figure C7 767300 Thrust vs. Distance

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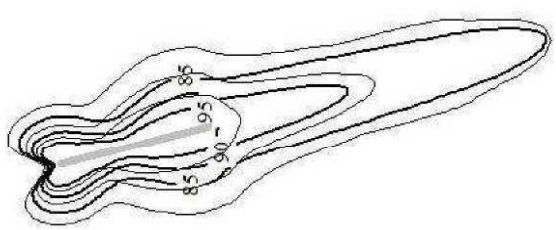

Figure C8 767300 Stage Length 3 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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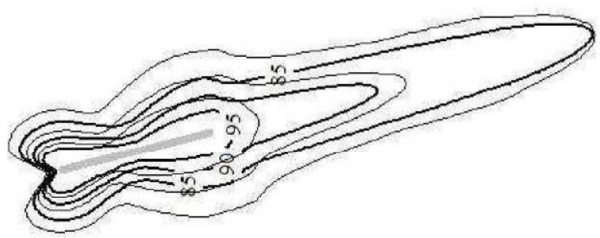

Figure C9 767300 Stage Length 4 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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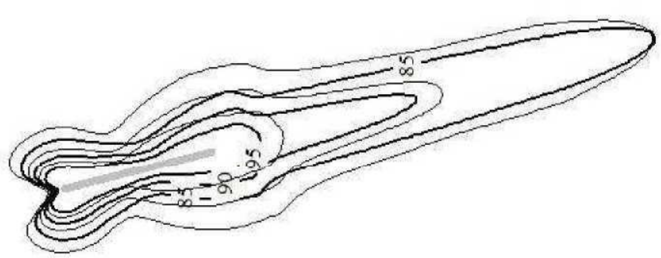

Figure C10 767300 Stage Length 5 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

Appendix D
MD11GE Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the McDonnell Douglas MD11GE operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

Our discussions with operators at SDF indicate that MD11GE operations use a procedure similar to the ICAO A procedure. The INM v7.0b does not include a MD11GE departure procedure similar to ICAO A. The updated MD11GE Boeing 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. Figures D1 and D2 compare the standard INM altitude profiles and Boeing altitude profiles to actual aircraft climb performance at SDF. Figures D3 and D4 compare the standard INM speed profiles and Boeing speed profiles to actual aircraft speed profiles at SDF.

Comparisons of the MD11GE non-standard profiles and the INM standard profiles to a 498 track sample of radar data using a least squares calculation shows that using the user-defined profile results in improved agreement in the altitude profile for 38% of the radar tracks. A similar least squares analysis of the speed profiles showed improved agreement when the INM standard profiles were replaced by the user-defined profiles for 81% of the radar tracks. In total, 84% of tracks showed greater agreement in either the altitude or speed profile when the radar track was compared to the user-defined profile instead of the INM standard profile.

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Section 3 – Analysis Demonstrating Benefit

The differences between the INM standard MD11GE departure profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the location of transition from take-off thrust to climb thrust at 1,500 ft Above Field Elevation (AFE) in the Boeing developed profiles compared to 1,000 ft AFE in the INM standard profiles. In addition, the Boeing developed profiles maintain speed until 3,000 ft AFE, and then begin acceleration and flap retraction, where as the INM standard profile accelerate and retract the flaps after the thrust cutback at 1,000 ft AFE. Tables D1 through D6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Plots.xls", contains the profile points as found in the INM's flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures D5, D6, and D7. Comparisons of SEL contours for the user-defined and INM Standard profiles are shown in Figures D8 through D13.

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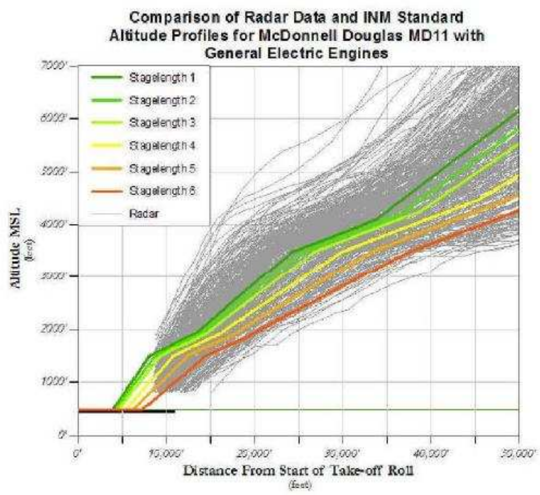

Distribution of modeled stagelengths:

1	2	3	4	5	6
37%	40%	<1%	8%	10%	5%

Figure D1 MD11GE INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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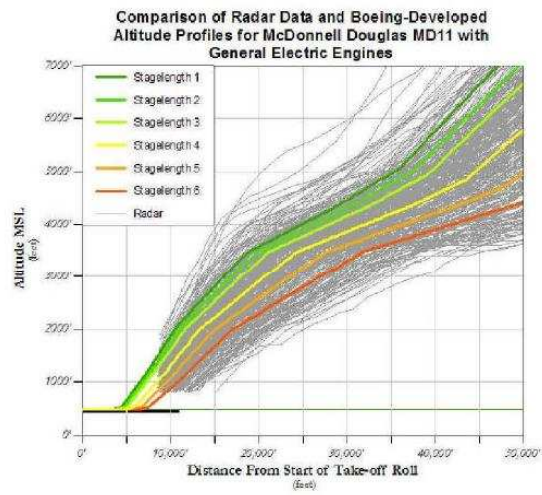

Distribution of modeled stagelengths:

1	2	3	4	5	6
37%	40%	<1%	8%	10%	5%

Figure D2 MD11GE Boeing Altitude Profiles Compared to Actual Aircraft Performance

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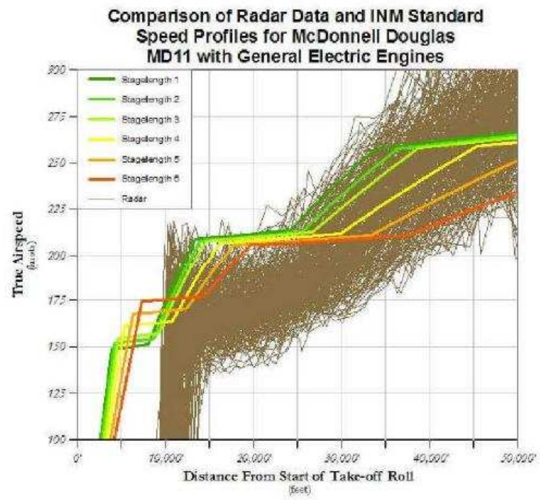

Distribution of modeled stagelengths:

1	2	3	4	5	6
37%	40%	<1%	8%	10%	5%

Figure D3 MD11GE INM Standard Speed Profiles Compared to Actual Aircraft Performance

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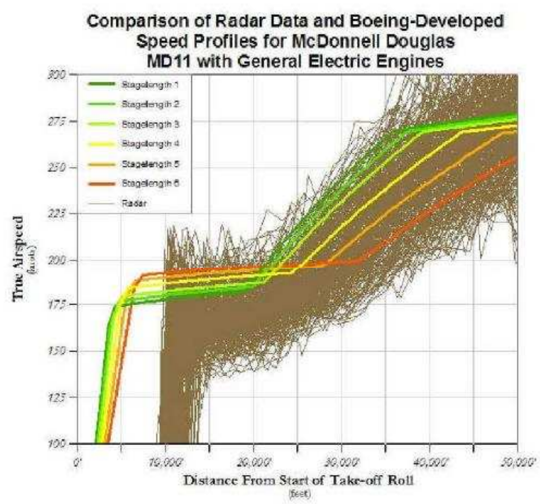

Distribution of modeled stagelengths:

1	2	3	4	5	6
37%	40%	<1%	8%	10%	5%

Figure D4 MD11GE Boeing Speed Profiles Compared to Actual Aircraft Performance

HARRIS MILLER MILLER & HANSON INC.

Table D1. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 395,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF041
Reference Temperature: 17ºC
Assumed Temperature: 44ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.6	134.7	5.1
0.5	119.0	119.8	0.8
1.0	103.5	105.4	1.9
1.5	98.7	99.5	0.8
2.0	95.9	93.0	-2.9
2.5	90.0	90.8	0.8
3.0	88.0	89.4	1.4
3.5	86.4	88.0	1.6
4.0	85.3	86.7	1.4
4.5	84.2	85.5	1.3
5.0	83.2	84.5	1.3
5.5	82.2	83.4	1.2
6.0	81.4	82.2	0.8
6.5	80.6	81.3	0.7
7.0	79.8	80.5	0.7
7.5	79.0	79.7	0.7
8.0	78.3	79.0	0.7
8.5	77.7	78.4	0.7
9.0	77.1	77.8	0.7
9.5	76.5	77.3	0.8
10.0	75.8	76.8	1.0

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Table D2. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 410,000 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF041
Reference Temperature: 17ºC
Assumed Temperature: 44ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.6	134.6	5.0
0.5	119.4	119.8	0.4
1.0	104.7	106.4	1.7
1.5	99.3	100.0	0.7
2.0	96.3	93.7	-2.6
2.5	90.9	91.2	0.3
3.0	88.5	89.6	1.1
3.5	86.9	88.4	1.5
4.0	85.7	87.1	1.4
4.5	84.7	86.0	1.3
5.0	83.7	84.9	1.2
5.5	82.8	84.0	1.2
6.0	81.8	82.9	1.1
6.5	81.1	81.9	0.8
7.0	80.3	81.0	0.7
7.5	79.6	80.2	0.6
8.0	78.9	79.5	0.6
8.5	78.2	78.8	0.6
9.0	77.6	78.3	0.7
9.5	77.1	77.7	0.6
10.0	76.5	77.3	0.8

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Table D3. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 425,000 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF041
Reference Temperature: 17ºC
Assumed Temperature: 44ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.5	134.6	5.1
0.5	119.3	120.3	1.0
1.0	106.0	108.1	2.1
1.5	99.7	100.6	0.9
2.0	96.8	95.4	-1.4
2.5	93.3	91.6	-1.7
3.0	88.9	90.0	1.1
3.5	87.4	88.9	1.5
4.0	86.1	87.6	1.5
4.5	85.1	86.4	1.3
5.0	84.1	85.4	1.3
5.5	83.3	84.5	1.2
6.0	82.5	83.6	1.1
6.5	81.5	82.5	1.0
7.0	80.9	81.6	0.7
7.5	80.1	80.8	0.7
8.0	79.4	80.1	0.7
8.5	78.8	79.4	0.6
9.0	78.2	78.8	0.6
9.5	77.6	78.2	0.6
10.0	77.1	77.7	0.6

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Table D4. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 460,000 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF041
Reference Temperature: 17ºC
Assumed Temperature: 44ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.8	134.4	4.6
0.5	119.8	120.3	0.5
1.0	110.7	113.7	3.0
1.5	101.0	102.3	1.3
2.0	97.9	98.3	0.4
2.5	95.7	92.7	-3.0
3.0	90.1	90.9	0.8
3.5	88.5	89.6	1.1
4.0	87.1	88.7	1.6
4.5	86.1	87.5	1.4
5.0	85.2	86.5	1.3
5.5	84.3	85.7	1.4
6.0	83.5	84.8	1.3
6.5	82.7	84.1	1.4
7.0	82.0	83.1	1.1
7.5	81.2	82.2	1.0
8.0	80.6	81.5	0.9
8.5	79.9	80.7	0.8
9.0	79.3	80.0	0.7
9.5	78.7	79.4	0.7
10.0	78.2	78.9	0.7

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Table D5. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 495,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF039
Reference Temperature: 17ºC
Assumed Temperature: 17ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.7	134.3	4.6
0.5	119.7	120.9	1.2
1.0	117.8	132.0	14.2
1.5	103.1	104.4	1.3
2.0	99.0	99.8	0.8
2.5	96.7	95.9	-0.8
3.0	93.5	91.8	-1.7
3.5	89.4	90.5	1.1
4.0	88.2	89.4	1.2
4.5	87.0	88.5	1.5
5.0	86.1	87.6	1.5
5.5	85.2	86.7	1.5
6.0	84.4	85.9	1.5
6.5	83.7	85.2	1.5
7.0	83.0	84.5	1.5
7.5	82.4	83.8	1.4
8.0	81.8	82.9	1.1
8.5	81.1	82.2	1.1
9.0	80.4	81.4	1.0
9.5	79.8	80.7	0.9
10.0	79.2	80.1	0.9

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Table D6. Comparison of MD11GE Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11GE
Profile Weight: 535,000 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF039
Reference Temperature: 17°C
Assumed Temperature: 17°C

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.5	134.7	5.2
0.5	120.3	121.4	1.1
1.0	117.7	118.8	1.1
1.5	106.7	107.2	0.5
2.0	100.5	101.4	0.9
2.5	98.0	98.3	0.3
3.0	96.0	93.3	-2.7
3.5	90.8	91.5	0.7
4.0	89.2	90.4	1.2
4.5	88.2	89.4	1.2
5.0	87.1	88.6	1.5
5.5	86.3	87.9	1.6
6.0	85.5	87.0	1.5
6.5	84.8	86.3	1.5
7.0	84.1	85.7	1.6
7.5	83.5	85.0	1.5
8.0	82.9	84.5	1.6
8.5	82.3	83.9	1.6
9.0	81.8	83.1	1.3
9.5	81.1	82.5	1.4
10.0	80.5	81.8	1.3

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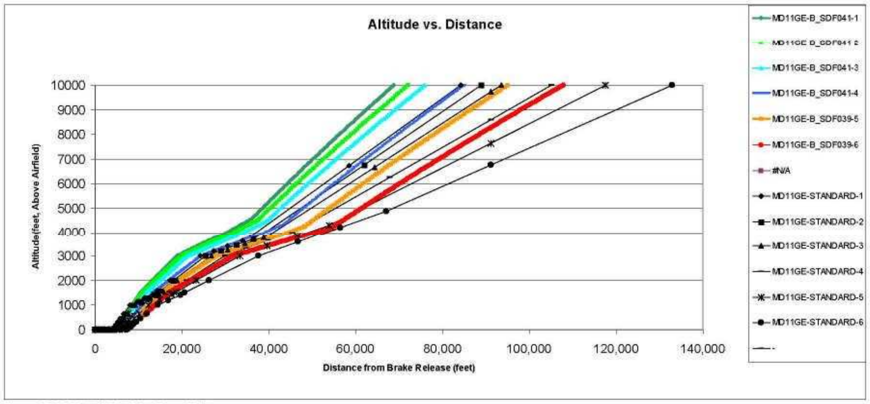

Figure D5 MD11GE Altitude vs. Distance

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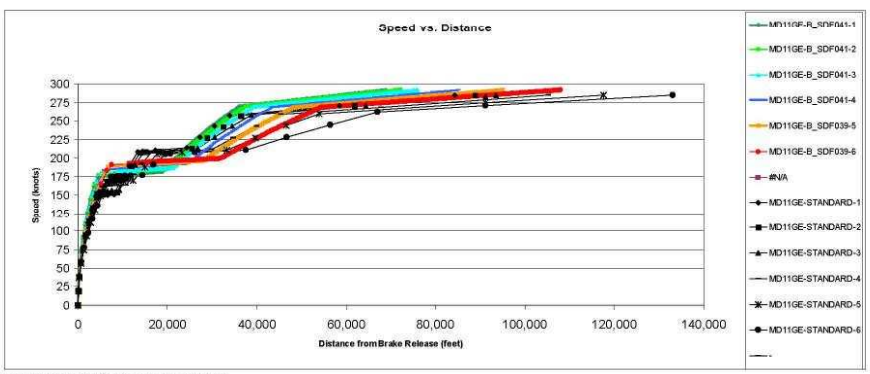

Figure D6 MD11GE Speed vs. Distance

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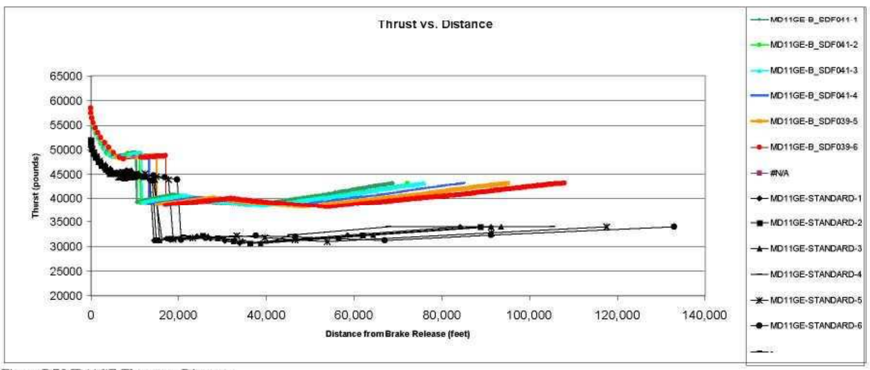

Figure D7 MD11GE Thrust vs. Distance

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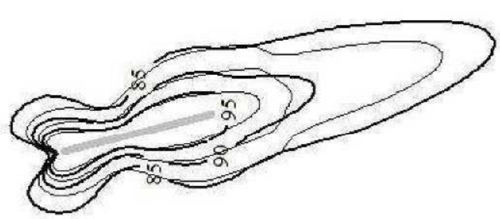

Figure D8 MD11GE Stage Length 1 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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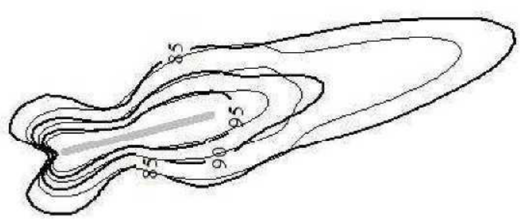

Figure D9 MD11GE Stage Length 2 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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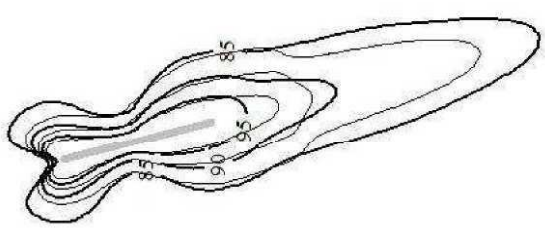

Figure D10 MD11GE Stage Length 3 Departure SEL Contours (Bold Line = User-defined, Thin Line= INM Standard)

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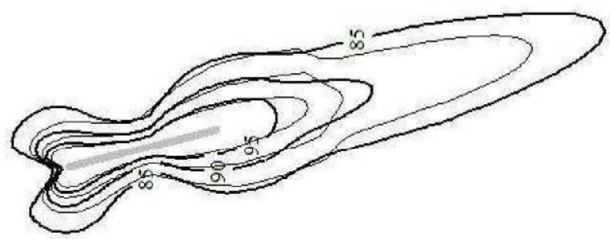

Figure D11 MD11GE Stage Length 4 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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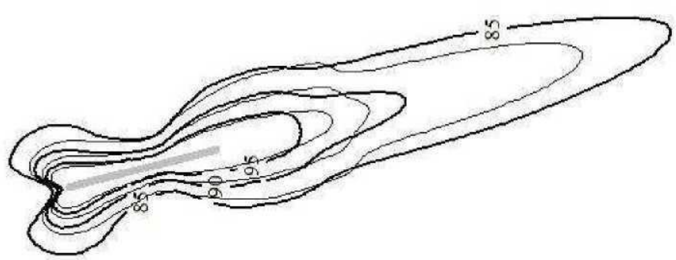

Figure D12 MD11GE Stage Length 5 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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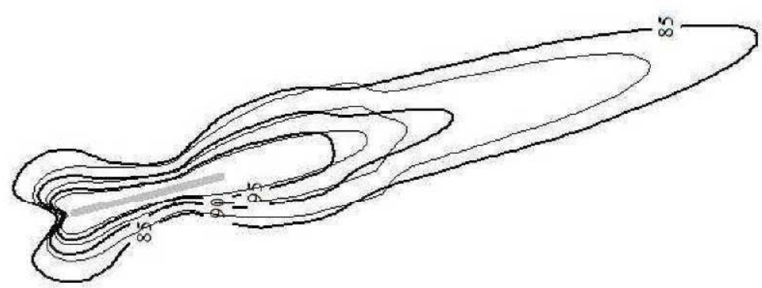

Figure D13 MD11GE Stage Length 6 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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Appendix E
MD11PW Profile Review

Section 1 – Background

We are submitting this request for written approval of changes to the Integrated Noise Model, Version 7.0b, (INM) profiles in support of a Noise Exposure Map (NEM) Update at Louisville International Airport (SDF). The Louisville Regional Airport Authority (LRAA) is the airport proprietor and sponsor of the study.

This section contains data on the McDonnell Douglas MD11PW operating procedures as provided by The Boeing Company (Boeing), who is a member of the NEM contractor team.

Section 2 – Statement of Benefit

Our discussions with operators at SDF indicate that MD11PW operations use a procedure similar to the ICAO A procedure. The INM v7.0b model does not include a MD11PW departure procedure similar to ICAO A. The updated MD11PW Boeing 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. Figures E1 and E2 compare the standard INM altitude profiles and Boeing altitude profiles to actual aircraft climb performance at SDF. Figures E3 and E4 compare the standard INM speed profiles and Boeing speed profiles to actual aircraft speed profiles at SDF.

Comparisons of the MD11PW non-standard profiles and the INM standard profiles to a 1,499 track sample of radar data using a least squares calculation shows that using the user-defined profile results in improved agreement in the altitude profile for 25% of the radar tracks. A similar least squares analysis of the speed profiles showed improved agreement when the INM standard profiles were replaced by the user-defined profiles for 55% of the radar tracks. In total, 61% of tracks showed greater agreement in either the altitude or speed profile when the radar track was compared to the user-defined profile instead of the INM standard profile.

Section 3 – Analysis Demonstrating Benefit

The differences between the INM standard MD11PW departure profiles in INM7.0b and the recommended Boeing-developed profiles are primarily due to the location of transition from take-off thrust to climb thrust at 1,500 ft Above Field Elevation (AFE) in the Boeing developed profiles compared to 1,000 ft AFE in the INM standard profiles. In addition, the Boeing developed profiles maintain speed until 3,000 ft AFE, and then begin acceleration and flap retraction, where as the INM standard profile accelerate and retract the flaps after the thrust cutback at 1,000 ft AFE. Tables E1 through E6 show the SEL results under the flight path from the Boeing-developed departure; the standard INM departure profiles are presented for comparison.

Section 4 – Concurrence on Aircraft Performance

The profiles in this document were created by Boeing. Their letter of concurrence is attached as Appendix A.

Section 5 – Certification of New Parameters

The Boeing-developed points-type profiles were input into the INM. An INM study containing the Boeing-developed profiles is included as an attachment. 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.

Section 6 – Graphical and Tabular Comparison

An accompanying MS Excel file, "Appendix_F_Profile_Plots.xls", contains the profile points as found in the INM's flight.txt file and graphs comparing these points to the INM Standard profiles (INM Standard data is also plotted from flight.txt). Graphs of Altitude vs. Distance, Speed vs. Distance, and Thrust vs. Distance are also included here as Figures E5, E6, and E7. Comparisons of SEL contours for the user-defined and INM Standard profiles are shown in Figures E8 through E13.

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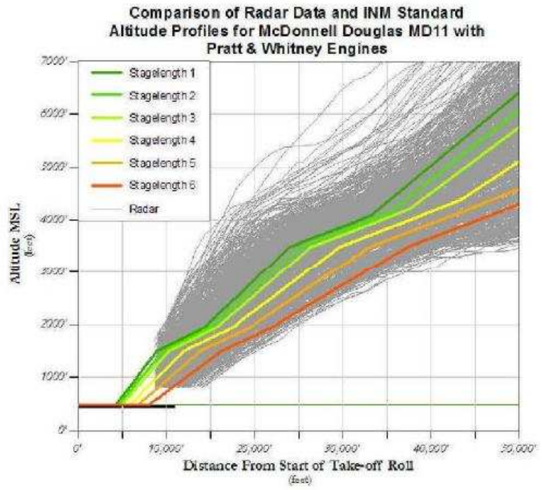

Distribution of modeled stagelengths:

1	2	3	4	5	6
34%	43%	<1%	10%	7%	6%

Figure E1 MD11PW INM Standard Altitude Profiles Compared to Actual Aircraft Performance

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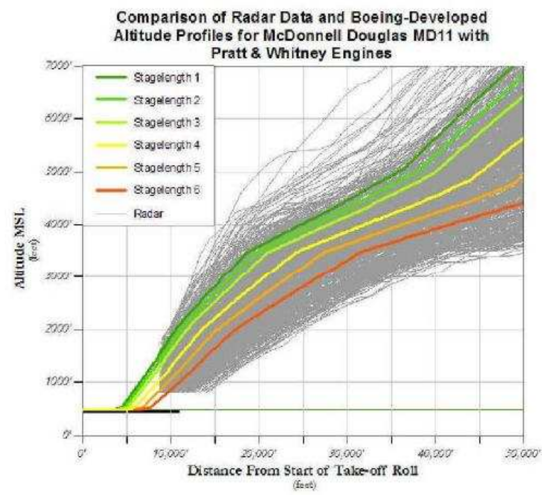

Distribution of modeled stagelengths:

1	2	3	4	5	6
34%	43%	<1%	10%	7%	6%

Figure E2 MD11PW Boeing-Developed Altitude Profiles Compared to Actual Aircraft Performance

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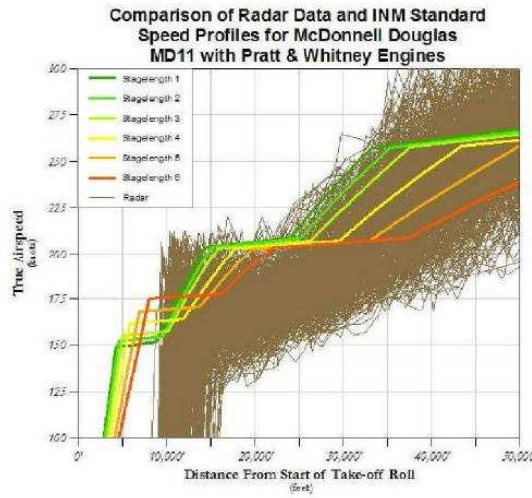
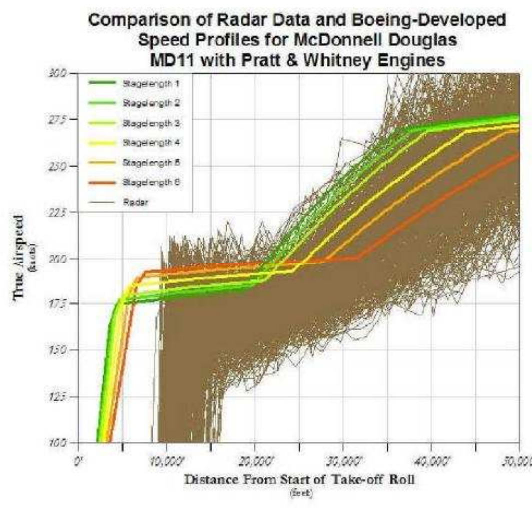


Distribution of modeled stagelengths:

1	2	3	4	5	6
34%	43%	<1%	10%	7%	6%

Figure E3 MD11PW INM Standard Speed Profiles Compared to Actual Aircraft Performance



Distribution of modeled stagelengths:

1	2	3	4	5	6
34%	43%	<1%	10%	7%	6%

Figure E4 MD11PW Boeing-Developed Speed Profiles Compared to Actual Aircraft Performance

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Table E1. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 395,000 lbs. (PROF_ID2 = 1)
User PROF_ID1: B_SDF044
Reference Temperature: 17ºC
Assumed Temperature: 45ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	132.8	3.9
0.5	118.9	119.5	0.6
1.0	104.2	105.0	0.8
1.5	97.7	98.6	0.9
2.0	94.7	92.6	-2.1
2.5	91.2	90.2	-1.0
3.0	88.3	88.7	0.4
3.5	86.6	87.2	0.6
4.0	85.4	85.9	0.5
4.5	84.1	84.5	0.4
5.0	83.0	83.3	0.3
5.5	81.7	82.1	0.4
6.0	81.0	80.9	-0.1
6.5	80.1	80.1	0.0
7.0	79.4	79.3	-0.1
7.5	78.6	78.5	-0.1
8.0	78.0	77.8	-0.2
8.5	77.4	77.1	-0.3
9.0	76.8	76.5	-0.3
9.5	76.1	75.9	-0.2
10.0	75.5	75.3	-0.2

Table E2. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 410,000 lbs. (PROF_ID2 = 2)
User PROF_ID1: B_SDF044
Reference Temperature: 17ºC
Assumed Temperature: 45ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.8	132.7	3.9
0.5	118.8	120.1	1.3
1.0	105.9	106.3	0.4
1.5	98.4	99.2	0.8
2.0	95.3	93.3	-2.0
2.5	92.7	90.6	-2.1
3.0	88.8	89.0	0.2
3.5	87.1	87.7	0.6
4.0	85.8	86.3	0.5
4.5	84.6	85.1	0.5
5.0	83.5	83.9	0.4
5.5	82.5	82.7	0.2
6.0	81.4	81.6	0.2
6.5	80.7	80.6	-0.1
7.0	79.9	79.8	-0.1
7.5	79.1	79.1	0.0
8.0	78.5	78.4	-0.1
8.5	77.9	77.7	-0.2
9.0	77.3	77.0	-0.3
9.5	76.7	76.4	-0.3
10.0	76.1	75.8	-0.3

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Table E3. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 425,000 lbs. (PROF_ID2 = 3)
User PROF_ID1: B_SDF044
Reference Temperature: 17ºC
Assumed Temperature: 45ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.7	132.6	3.9
0.5	118.8	120.1	1.3
1.0	108.0	108.1	0.1
1.5	99.1	99.9	0.8
2.0	95.7	94.5	-1.2
2.5	93.4	91.1	-2.3
3.0	89.4	89.4	0.0
3.5	87.7	88.2	0.5
4.0	86.2	86.8	0.6
4.5	85.2	85.6	0.4
5.0	84.0	84.5	0.5
5.5	83.0	83.4	0.4
6.0	82.1	82.3	0.2
6.5	81.2	81.2	0.0
7.0	80.4	80.4	0.0
7.5	79.6	79.6	0.0
8.0	79.0	78.9	-0.1
8.5	78.4	78.3	-0.1
9.0	77.8	77.6	-0.2
9.5	77.3	77.0	-0.3
10.0	76.7	76.4	-0.3

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Table E4. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 460,000 lbs. (PROF_ID2 = 4)
User PROF_ID1: B_SDF044
Reference Temperature: 17ºC
Assumed Temperature: 45ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	129.1	132.5	3.4
0.5	119.2	120.1	0.9
1.0	119.2	114.4	-4.8
1.5	101.3	101.8	0.5
2.0	97.0	97.5	0.5
2.5	94.6	92.2	-2.4
3.0	92.0	90.4	-1.6
3.5	88.8	89.0	0.2
4.0	87.4	88.0	0.6
4.5	86.2	86.8	0.6
5.0	85.2	85.7	0.5
5.5	84.1	84.7	0.6
6.0	83.3	83.7	0.4
6.5	82.4	82.8	0.4
7.0	81.6	81.8	0.2
7.5	80.8	80.9	0.1
8.0	80.1	80.2	0.1
8.5	79.5	79.5	0.0
9.0	78.9	78.9	0.0
9.5	78.3	78.3	0.0
10.0	77.8	77.7	-0.1

Table E5. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 495,000 lbs. (PROF_ID2 = 5)
User PROF_ID1: B_SDF042
Reference Temperature: 17ºC
Assumed Temperature: 17ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.9	132.8	3.9
0.5	120.9	120.6	-0.3
1.0	117.3	124.8	7.5
1.5	104.4	104.2	-0.2
2.0	98.6	99.0	0.4
2.5	95.8	95.3	-0.5
3.0	93.8	91.3	-2.5
3.5	90.1	89.9	-0.2
4.0	88.5	88.7	0.2
4.5	87.2	87.8	0.6
5.0	86.2	86.8	0.6
5.5	85.3	85.8	0.5
6.0	84.4	84.9	0.5
6.5	83.5	84.0	0.5
7.0	82.8	83.2	0.4
7.5	82.0	82.4	0.4
8.0	81.3	81.5	0.2
8.5	80.5	80.8	0.3
9.0	79.9	80.2	0.3
9.5	79.3	79.5	0.2
10.0	78.8	79.0	0.2

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Table E6. Comparison of MD11PW Noise Impacts from Brake Release for INM Standard and Boeing-Developed Departure Procedures
INM Aircraft Model: MD11PW
Profile Weight: 535,000 lbs. (PROF_ID2 = 6)
User PROF_ID1: B_SDF042
Reference Temperature: 17ºC
Assumed Temperature: 17ºC

Distance from Brake Release (nmi)	INM Standard, SEL (dBA)	Boeing-Developed Profile, SEL (dBA)	Difference SEL (dBA)
0.0	128.7	132.7	4.0
0.5	119.7	121.3	1.6
1.0	117.7	118.4	0.7
1.5	109.5	107.4	-2.1
2.0	101.1	100.9	-0.2
2.5	97.4	97.5	0.1
3.0	95.2	93.0	-2.2
3.5	93.4	90.9	-2.5
4.0	89.8	89.7	-0.1
4.5	88.5	88.7	0.2
5.0	87.4	87.8	0.4
5.5	86.4	87.0	0.6
6.0	85.6	86.2	0.6
6.5	84.7	85.4	0.7
7.0	84.0	84.6	0.6
7.5	83.2	83.8	0.6
8.0	82.6	83.1	0.5
8.5	81.9	82.5	0.6
9.0	81.3	81.7	0.4
9.5	80.7	81.1	0.4
10.0	80.0	80.5	0.5

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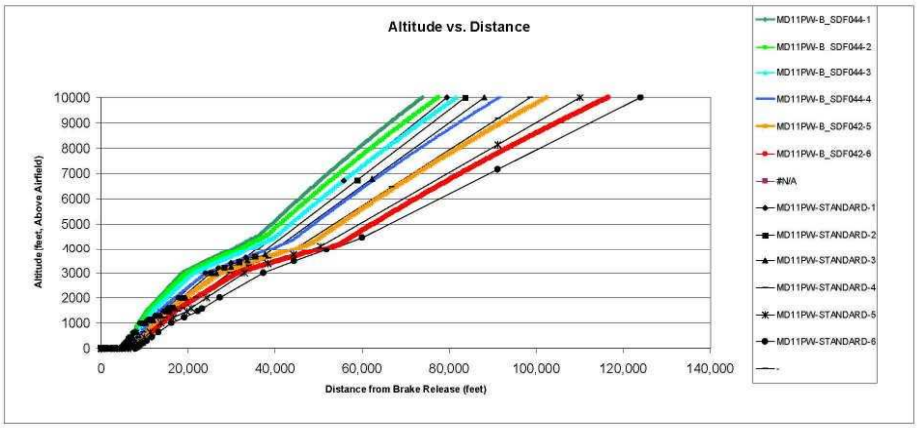

Figure E5 MD11 PW Altitude vs. Distance

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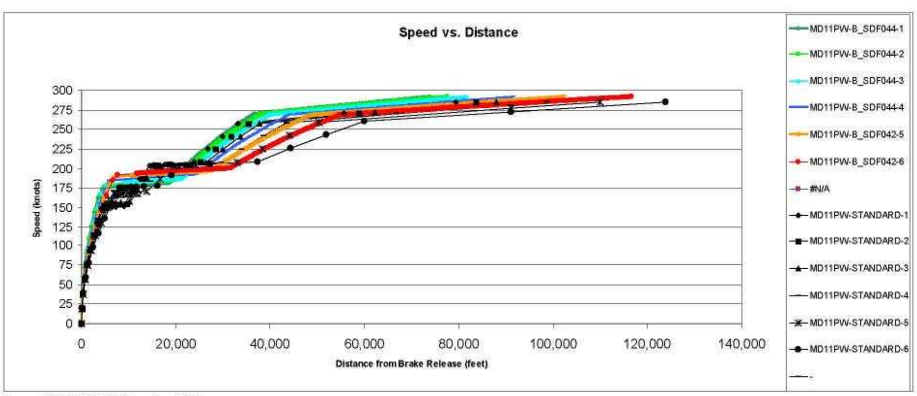

Figure E6 MD11 PW Speed vs. Distance

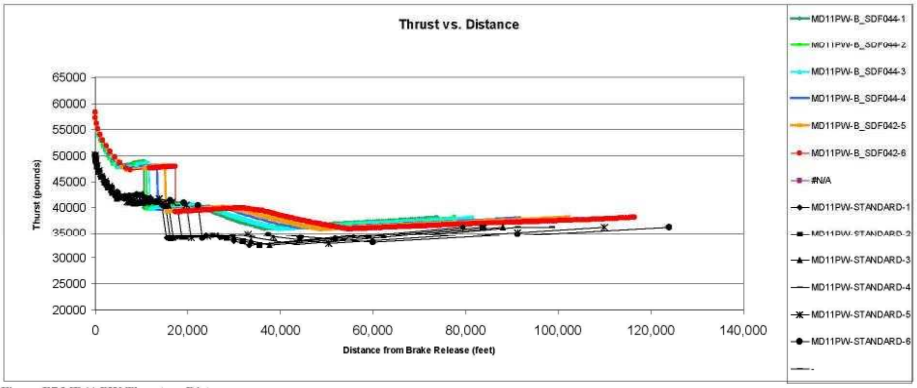

Figure E7 MD11 PW Thrust vs. Distance

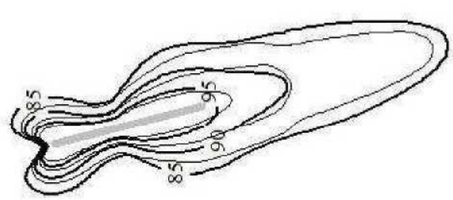

Figure E8 MD11PW Stage Length 1 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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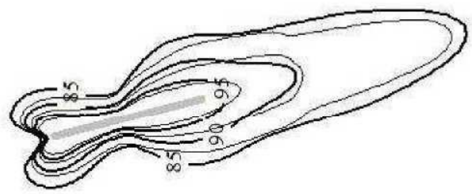

Figure E9 MD11PW Stage Length 2 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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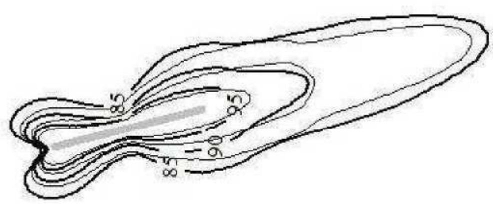

Figure E10 MD11PW Stage Length 3 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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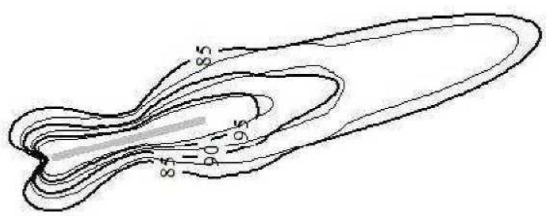

Figure E11 MD11PW Stage Length 4 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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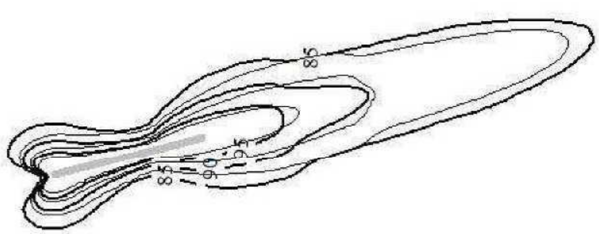

Figure E12 MD11PW Stage Length 5 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

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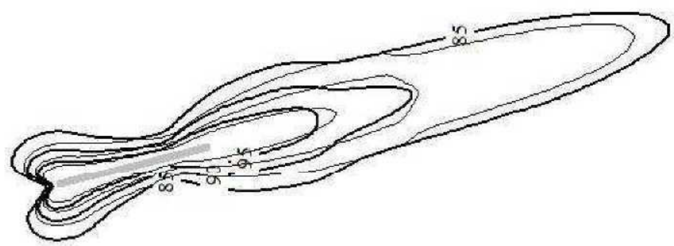

Figure E13 MD11PW Stage Length 6 Departure SEL Contours (Bold Line = User-defined, Thin Line = INM Standard)

G.4 Addendum with Additional 767 Aircraft Data October 7, 2010

From: Brad L. Nicholas
Sent: Thursday, October 07, 2010 1:23 PM
To: 'Hua.He@faa.gov'
Cc: 'Scott, Karen'; 'Slattery, Bob'; 'Tommy.Dupree@faa.gov'; Eugene M. Reindel; 'Stephen.Wilson@faa.gov'
Subject: SDF NEM -767 addendum to non-standard profiles request

Bill,

I have attached additional information for the 767300 profiles that we discussed on Friday. I have broken out the profile graphs by stage length and included least square statistics below the each of the new plots. I believe the graphics and analysis results should paint a clearer picture now. I appreciate your continued attention to this matter. If there is any further assistance that I can offer in order to expedite your review, please let me know.

Thank you,

Bradley L. Nicholas
Senior Consultant

Harris Miller Miller & Hanson Inc.
77 South Bedford Street Burlington, MA 01803
T 781.229.0707 | F 781.229.7939
bnicholas@hmmh.com

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HARRIS MILLER MILLER & HANSON INC.
77 South Bedford Street
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www.hmmh.com

October 7, 2010 Sent via email

Dr. Hua He
Office of Environment and Energy
Federal Aviation Administration
Hua.He@faa.gov

Subject: Request for INM 7.0b User Defined Profiles for SDF NEM Update – Boeing 767-300

Reference: SDF NEM Update, HMMH Project No. 304060.004 (001)

Dear Mr. He:

Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority to prepare a Noise Exposure Map (NEM) update for Louisville International Airport (SDF). At your request HMMH is submitting this addendum to our previous non-standard INM input approval requests for user-defined profiles dated June 17, 2010 and September 20, 2010. The contents of this addendum are consistent with our telephone conversation on October 1, 2010.

The profile information submitted for FAA review and approval is included as "Attachment C Addendum" for consistency with the naming of previous submittals. The attachment provides complementary information to Attachment C of our September 20, 2010 submittal and does not replace it.

On behalf of the Louisville Regional Airport Authority, we request that the FAA approve these INM 7.0b user-defined profiles for the Boeing 767-300 for use in the Louisville NEM Update. We would be pleased to answer any questions that either FAA/AEE or you have regarding this request.

Thank you for your assistance on this matter.

Sincerely yours,

HARRIS MILLER MILLER & HANSON INC.

Bradley Nicholas
Senior Consultant

c: ,

Ms. Karen Scott (LRAA)
Mr. Robert Slattery (LRAA)
Mr. Tommy Dupree (FAA, Memphis ADO)
Mr. Stephen Wilson (FAA, Memphis ADO)
Mr. Gene Reindel (HMMH)

Attch: Appendix C Addendum: Boeing 767300 Profile Review

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Appendix C Addendum
767300 Profile Review

Please see Attachment C to HMMH's previous submittal dated September 20, 2010 for the full profile approval request in accordance with the INM 7.0 User's Guide, "Appendix B: FAA Profile Review and Checklist." The information provided in this addendum is provided based on FAA AEE's request via phone for clarifying graphics and text describing the analysis which showed improved agreement between radar data and the proposed user-defined profiles as compared to the INM standard profiles for the 767300.

Comparisons of the Boeing 767300 user-defined profiles and the INM standard profiles to a 1,033 track sample of radar data[1] using a least squares calculation shows that using the user-defined profiles for all stagelengths result in improved agreement in the altitude profiles for 56% of the radar tracks. A similar least squares analysis of the speed profiles showed improved agreement when the INM standard profiles were replaced by the user-defined profiles for 97% of the radar tracks. In total, 54% of tracks showed greater agreement in both the altitude and the speed profile and 99% of tracks showed greater agreement in either the altitude or speed profile for the user-defined profiles as compared to the INM standard profile for all stagelengths.

Figures C11 through C16 compare the INM Standard and Boeing profiles to samples of radar data. The figures are divided by stagelength. The stagelength assignment for each radar track was determined using city pairs and aircraft weights (standard modeling) not through a matching process. For each stagelength two figures are presented. The first compares the INM altitude profiles to the actual climb performance of 767300 aircraft at SDF. The second figure compares the INM speed profiles to the actual speed profiles of 767300 aircraft at SDF. The results of a least squares analysis are presented below each figure.

[1] This transmittal corrects a minor error in the previous 767300 least squares profile calculations. The previous transmittal compared departures on all runways to INM computed profiles on a single runway (the most commonly used runway for these departures). Due to differences in factors such as runway gradient, INM and actual aircraft profiles vary slightly from runway to runway. For the highest accuracy, only the radar tracks from the runway used for the INM profiles were included in the analysis described in this document. This change resulted in a minor improvement in the percentage of radar tracks which better match the user-defined profiles as compared to the INM standard profiles.

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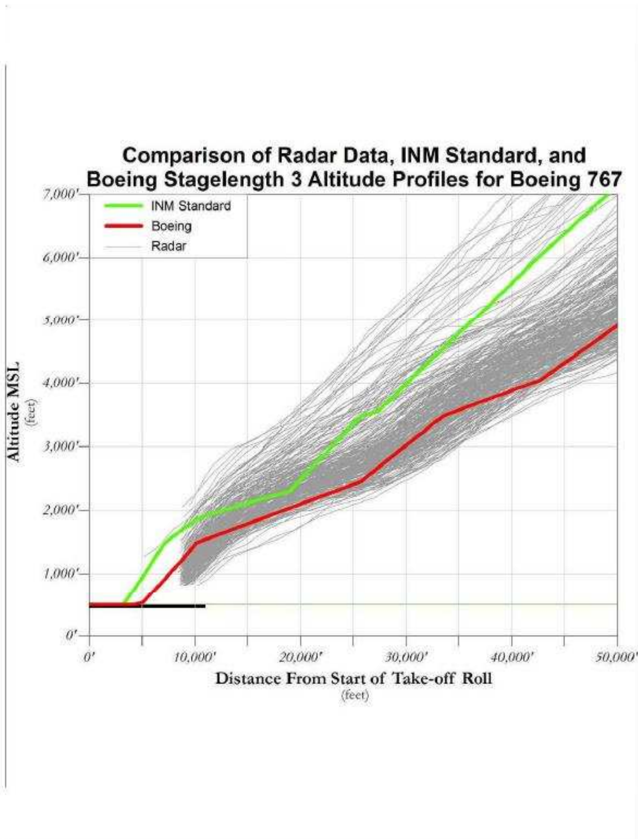

Figure C11 767300 INM Altitude Profiles Compared to Actual Aircraft Performance – Stagelength 3

A least squares calculation shows better agreement with the Boeing altitude profile for 91% of the stagelenth 3 radar tracks.

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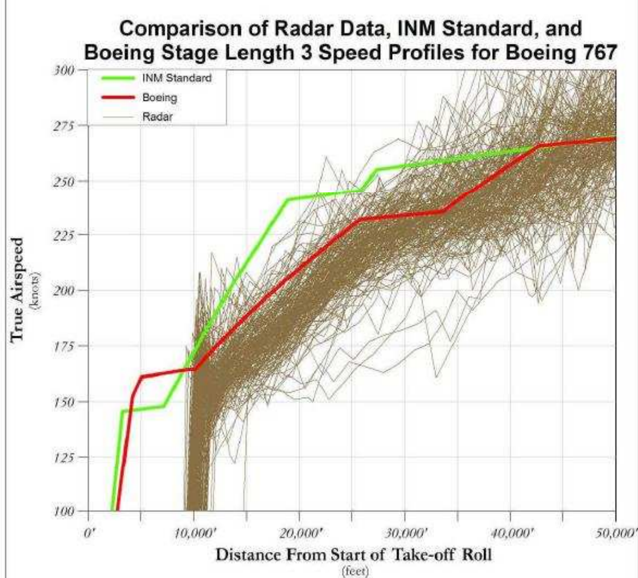

Figure C12 767300 INM Speed Profiles Compared to Actual Aircraft Performance – Stagelength 3

A least squares calculation shows better agreement with the Boeing speed profile for 100% of the stagelength 3 radar tracks.

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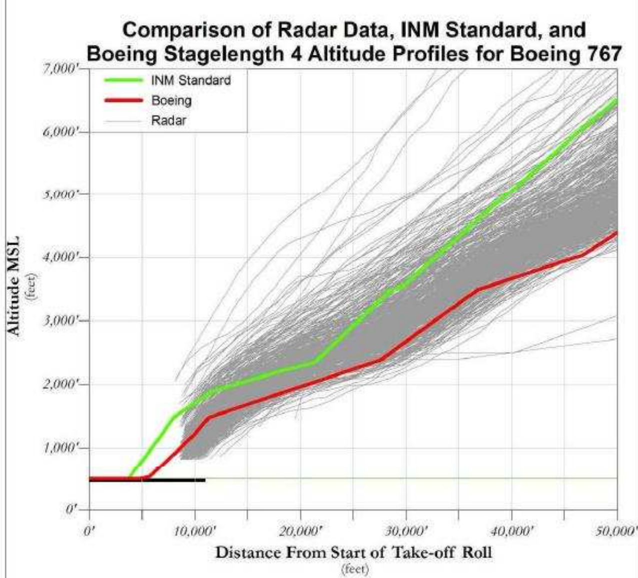

Figure C13 767300 INM Altitude Profiles Compared to Actual Aircraft Performance – Stagelength 4

A least squares calculation shows better agreement with the Boeing altitude profile for 74% of the stagelength 4 radar tracks.

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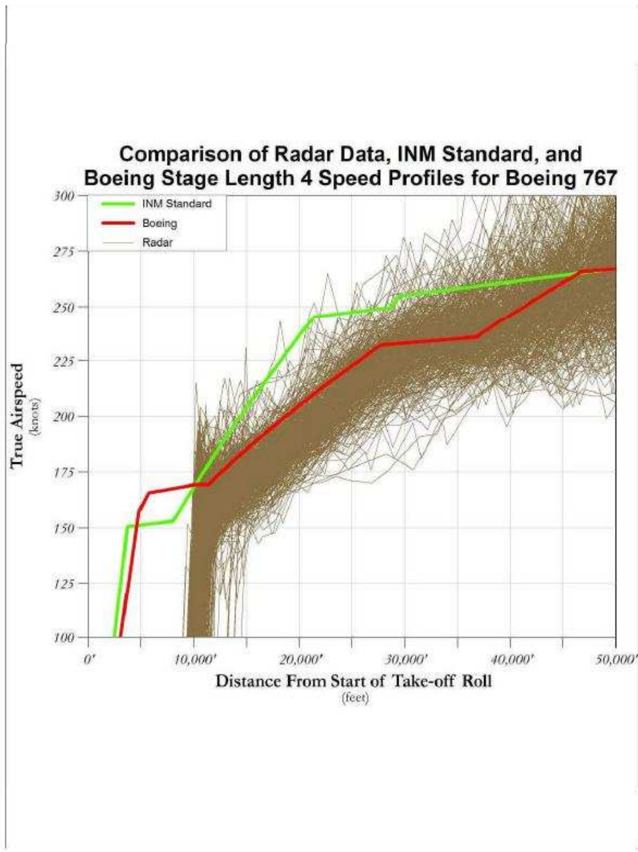

Figure C14 767300 INM Speed Profiles Compared to Actual Aircraft Performance – Stagelength 4

A least squares calculation shows better agreement with the Boeing altitude profile for 98% of the stagelength 4 radar tracks.

HARRIS MILLER MILLER & HANSON INC.

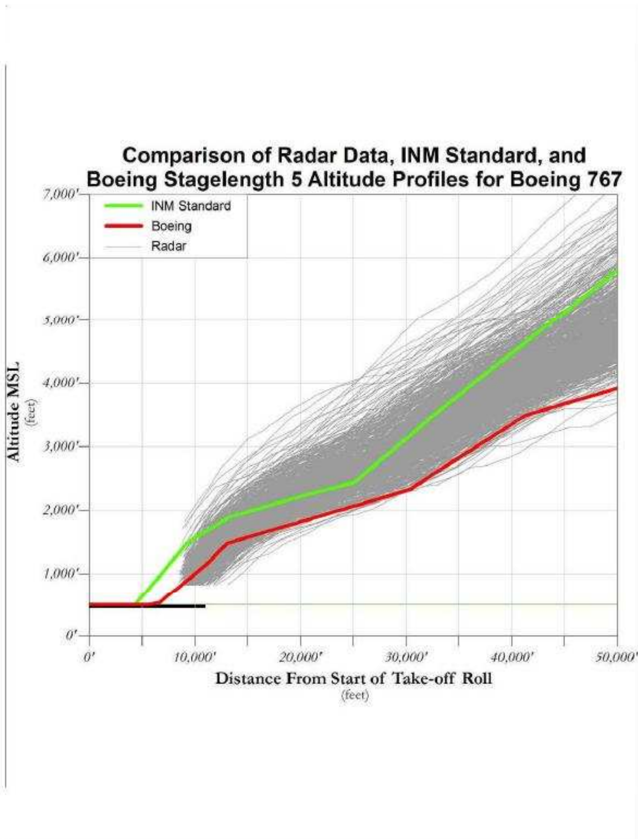

Figure C15 767300 INM Altitude Profiles Compared to Actual Aircraft Performance – Stagelength 5

A least squares calculation shows better agreement with the Boeing altitude profile for 40% of the stagelength 5 radar tracks.

HARRIS MILLER MILLER & HANSON INC.

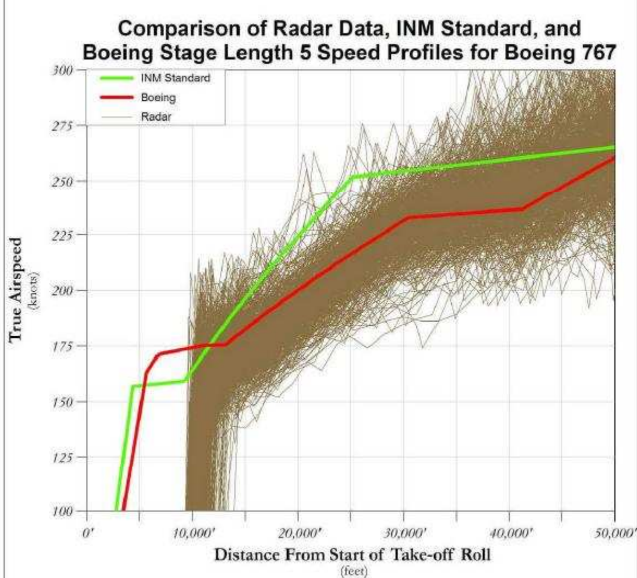

Figure C16 767300 INM Speed Profiles Compared to Actual Aircraft Performance – Stagelength 5

A least squares calculation shows better agreement with the Boeing speed profile for 96% of the stagelength 5 radar tracks.

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G.5 Addendum with Additional User Defined Profiles Data November 11, 2010

HARRIS MILLER MILLER & HANSON INC.
77 South Bedford Street
Burlington, MA 01803
T 781.229.0707
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www.hmmh.com

November 11, 2010

Sent via email

Dr. Hua He
Office of Environment and Energy
Federal Aviation Administration
Hua.He@faa.gov

Subject: Addendum to INM 7.0b User Defined Profiles Approval Request

Reference: SDF NEM Update, HMMH Project No. 304060.004 (001)

Dear Mr. He:

Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority to prepare a Noise Exposure Map (NEM) update for Louisville International Airport (SDF). At your request HMMH is submitting this addendum to our previous non-standard INM input approval requests for user-defined profiles dated June 17, 2010 September 20, 2010, and October 7, 2010.

Via phone and email you expressed concerns that the profiles may not be appropriate for all runways due to the performance limited weight assumptions in the Assumed Temperature Method of thrust reduction. The attached Appendix G summarizes the detailed calculation that Boeing made in the production and selection of the appropriate profiles for the SDF NEM. **All profile weights selected for use in the SDF NEM modeling were at weights which fell below the performance limited weight for the particular aircraft, runway, and assumed temperature combinations used in the NEM modeling.** As a reminder, the September 20, 2010 submittal included least squares profile fit calculations which included **all runways used in the modeling in the SDF NEM.**

In alignment with all previous submittals, the extensive Boeing analysis, and our recent phone conversations and emails and on behalf of the Louisville Regional Airport Authority, we request that the FAA approve these INM 7.0b user-defined profiles for the Boeing 757RR, Boeing 767300, McDonnell Douglas MD11GE, and McDonnell Douglas MD11PW for use in the Louisville NEM Update. We would be pleased to answer any questions that you have regarding this request.

Thank you for your extensive and continued assistance on this matter.

Sincerely yours,

HARRIS MILLER MILLER & HANSON INC.

Bradley Nicholas
Senior Consultant

c:

Ms. Karen Scott (LRAA)
Mr. Robert Slattery (LRAA)
Mr. Tommy Dupree (FAA, Memphis ADO)
Mr. Stephen Wilson (FAA, Memphis ADO)
Mr. Gene Reindel (HMMH)

Attch: Appendix G: Boeing Performance Limited Takeoff Weights Analysis Results

Appendix G
Boeing Performance Limited Weights Analysis Results

Section 1 – Background

The creation and selection of user-defined profiles for the SDF NEM involved an extensive collaboration between Boeing and HMMH. In the process of creating the profiles, Boeing computed the performance limited weight[1] for each profile on each runway at SDF. HMMH evaluated the existing operations in a full year of radar data to examine the combinations of aircraft, departure runway, and stage length. The project team selected profiles with an eye toward producing a single set of profiles to faithfully represent operations on all necessary runways[2]. To that end, all operations using user-defined profiles in the NEM have weights which are below the performance limited weight for the Runway on which that operation occurs.

[1] For an aircraft using a particular takeoff procedure on a certain runway, the performance limited weight is the maximum aircraft weight which meets various constraints including, but not limited to, runway length, obstacle clearance, climb requirements, and tire speed limits.
[2] As shown in the table below, radar data, and the NEM modeling, the cargo aircraft in this submittal do not depart on Runway 11. Additionally, these aircraft, particularly those with higher stage lengths, tend to depart on Runway 17R.

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Section 2 – Results

Tables 1 and 2 below presents the performance limited weight for each aircraft profile on each runway at SDF. Note that:

- Cells marked Grey have a performance limited weight which is below the profile weight. That is, the INM profile weight is higher than the performance parameters of the runway and aircraft would allow safely. This generally occurs at higher stage lengths or on shorter runways such as 11/29.
- Table 2 is identical to Table 1 with the exception that profiles/runway combinations with blank cells in Table 2 have no operations in the NEM modeling (i.e. these aircraft/runway/stage length combinations were not present in the radar data on which the NEM modeling is based).
- **All operations in the NEM modeling have an INM profile weight which is lower than the performance limited weight.**

Table 1 Boeing Performance Limited Weights Analysis Results (All profile/runway combinations)

INM Aircraft	Profile Name	Stage Length	Weight (lbs)	Assumed Temp (deg C)	Performance Limited Weight by Runway (lbs)					
					11	17L	17R	29	35L	35R
767300	B_SDF064	3	286,400	47	312,446	333,899	358,258	306,392	339,303	331,220
767300	B_SDF064	4	305,700	47	312,446	333,899	358,258	306,392	339,303	331,220
767300	B_SDF064	5	330,000	47	312,446	333,899	358,258	306,392	339,303	331,220
757RR	B_SDF061	1	183,900	48	202,861	215,361	229,470	199,137	219,038	214,395
757RR	B_SDF061	2	191,200	48	202,861	215,361	229,470	199,137	219,038	214,395
757RR	B_SDF060	3	199,100	34	224,973	238,948	252,566	219,935	244,927	238,344
757RR	B_SDF060	4	215,200	34	224,973	238,948	252,566	219,935	244,927	238,344
757RR	B_SDF058	5	234,800	17	236,410	251,001	265,478	231,241	256,309	250,364
MD11GE	B_SDF041	1	395,000	44	453,073	483,892	536,447	452,376	525,759	480,394
MD11GE	B_SDF041	2	410,000	44	453,073	483,892	536,447	452,376	525,759	480,394
MD11GE	B_SDF041	3	425,000	44	453,073	483,892	536,447	452,376	525,759	480,394
MD11GE	B_SDF041	4	460,000	44	453,073	483,892	536,447	452,376	525,759	480,394
MD11GE	B_SDF039	5	495,000	17	501,639	537,076	599,227	501,576	586,326	532,914
MD11GE	B_SDF039	6	535,000	17	501,639	537,076	599,227	501,576	586,326	532,914
MD11PW	B_SDF044	1	395,000	45	457,788	487,865	538,500	457,347	527,507	483,845
MD11PW	B_SDF044	2	410,000	45	457,788	487,865	538,500	457,347	527,507	483,845
MD11PW	B_SDF044	3	425,000	45	457,788	487,865	538,500	457,347	527,507	483,845
MD11PW	B_SDF044	4	460,000	45	457,788	487,865	538,500	457,347	527,507	483,845
MD11PW	B_SDF042	5	495,000	17	521,719	559,284	615,208	520,572	602,466	554,260
MD11PW	B_SDF042	6	535,000	17	521,719	559,284	615,208	520,572	602,466	554,260

Note: Grey cells denote a performance limited weight which is lower than the INM profile weight.
Note: Not all profile and runway combinations are utilized in the NEM modeling

Appendix G
Submittals to FAA for Approval of Non-standard Aircraft Profiles Modeling Request

SDF Noise Exposure Map Update
Appendices

HARRIS MILLER MILLER & HANSON INC.

Request for INM 7.0b User-Defined Profiles for the SDF NEM Update
November 11, 2010
Page G 3

Table 2 Boeing Performance Limited Weights Analysis Results (NEM profile/runway combinations)

INM Aircraft	Profile Name	Stage Length	Weight (lbs)	Assumed Temp (deg C)	Performance Limited Weight by Runway (lbs)					
					11	17L	17R	29	35L	35R
767300	B_SDF064	3	286,400	47		333,899	358,258	306,392	339,303	331,220
767300	B_SDF064	4	305,700	47		333,899	358,258	306,392	339,303	331,220
767300	B_SDF064	5	330,000	47		333,899	358,258		339,303	331,220
757RR	B_SDF061	1	183,900	48		215,361	229,470	199,137	219,038	214,395
757RR	B_SDF061	2	191,200	48		215,361	229,470		219,038	214,395
757RR	B_SDF060	3	199,100	34		238,948	252,566	219,935	244,927	238,344
757RR	B_SDF060	4	215,200	34		238,948	252,566		244,927	
757RR	B_SDF058	5	234,800	17			265,478			
MD11GE	B_SDF041	1	395,000	44		483,892	536,447	452,376	525,759	480,394
MD11GE	B_SDF041	2	410,000	44		483,892	536,447	452,376	525,759	480,394
MD11GE	B_SDF041	3	425,000	44		483,892	536,447	452,376	525,759	480,394
MD11GE	B_SDF041	4	460,000	44		483,892	536,447		525,759	480,394
MD11GE	B_SDF039	5	495,000	17		537,076	599,227	501,576	586,326	532,914
MD11GE	B_SDF039	6	535,000	17			599,227		586,326	
MD11PW	B_SDF044	1	395,000	45		487,865	538,500	457,347	527,507	483,845
MD11PW	B_SDF044	2	410,000	45		487,865	538,500	457,347	527,507	483,845
MD11PW	B_SDF044	3	425,000	45			538,500	457,347	527,507	483,845
MD11PW	B_SDF044	4	460,000	45		487,865	538,500		527,507	483,845
MD11PW	B_SDF042	5	495,000	17		559,284	615,208	520,572	602,466	554,260
MD11PW	B_SDF042	6	535,000	17			615,208		602,466	554,260

Note: Grey cells denote a performance limited weight which is lower than the INM profile weight.
Note: Profile/runway combinations with blank cells have no operations in the NEM.

Appendix H FAA Response to LRAA on Non-standard Aircraft Profiles Modeling Request

U.S. Department of Transportation
Federal Aviation Administration

Memphis Airports District Office
2862 Business Park Dr, Bldg G
Memphis, Tennessee 38118-1555

Phone: 901-322-8185

December 21, 2010

Mr. Robert Slattery
Noise Environmental Coordinator
Louisville Regional Airport Authority
P.O. Box 9129
Louisville, KY 40209

Integrated Noise Model (INM) – User Defined Profile Request
Noise Exposure Map (NEM) Update
Louisville International Airport (SDF)

Dear Mr. Slattery:

The Federal Aviation Administration (FAA) has reviewed the request for User Defined Profiles being used in the INM Version 7.0. This request is an integral component to the ongoing SDF NEM update.

The FAA Office of Environment and Energy (AEE) has approved the profiles for four aircraft. This response is based on the latest information provided by HMMH regarding profile weights. This determination is specific to the current SDF NEM update. A separate request is required for any other non standard INM projects at SDF.

Should you have any questions, please feel free to contact me at (901) 322-8185.

Sincerely,

Stephen A Wilson

Stephen Wilson, Community Planner
Memphis Airports District Office

Enclosure

cc: Karen Scott, LRAA
Eugene M. Reindel, HMMH

U.S. Department of Transportation
Federal Aviation Administration

Office of Environment and Energy

800 Independence Ave., S.W.
Washington, D.C. 20591

Date: November 19, 2010

Stephen Wilson
Community Planner
Federal Aviation Administration
Memphis Airports District Office
2862 Business Park Drive, Bldg. G
Memphis, TN 38118-1555

Dear Mr. Wilson,

The Office of Environment and Energy (AEE) has received the memo dated June 17, 2010, referencing HMMH Project number 304060.004 requesting approval of user-defined departure profiles for four Boeing aircraft (757RR, 767300, MD11GE and MD11PW). HMMH is assisting the Louisville Regional Airport Authority (LRAA) to prepare a Noise Exposure Map Update for Louisville International Airport (SDF).

In this request, HMMH used radar data to justify the use of user-defined departure profiles as opposed to using standard departure profiles from INM7.0b. These user-defined flight profiles were developed at SDF by Boeing based on the Assumed Temperature Method, which involved the use of Boeing's proprietary software.

AEE reviewed the request and asked HMMH to provide additional details. Consequently, HMMH submitted two addenda dated September 20, 2010 and October 7, 2010. The September 20 addendum discussed the importance of the non-standard profiles for this study. This addendum also included a distribution of the modeled stage-lengths and least squares calculation that demonstrated more clearly the agreement between the user-defined profiles and the radar data. In the October 7 addendum, HMMH provided a revised profile comparison for the 767300 for stage length numbers 3, 4 and 5.

The submissions from HMMH indicate that the user-defined departure profiles provided a better match to radar data than the INM standard departure profiles. The better agreement is evident from both altitude-distance graphs and speed-distance graphs.

On November 11, 2010, HMMH submitted another addendum letter which listed INM profile weights and assumed temperatures used, and runway dependent performance limited weights. The letter stated that "all profile weights selected for use in the SDF NEM modeling were at weights which fell below the performance limited weight for the particular aircraft, runways, and assumed temperature combination used in the NEM modeling". The addendum letter helps to verify that the proposed user-defined flight profiles are generally applicable for all runways at SDF.

Our office approves the use of the user-defined profiles for the four aircraft. Please understand that this approval is limited to this particular project for SDF. Any additional projects or non-standard INM input at SDF or any other site will require separate approval.

Sincerely,

Joseph DiPardo
Acting Manager
AEE/Noise Division

cc: Jim Byers, APP-400

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Appendix H

AEDT 2b study used to prepare this non-standard profile submittal

Available as electronic file "Appendix_H_SDF_NEM_User_Profiles_AEDT_Study_20160422.zip"
Approximately 53 Mb in file size

Appendix I

UPS Concurrence Letter

SDF Part 150 Noise Study Aircraft Performance Data Review and Concurrence

HMMH
77 South Bedford Street
Burlington, Massachusetts 01803
781.229.0707
www.hmmh.com

MEMORANDUM

To:	Thomas P. Foote Director Airport Properties UPS Airlines 1400 N. Hurstbourne Parkway Louisville, KY 40223-4017
From:	Diana Wasiuk, HMMH Justin Divens, HMMH
Date:	May 6, 2016
Subject:	SDF Part 150 Noise Study Aircraft Performance Data Review and Concurrence
Reference:	HMMH Project Number 307940.000.005

Dear Mr. Foote:

The Louisville Regional Airport Authority (LRAA) is conducting an Airport Noise Compatibility Planning Study pursuant to Title 14 of the Code of Federal Regulations Part 150 (14 CFR Part 150) for Louisville International Airport (SDF). The SDF Part 150 Study will quantify existing and future aircraft noise exposure levels, assess land use impacts according to federal standards, and seek ways to minimize those impacts to the greatest extent practical within Part 150 guidelines.

The consultant team is using the Federal Aviation Authority (FAA) Aviation Environmental Design Tool version 2b (AEDT 2b) for all aircraft noise modeling. The noise model contains a standard set of aircraft with departure profiles for each type. Consistent with FAA policies and procedures, any changes to the standard AEDT departure profiles require prior written approval from the Office of Environment and Energy Noise Division (AEE-100). This requirement applies to the use of user-defined profiles for the 14 CFR Part 150 Noise Exposure Map being prepared for SDF.[1]

In your position as the Director of Airport Properties, we request your assistance with the SDF Part 150. LRAA and its consultant team would appreciate your review of and concurrence with user-defined profiles that have been developed for the SDF Part 150 study. The user-defined profiles differ from the standard AEDT profiles to account for the altitude maintained and procedures used, often directed by Air Traffic, during departure from SDF.[1]

The consultant team has evaluated a year of radar data from the LRAA's Noise and Operations Monitoring System (NOMS) for SDF and identified several procedures where the aircraft flight profile differs from the flight profile provided in the noise model. Because these procedures are different from the standard procedures provided in the AEDT, we would like your review and written concurrence that our modeled procedures accurately depict actual procedures flown by operators at SDF. We need your concurrence that the new profiles fall within reasonable bounds of the aircraft performance for UPS operations at SDF before we request final FAA approval. With your concurrence and FAA approval, these modeled procedures will then be used as inputs to update the SDF Part 150 noise model.

Attached to this request (Attachment 1) you will find the draft letter to be submitted to FAA which describes the aircraft types selected for user-defined profiles, standard and user-defined data for four

[1] 1050.1F Desk Reference Appendix C. "Guidance on Using the Aviation Environmental Design Tool (AEDT) 2b to Conduct Environmental Modeling for FAA Actions subject to NEPA July 2015" is available on the FAA's AEDT2b website https://aedt.faa.gov/2b_information.aspx, as document "AEDT 2b NEPA Guidance (PDF), last updated 7/16/2015" viewed on 4/24/2016. Although this project is a Noise Exposure Map, "Section 5.3.2 User-defined profiles" of the referenced document appears to provide the most relevant guidance for preparing this request for FAA review.

example aircraft representing the top noise modeling groups for the SDF Part 150, and the process by which the consultant team developed the user-defined profiles. For each example aircraft type we provide 1) a comparison of the AEDT 2b standard profile to the observed radar data, 2) a comparison of the AEDT 2b standard profile, the observed radar data, and the user-defined profile, 3) comparisons of flight profile parameters and the overall noise effects as required by the FAA. Tables show the specifics of the procedures/profiles and graphic depictions compare the differences in aircraft performance profile altitude, speed, and net thrust.

The appendices in Attachment 1 provide the profile changes for the proposed aircraft. Specifically, these are:

- Appendix B – 757RR Profile Review with AEDT 2b
- Appendix C – 767300 Profile Review with AEDT 2b
- Appendix D – MD11GE Profile Review with AEDT 2b
- Appendix E – MD11PW Profile Review with AEDT 2b

We have provided below a statement of concurrence for proposed modifications to the AEDT 2b standard data. If you agree with these data, please sign and return a copy of the concurrence form to us. If you have any questions about what we have done, please contact us so we can resolve the issue as quickly as possible.

If you have any questions or comments regarding the content of this letter, you can reach me via telephone at 339.234.2038 or via email at dwasiuk@hmmh.com. The LRAA contact for the SDF Part 150 Study is Robert Slattery; you can contact him at bob.slattery@flylouisville.com or 502.363.8516 if you have any additional questions or comments. Thank you for your consideration. I look forward to hearing back from you at your earliest convenience.

D. Wasiuk

Diana Wasiuk
Vice President and Chief Operating Officer

Memorandum to: Thomas P. Foote, Director, Airport Properties – UPS Airlines
May 6, 2016
Page 3

UPS Airlines concurs with the example modeled procedures:

Modified profiles to include altitude hold downs:

Boeing 757RR	AEDT 2b type: 757RR	Departure ______
Boeing 767300	AEDT 2b type: 767300	Departure ______
McDonnell Douglas MD-11 GE	AEDT 2b type: MD11GE	Departure ______
McDonnell Douglas MD-11 PW	AEDT 2b type: MD11PW	Departure ______

UPS Airlines certifies that the proposed profiles listed above departing from Louisville International Airport fall within reasonable bounds of the above-listed aircraft performance.

Thm P. Foote 6/1/2016
Name Date

DIRECTOR – AIRPORT PROPERTIES
Position/ Title

Attachment 1:

AEDT 2b Non-Standard Flight Profile Request

Prepared by HMMH and Submitted to Louisville Regional Airport Authority, May 5, 2016

Submitted by Louisville Regional Airport Authority to FAA for Review and Approval May XX, 2016

These modifications are considered DRAFT until approved by the FAA.

HMMH
77 South Bedford Street
Burlington, Massachusetts 01803
781.229.0707
www.hmmh.com

TECHNICAL MEMORANDUM

To:	Aaron Braswell Environmental Protection Specialist Memphis Airports District Office Federal Aviation Administration 2600 Thousand Oaks Blvd., Suite 2250 Memphis, TN 38118
CC:	Bob Slattery, LRAA
From:	Diana Wasiuk and Justin Divens, HMMH
Date:	July 26, 2016
Subject:	Request for AEDT 2b User Defined Profiles for SDF NEM Update – SEL Contours Addendum – Appendix J (Revision)
Reference:	SDF NEM Update, HMMH Project No. 307940.000

INTRODUCTION

Dear Mr. Braswell:

Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority to prepare a Noise Exposure Map (NEM) update for Louisville International Airport (SDF). At your request HMMH is submitting this addendum to our previous non-standard INM input approval requests for user-defined profiles dated June 7, 2016. The contents of this addendum are consistent with our telephone conversation on July 7, 2016.

This revision includes a figure update (Figure 1), as requested in your emailed comments on July 19, 2016.

The profile information submitted for FAA review and approval is included as "Appendix J – SEL Contours Addendum" for consistency with the naming of previous submittals. The attachment provides complementary information to Appendices B through H of our June 7, 2016 submittal and does not replace it.

On behalf of the Louisville Regional Airport Authority, we request that the FAA approve these AEDT 2b user-defined profiles for use in the Louisville NEM Update. We would be pleased to answer any questions that FAA/AEE has regarding this request.

Thank you for your assistance on this matter.

Sincerely yours,

Diana Wasiuk

Vice President and Chief Operating Officer

Appendix J: SEL Contours Addendum

Submitted by Louisville Regional Airport Authority to FAA for review and Approval July 18, 2016

At the request of the FAA, this addendum includes several contour figures (Fig. 1 – Fig. 25) showing comparisons of Sound Exposure Level (SEL) between AEDT standard profiles, and proposed user-defined profiles. There is a comparison SEL contour for each aircraft and stagelength that is proposed to use a user-defined profile in the SDF NEM.

These modifications are considered DRAFT until approved by FAA.

757RR SEL Departure Contours

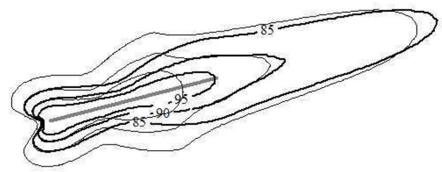

Figure 1: 757RR Stagelength 1 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

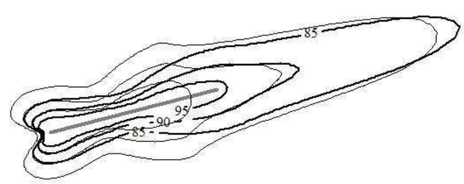

Figure 2: 757RR Stagelength 2 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

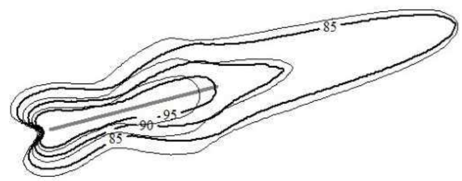

Figure 3: 757RR Stagelength 3 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

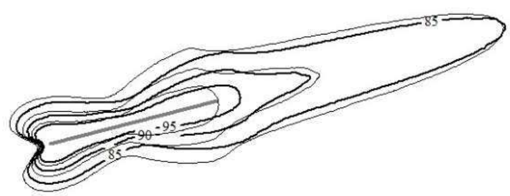

Figure 4: 757RR Stagelength 4 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

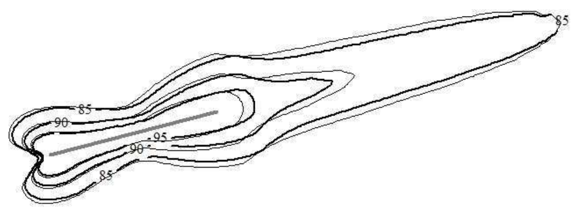

Figure 5: 757RR Stagelength 5 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

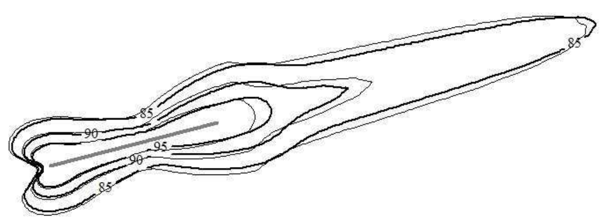

Figure 6: 757RR Stagelength 6 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

767300 SEL Departure Contours

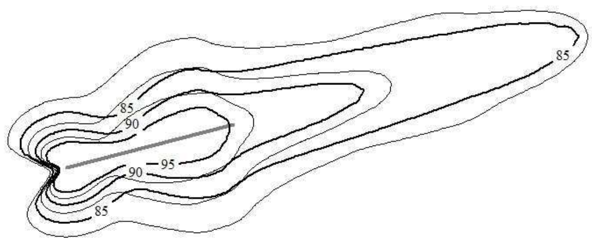

Figure 7: 767300 Stagelength 1 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

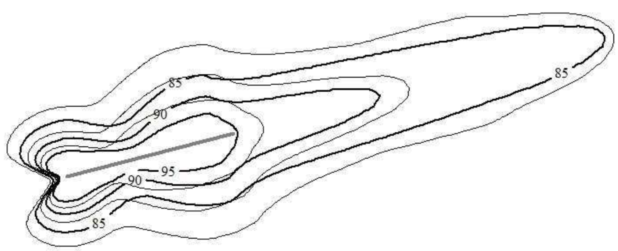

Figure 8: 767300 Stagelength 2 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

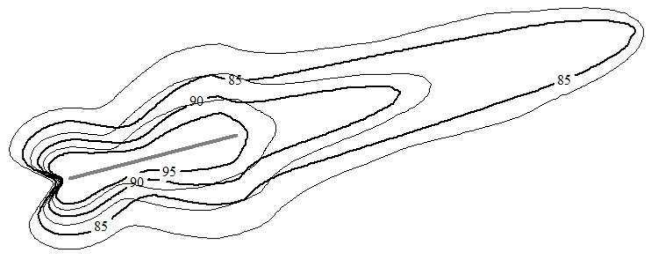

Figure 9: 767300 Stagelength 3 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

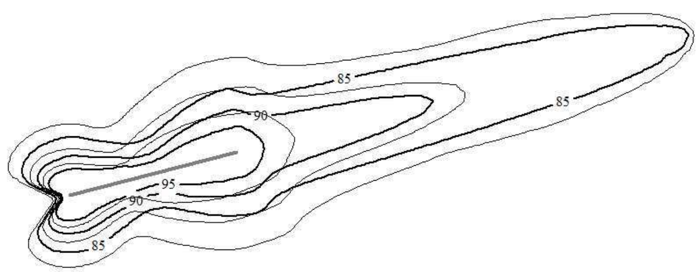

Figure 10: 767300 Stagelength 4 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

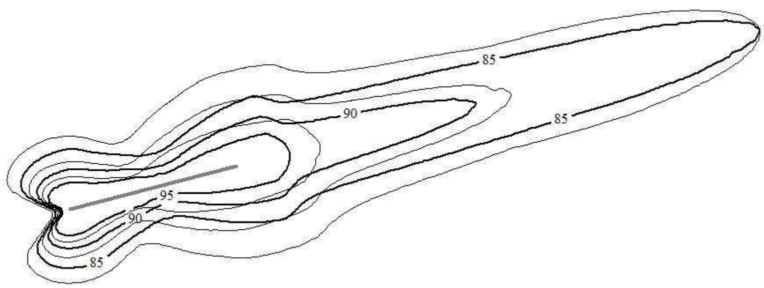

Figure 11: 767300 Stagelength 5 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

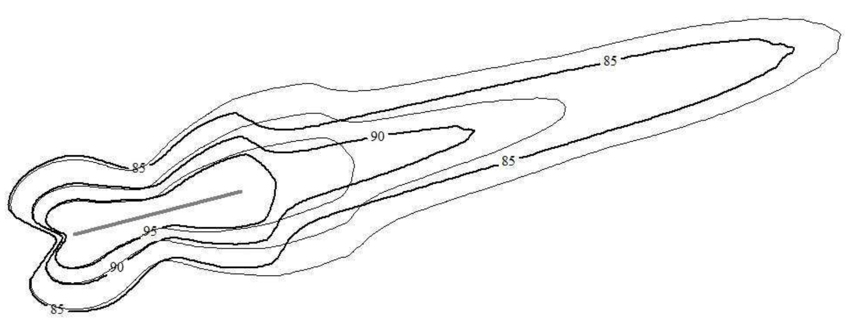

Figure 12: 767300 Stagelength 6 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

Aaron Braswell
July 26, 2016
Page 9

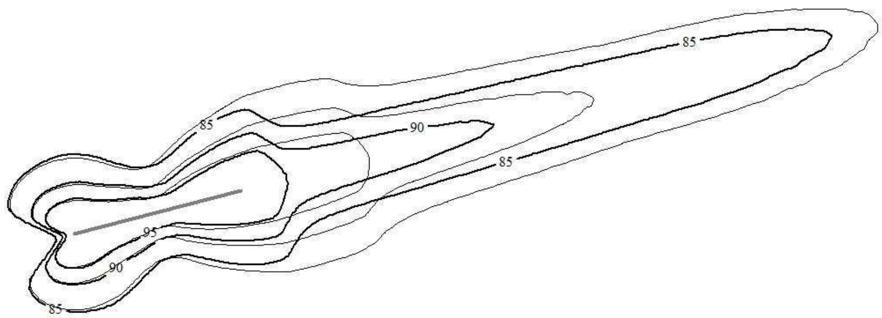

Figure 13: 767300 Stagelength 7 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

MD11GE SEL Departure Contours

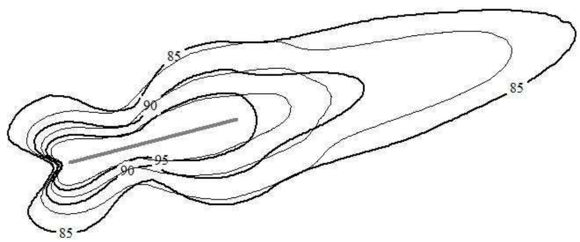

Figure 14: MD11GE Stagelength 1 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

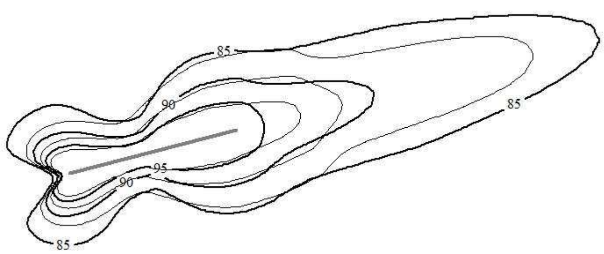

Figure 15: MD11GE Stagelength 2 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

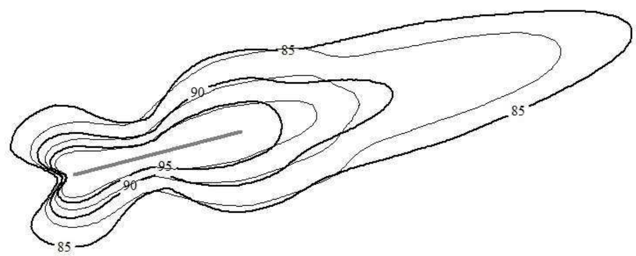

Figure 16: MD11GE Stagelength 3 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

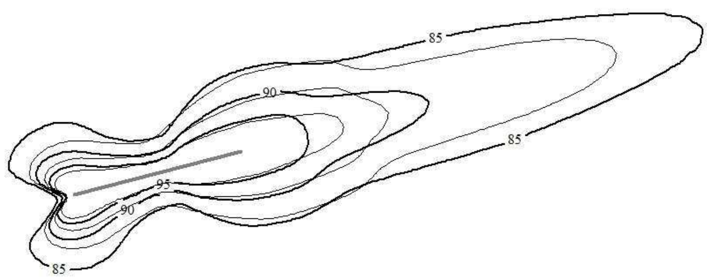

Figure 17: MD11GE Stagelength 4 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

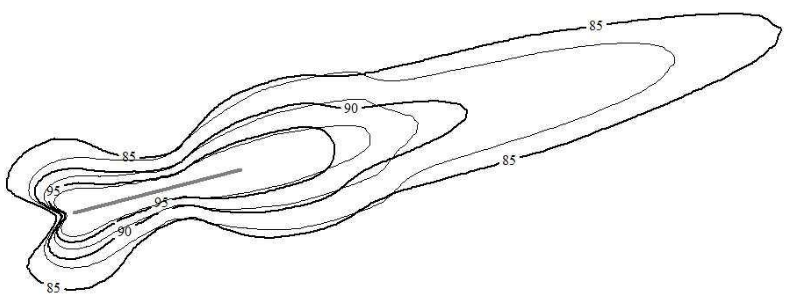

Figure 18: MD11GE Stagelength 5 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

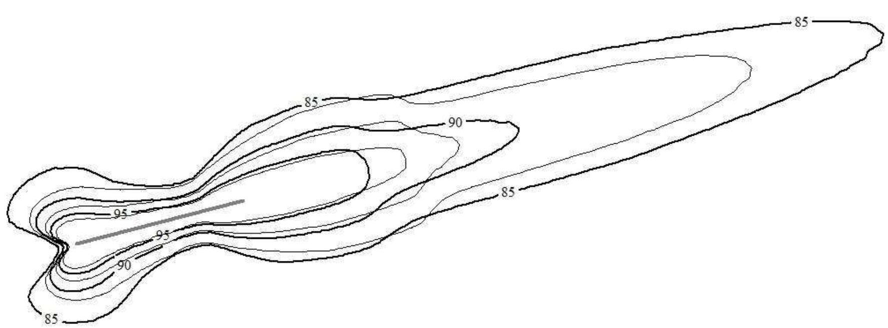

Figure 19: MD11GE Stagelength 6 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

MD11PW SEL Departure Contours

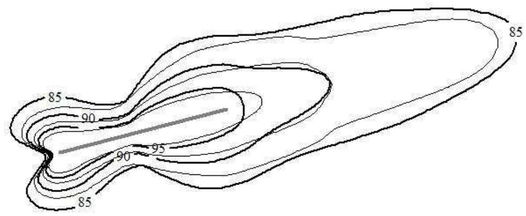

Figure 20: MD11PW Stagelength 1 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

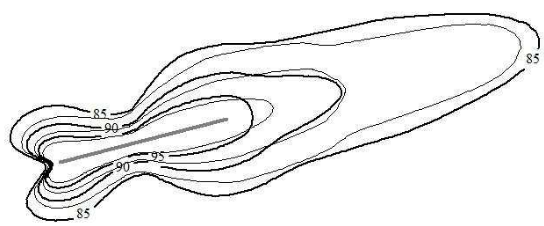

Figure 21: MD11PW Stagelength 2 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

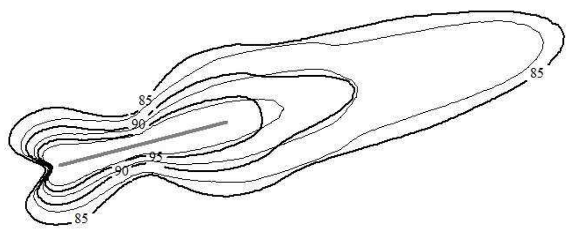

Figure 22: MD11PW Stagelength 3 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

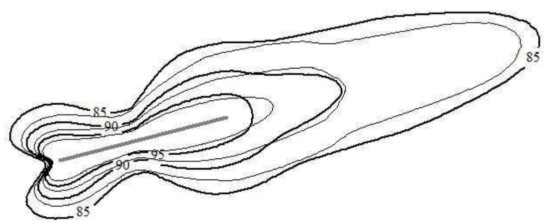

Figure 23: MD11PW Stagelength 4 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

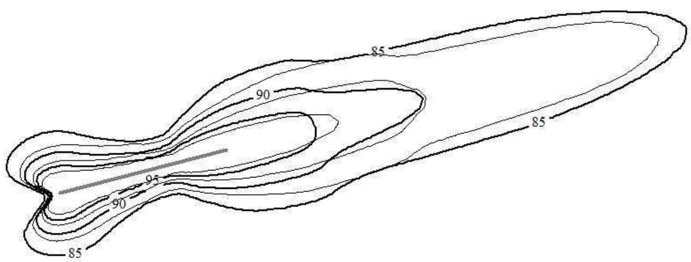

Figure 24: MD11PW Stagelength 5 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

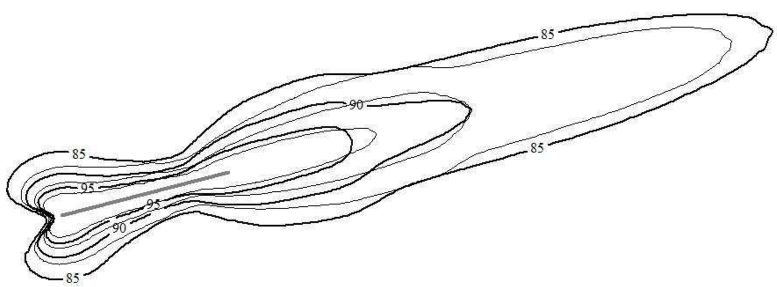

Figure 25: MD11PW Stagelength 6 Departure SEL Contours
AEDT STANDARD (thin line)
User-defined profile (**thick** line)

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Appendix H FAA Response to LRAA on Non-Standard Aircraft Profiles Modeling Request

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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

Date: July 28, 2016

Aaron Braswell
Environmental Protection Specialist
Federal Aviation Administration
2600 Thousand Oasks Bldv, Suite 2250
Memphis, TN 38118

Dear Mr. Braswell,

The Office of Environment and Energy (AEE) has received the memo dated June 7, 2016, requesting approval of user-defined departure profiles for four Boeing aircraft types (757RR, 767300, MD11GE and MD11PW). Harris Miller Miller & Hanson Inc. (HMMH) is assisting the Louisville Regional Airport Authority (LRAA) to prepare a Noise Exposure Map Update for Louisville International Airport (SDF) using the Aviation Environmental Design Tool (AEDT) Version 2b.

In this request, HMMH used radar data to justify the use of user-defined departure profiles as opposed to using standard departure profiles from AEDT2b. These user-defined flight profiles were developed at SDF by Boeing based on Assumed Temperature Method, which involved the use of Boeing's proprietary software.

AEE reviewed the request and requested SEL contour comparisons be done in AEDT2b. AEE also sought information regarding changes if any in terms of aircraft operations including an estimate of stage length allocations in the noise modeling. HMMH subsequently provided updated memo and a new addendum dated July 26, 2016. The user-defined departure profiles seem to represent aircraft operations in the study year (2015) better than the AEDT standard departure profiles. Our office approves the use of the user-defined profiles for the four aircraft types.

Please understand that this approval is limited to this particular project for SDF. Any additional projects or non-standard AEDT input at SDF or any other site will require separate approval.

Sincerely,

Rebecca Cointin

Rebecca Cointin
Manager, AEE/Noise Division

cc: Jim Byers, APP-400

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Appendix I Sample Contraflow Report

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Louisville
INTERNATIONAL AIRPORT

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

September 19-23, 2016

Louisville Regional Airport Authority®

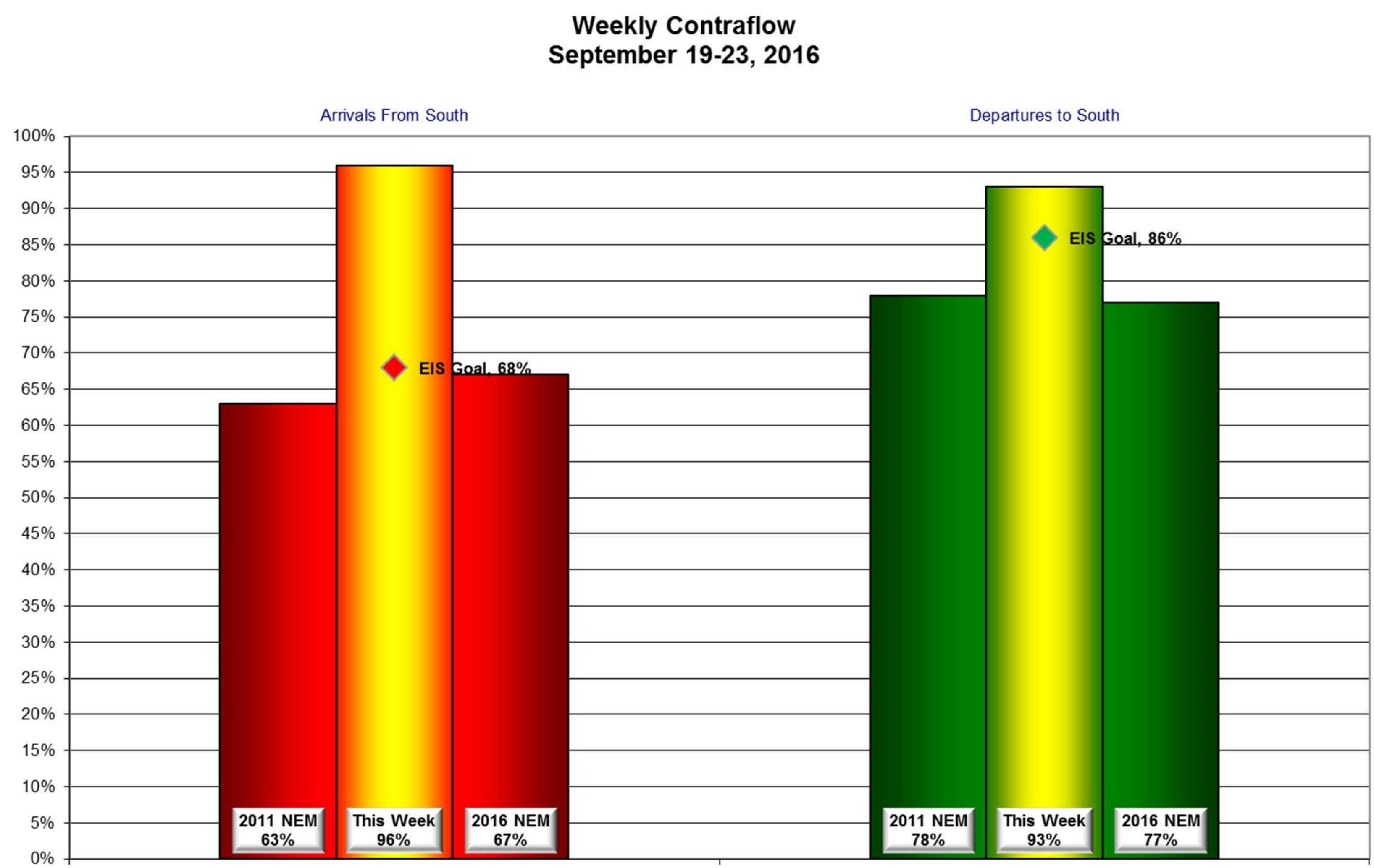
The chart below is a reprint of Table 5-1 in the Environmental Impact Statement for the Louisville Airport Improvement Program. The same figures are repeated in the Part 150 Noise Compatibility Program Table 5D. ***Landings at night from the south*** are expected to be ***68%*** of all operations. ***Departures to the south*** are expected to be ***86% at night***.

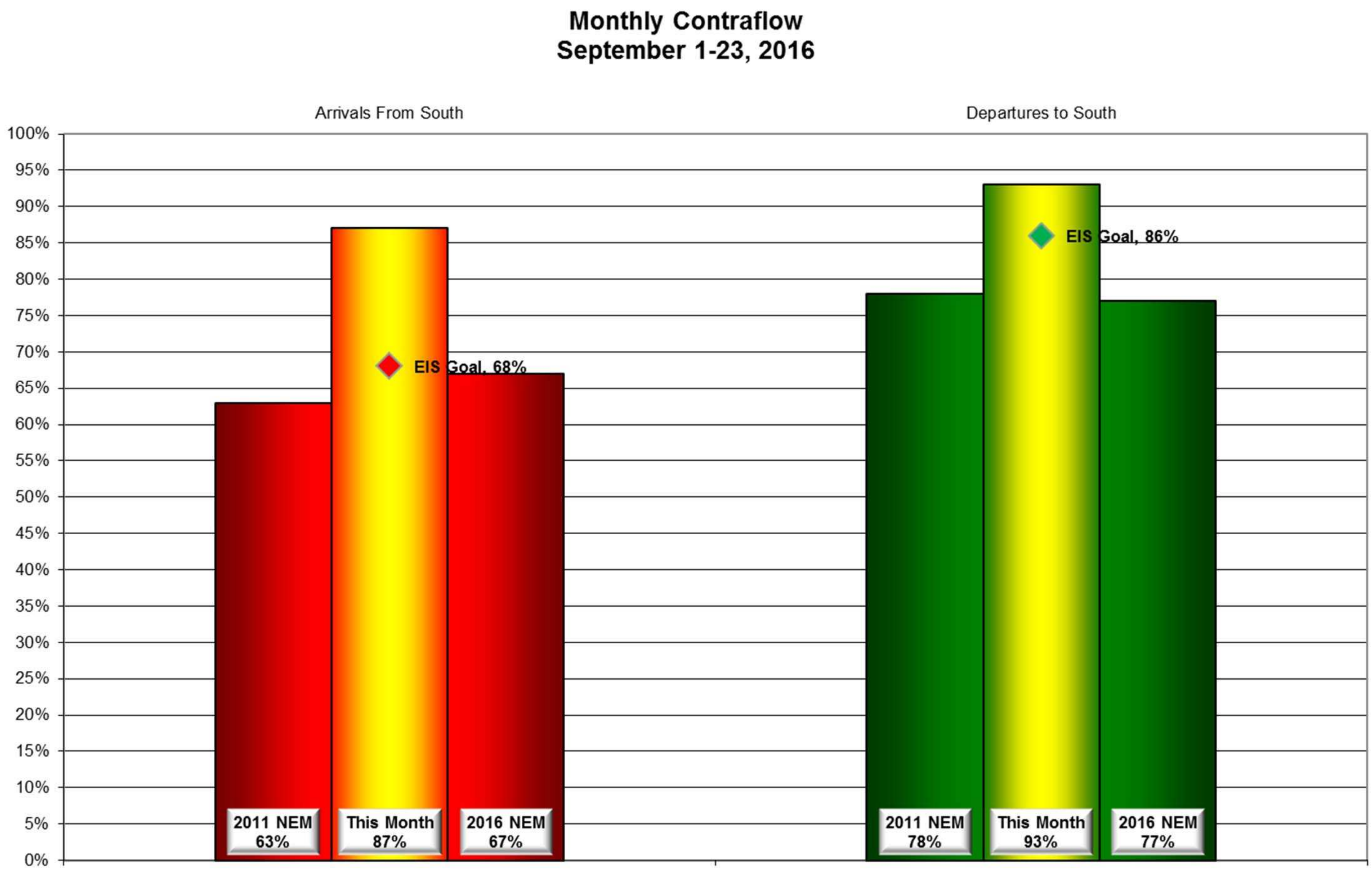
RUNWAY DIRECTIONAL FLOW DISTRIBUTION (PERCENT):
JET AIRCRAFT AND LARGE PROPELLER AIRCRAFT[a]

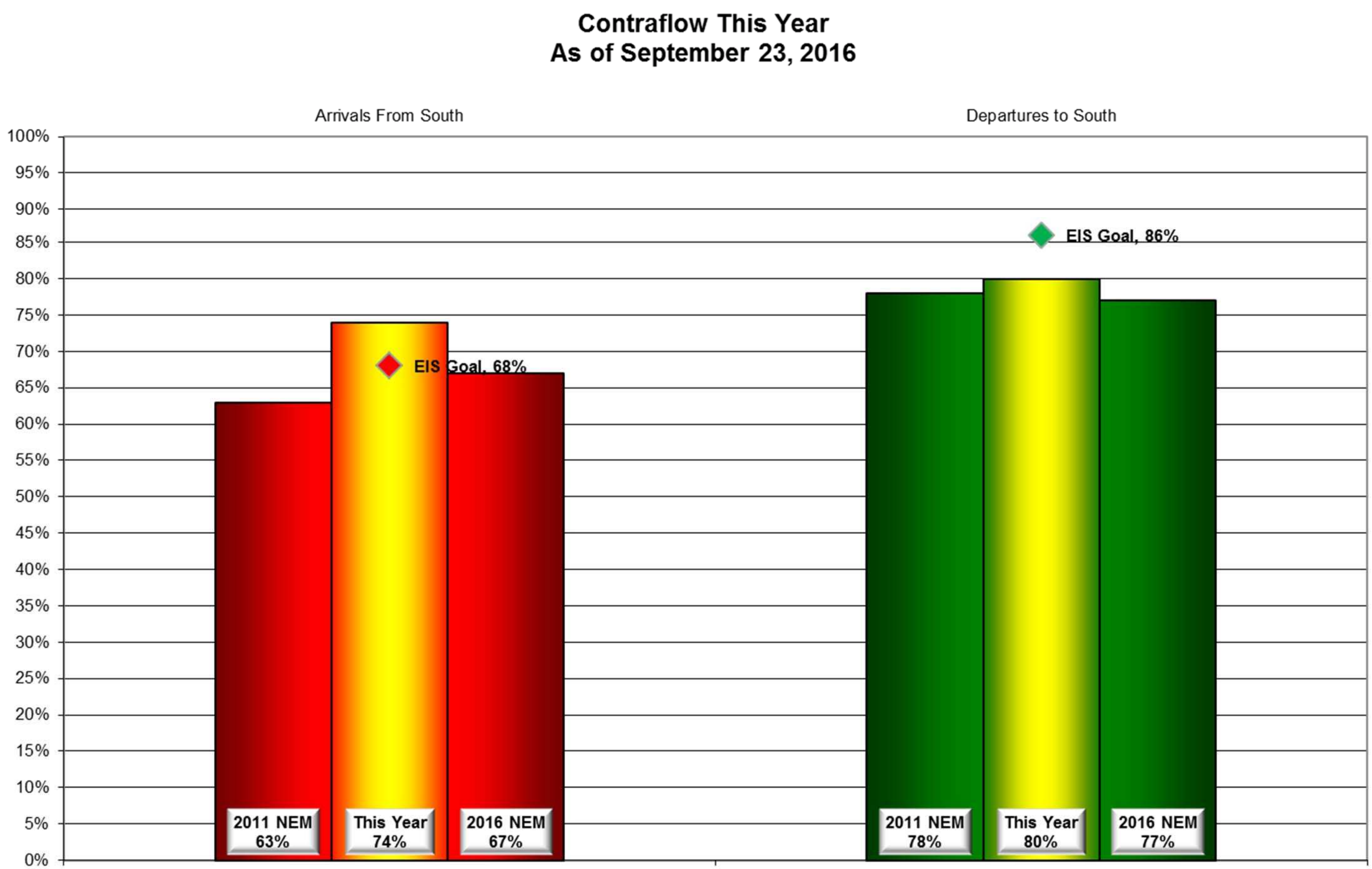
Runway Heading	Category of Operation			
	Landings		Departures	
	Day	Night	Day	Night
35 North[b]	10	68	10	11
17 South[b]	83	30	85	86
11 East	3	1	2	1
29 West	4	1	3	2
TOTAL	100	100	100	100

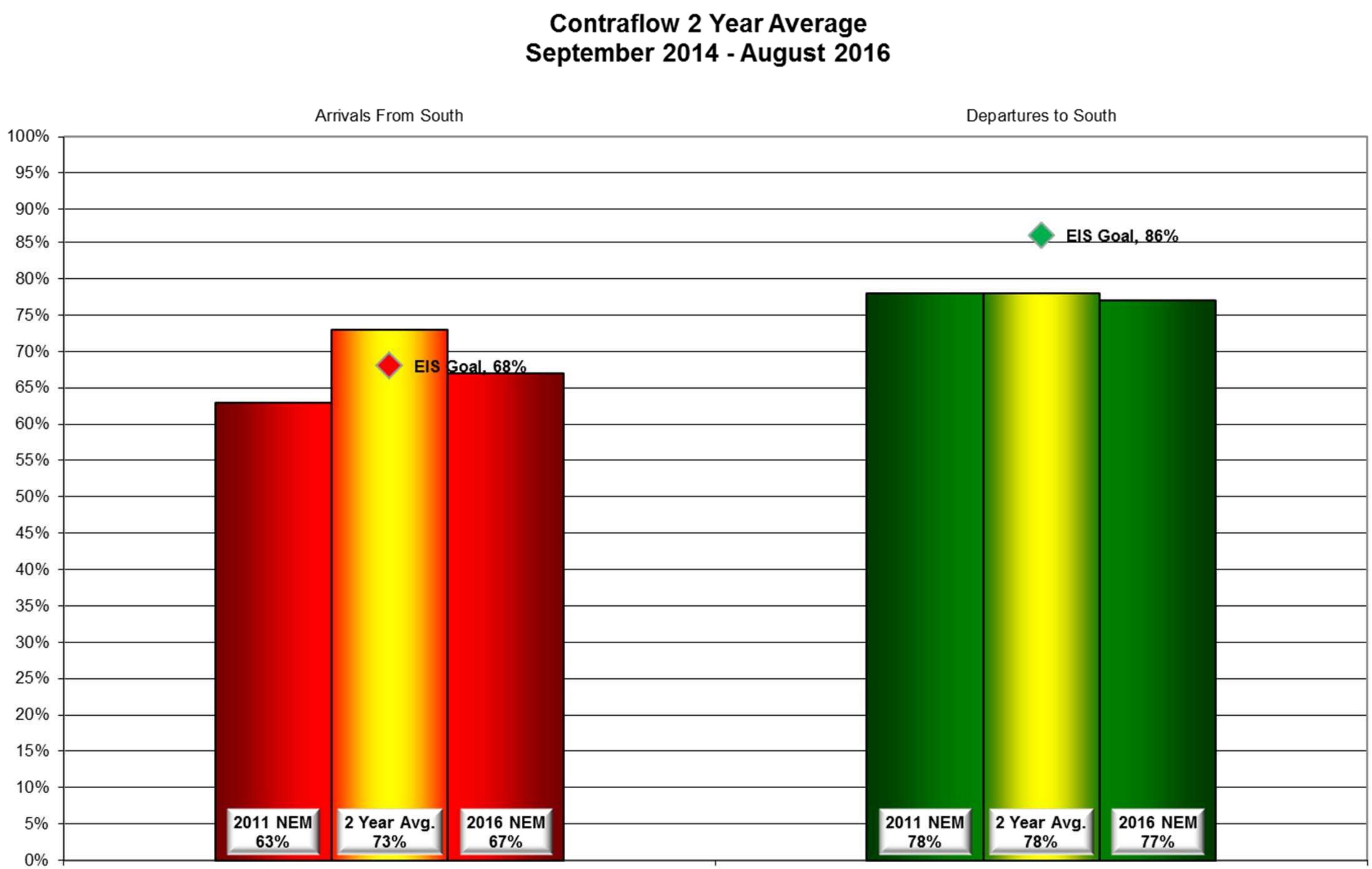
[a]Small general aviation aircraft with reciprocating engines are of virtually no account to the noise contour analysis.
[b]For conditions without further mitigation. All traffic operating on Runways 35 or 17 may, with the exception of wide body aircraft and heavily loaded DC8s, be equally distributed between the two runways. The wide body and heavy DC8 aircraft are assumed to operate on the longer west runway.

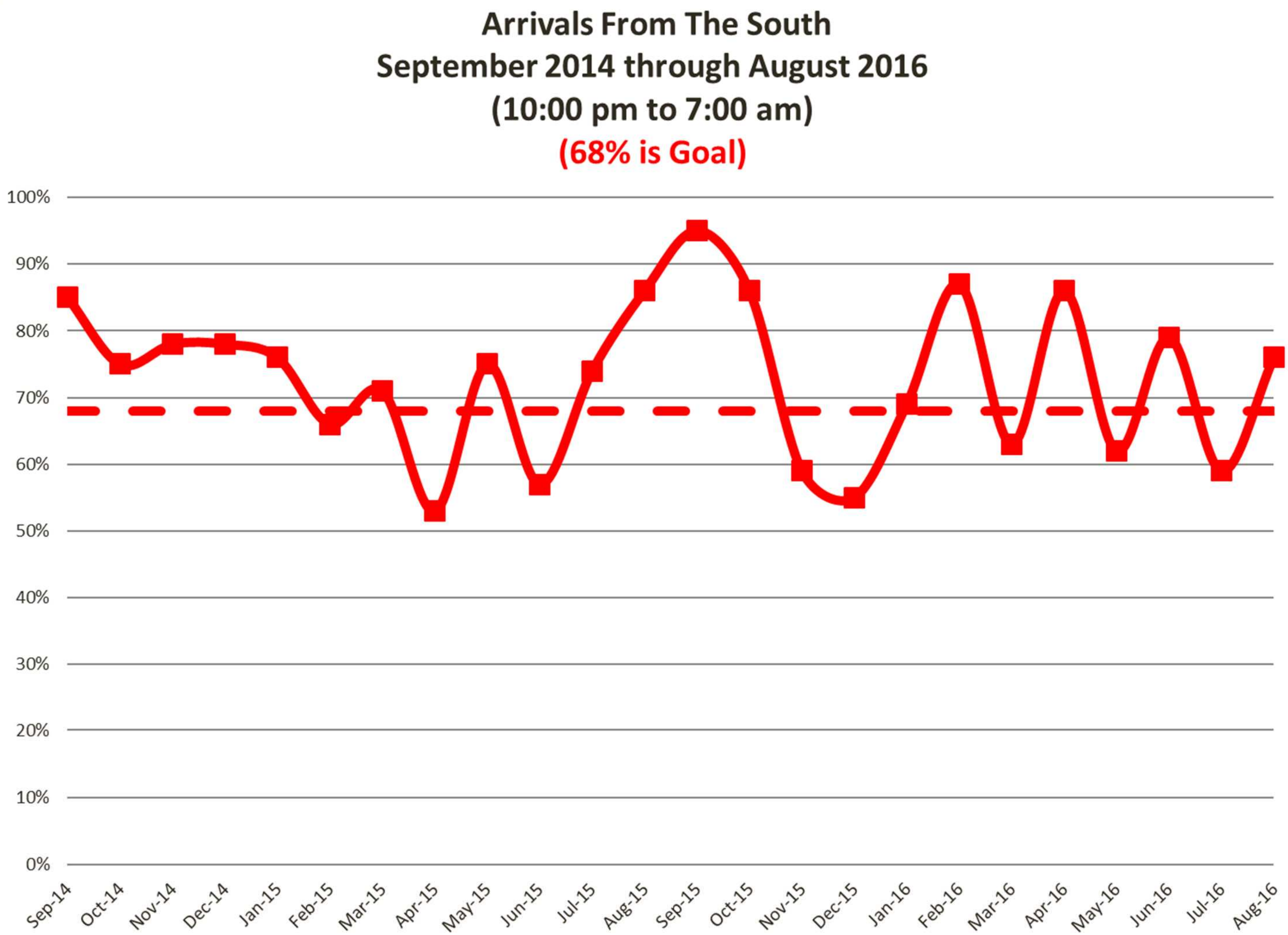
Source: Regional Airport Authority
Coffman Associates


Weekly Contraflow
September 19-23, 2016
Arrivals From South
Departures to South
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
EIS Goal, 68%
EIS Goal, 86%
2011 NEM 63%
This Week 96%
2016 NEM 67%
2011 NEM 78%
This Week 93%
2016 NEM 77%


Monthly Contraflow
September 1-23, 2016
Arrivals From South
Departures to South
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
EIS Goal, 68%
EIS Goal, 86%
2011 NEM 63%
This Month 87%
2016 NEM 67%
2011 NEM 78%
This Month 93%
2016 NEM 77%


Contraflow This Year
As of September 23, 2016
Arrivals From South
Departures to South
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
EIS Goal, 68%
EIS Goal, 86%
2011 NEM 63%
This Year 74%
2016 NEM 67%
2011 NEM 78%
This Year 80%
2016 NEM 77%


Contraflow 2 Year Average
September 2014 - August 2016
Arrivals From South
Departures to South
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
EIS Goal, 68%
EIS Goal, 86%
2011 NEM 63%
2 Year Avg. 73%
2016 NEM 67%
2011 NEM 78%
2 Year Avg. 78%
2016 NEM 77%


Arrivals From The South
September 2014 through August 2016
(10:00 pm to 7:00 am)
(68% is Goal)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
Apr-15
May-15
Jun-15
Jul-15
Aug-15
Sep-15
Oct-15
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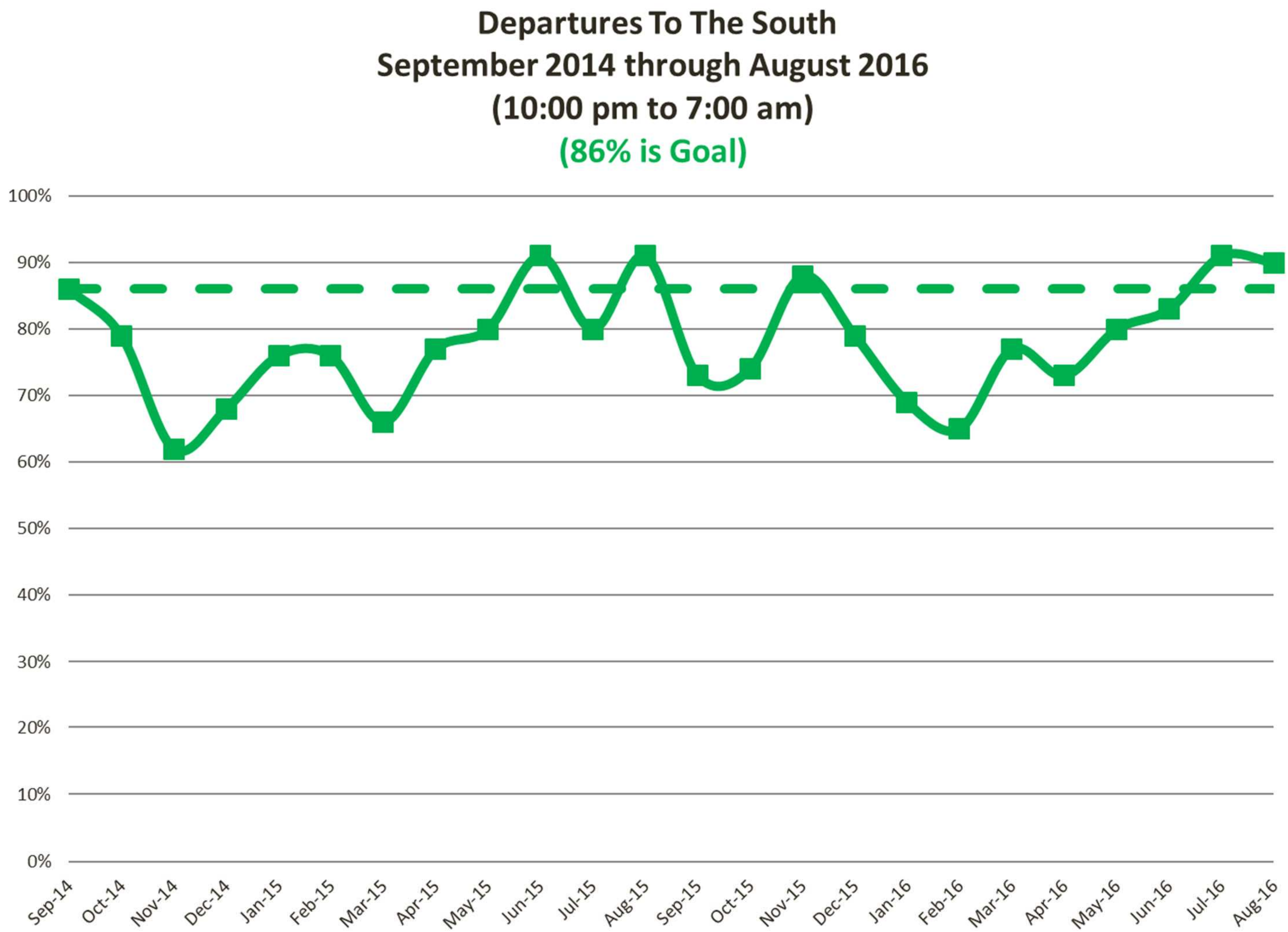
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16


Departures To The South
September 2014 through August 2016
(10:00 pm to 7:00 am)
(86% is Goal)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
Apr-15
May-15
Jun-15
Jul-15
Aug-15
Sep-15
Oct-15
Nov-15
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16

Year-to-Year by Month Percent* Contraflow

Arrivals From the South (Goal 68%)									
	2009	2010	2011	2012	2013	2014	2015	2016	Avg
Jan	63%	94%	91%	62%	72%	51%	76%	69%	72%
Feb	49%	90%	73%	69%	77%	72%	66%	80%	72%
Mar	46%	80%	52%	61%	87%	60%	71%	63%	65%
Apr	53%	57%	47%	78%	60%	67%	53%	86%	63%
May	66%	56%	69%	72%	46%	60%	75%	62%	63%
Jun	72%	66%	61%	79%	76%	75%	57%	79%	71%
Jul	72%	61%	91%	62%	74%	79%	74%	59%	72%
Aug	61%	59%	82%	49%	84%	61%	86%	76%	70%
Sep	89%	70%	85%	55%	86%	85%	95%		82%
Oct	42%	80%	88%	62%	87%	75%	86%		75%
Nov	74%	85%	55%	84%	73%	78%	59%		72%
Dec	71%	67%	70%	64%	58%	78%	55%		65%
Avg	63%	72%	72%	66%	73%	70%	71%	72%	

Departures to the South (Goal 86%)									
	2009	2010	2011	2012	2013	2014	2015	2016	Avg
Jan	74%	54%	71%	80%	65%	81%	76%	69%	71%
Feb	81%	71%	63%	74%	78%	71%	76%	67%	73%
Mar	67%	82%	72%	96%	77%	77%	66%	77%	77%
Apr	84%	84%	83%	76%	89%	83%	77%	73%	81%
May	84%	87%	85%	81%	85%	92%	80%	80%	84%
Jun	81%	96%	93%	87%	80%	91%	91%	83%	88%
Jul	82%	90%	88%	92%	88%	85%	80%	91%	87%
Aug	96%	92%	91%	91%	92%	92%	91%	90%	92%
Sep	82%	73%	64%	92%	87%	86%	73%		79%
Oct	71%	78%	63%	78%	89%	79%	74%		76%
Nov	73%	77%	72%	81%	83%	62%	88%		76%
Dec	65%	78%	65%	67%	71%	68%	79%		69%
Avg	78%	80%	76%	83%	82%	81%	79%	79%	

*Number is percentage of all operations between 10:00 PM - 7:00 AM

Louisville Regional Airport Authority®

Daily Runway Use Summary – September 2016
(from 10:00 PM date list in first column to 7:00 AM the following morning

% of all arrivals from the south

Date	Day	* in compliance		Runway # 11	Runway # 17L	Runway # 17R		Runway # 29	Runway # 35L	Runway # 35R	Unknown Runway Use	Notes / Comments
09/01/16	Thu	98%			1	1			64	34	0	
09/02/16	Fri	97%			2	1			57	40	0	
09/03/16	Sat											
09/04/16	Sun											
09/05/16	Mon	84%			14	2			65	19	0	
09/06/16	Tue	95%			4	1			56	39	0	
09/07/16	Wed	93%			5	2			58	35	0	
09/08/16	Thu	86%			11	3			53	33	0	
09/09/16	Fri	0%			42	58					0	180-220@6-9knts
09/10/16	Sat											
09/11/16	Sun											
09/12/16	Mon	94%			5	1			54	40	0	
09/13/16	Tue	93%			6	1			60	33	0	
09/14/16	Wed	95%			4	1			58	37	0	
09/15/16	Thu	97%			2	1			59	38	0	
09/16/16	Fri	61%			14	25			31	30	0	130-150@3-10knts
09/17/16	Sat											
09/18/16	Sun											
09/19/16	Mon	96%			4				60	36	0	
09/20/16	Tue	96%			4				55	41	0	
09/21/16	Wed	98%				2			59	39	0	
09/22/16	Thu	96%			2	2			56	40	0	
09/23/16	Fri	94%			2	4			62	32	0	

% of all departures to the south

Date	Day	** in compliance		Runway # 11	Runway # 17L	Runway # 17R		Runway # 29	Runway # 35L	Runway # 35R	Unknown Runway Use	Notes / Comments
09/01/16	Thu	94%			34	60			1	5	0	
09/02/16	Fri	91%			32	59			2	7	0	
09/03/16	Sat											
09/04/16	Sun											
09/05/16	Mon	94%			40	54			5	1	0	
09/06/16	Tue	89%			30	59			9	2	0	
09/07/16	Wed	96%			31	65			2	2	0	
09/08/16	Thu	96%			35	61			2	2	0	
09/09/16	Fri	100%			43	57					0	
09/10/16	Sat											
09/11/16	Sun											
09/12/16	Mon	91%			33	58			6	3	0	
09/13/16	Tue	87%			34	53			6	7	0	
09/14/16	Wed	92%			39	53			2	6	0	
09/15/16	Thu	94%			32	62			2	4	0	
09/16/16	Fri	97%			38	59			1	2	0	
09/17/16	Sat											
09/18/16	Sun											
09/19/16	Mon	96%			36	60			2	2	0	
09/20/16	Tue	94%			34	60			3	3	0	
09/21/16	Wed	94%			35	59			3	3	0	
09/22/16	Thu	93%			32	61			3	4	0	
09/23/16	Fri	90%			36	54			3	7	0	

Preferred Flow

DATIS Reported Conditions Indicate Support for Non-Preferred Flow

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

Appendix J Public Participation

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LOUISVILLE REGIONAL AIRPORT AUTHORITY®

Louisville International Airport Noise Exposure Map Update

Community Noise Forum Meeting

November 23, 2015

Welcome and Introductions

- **Consultant Team Members**
  - Gene Reindel, Principal-in-Charge
  - Sean Doyle, Project Manager
  - Marc Champigny, Forecast and Land Use Development
  - Clair Nichols, Public Involvement Coordinator
- **Community Noise Forum**
  - Round the table introductions
    - Name
    - Entity represented
    - Length of time on CNF

hmmh

Louisville NEM Update
Consultant Project Team

- HMMH
  - Project Management
  - Noise Lead
- C&S Companies
  - Aviation Forecast
  - Land Use Verification
- Guthrie/Mayes Public Relations
  - Community/CNF Liaison

Meeting Agenda

- What is a Noise Exposure Map Update?
- NEM Update Goals
- Roles and Responsibilities
- History of Part 150 at SDF
- Public Participation Process
- NEM Update Schedule
- Beyond FAA Requirements for NEM
- FAA Model - AEDT
- Summary

What is a Noise Exposure Map Update?
Airport Noise Compatibility Planning

- **Code of Federal Regulations (14 CFR) Part 150, "Airport Noise Compatibility Planning"**
  - Voluntary federal program
  - Over 250 airports have participated
  - Sets national standards for analysis
  - Provides access to federal funding
  - Aids in obtaining FAA implementation assistance
- **Part 150 has two principal technical elements**
  - Noise Exposure Map (NEM)
    - This project is an NEM update only
  - Noise Compatibility Program (NCP)
    - This project will **not** update the NCP

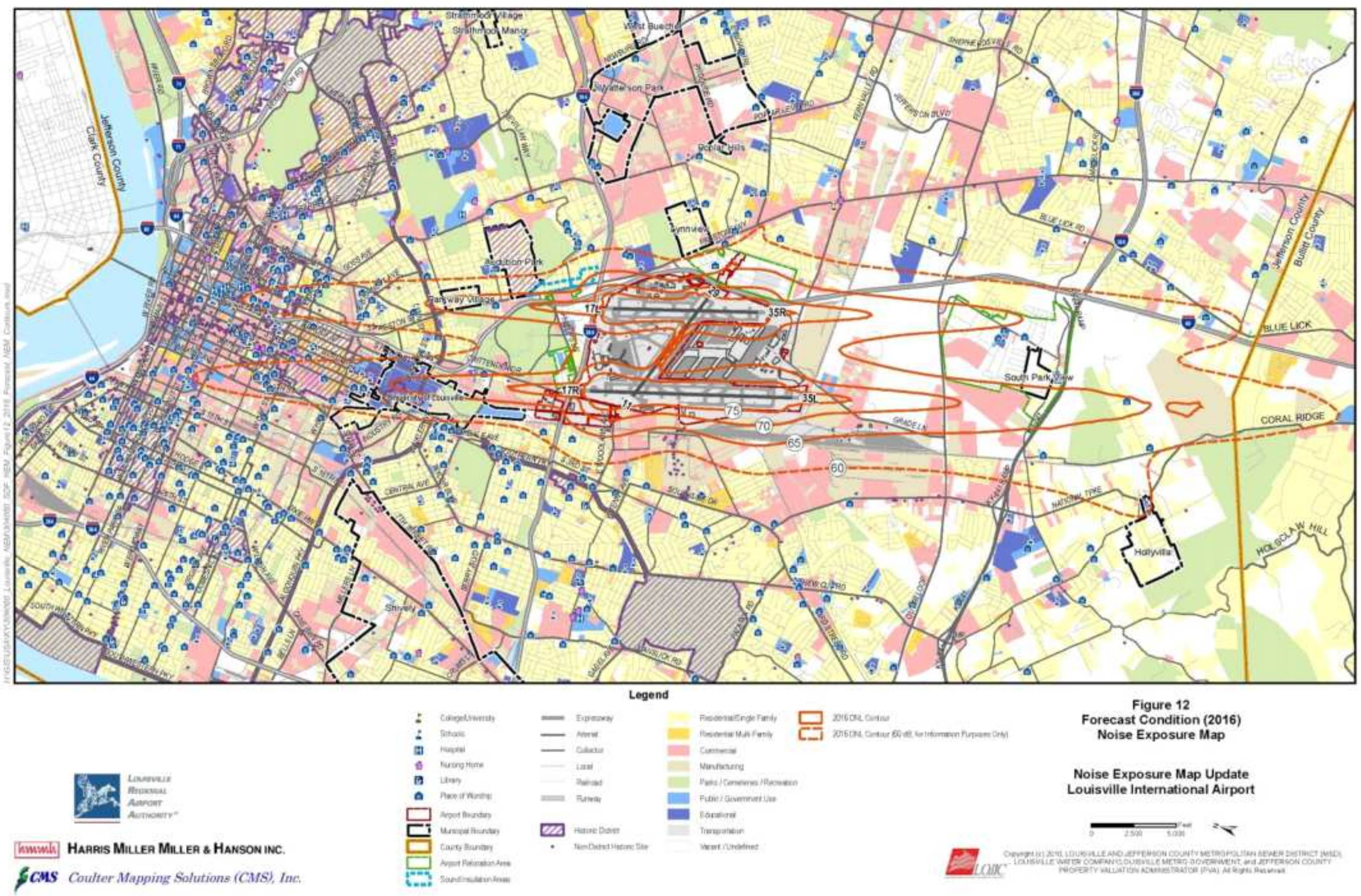
Federal Aviation Administration

What is a Noise Exposure Map Update?
Noise Exposure Map (NEM)

- **The NEM describes:**
  - Airport layout and operation
  - Aircraft related noise exposure
  - Land uses in the airport environs
  - Noise/land use compatibility situation
- **NEM must provide information for two timeframes**
  - Year of submission (2016)
  - Five-year forecast (2021)
- **FAA Checklist**
  - Requires extensive documentation to comply
- **Annual noise exposure depicted using "contours"**

What is a Noise Exposure Map Update?

FAA Accepted NEM Louisville International Airport – 2011



NEM Update Goals

Louisville NEM Update

- **Collect, analyze and report information regarding current and forecasted operations as it relates to:**
  - Aircraft noise
  - Land use compatibility
- **Continue implementation of the Noise Compatibility Program**
- **Public involvement**
  - Data and information sharing

Roles and Responsibilities
FAA's Noise Abatement Policy

Entity	Responsibility
U.S. Government	Noise emissions and flight procedures
Airport Proprietors	Plan / request implementation of noise abatement actions
State and Local Governments	Compatible land use planning, zoning, and housing regulations
Air Carriers (and other operators)	Comply with federal noise standards, and comply with noise abatement measures
Operators and Passengers	Bear the cost of noise reduction
Current and Prospective Residents	Understand airport noise and what steps can be taken to minimize its effect on people

Roles and Responsibilities
Louisville NEM Update

- **FAA**
  - Provides federal funding for NEM Update
  - Accepts NEM Update
- **Authority – Airport Project Sponsor**
  - Contracts with consultant team
  - Certifies the NEM is accurate and complete
  - Submits NEM Update to the FAA for acceptance
- **Consultant Team**
  - Conducts technical work
  - Generates NEM Update documentation per FAA requirements

Roles and Responsibilities
Louisville NEM Update

- **Community Noise Forum**
  - The core advisory group
  - Receives regular project updates at bimonthly CNF meetings
  - Review and provide comments on project materials, for example:
    - Current aircraft operations (2014/2015)
    - Base case aircraft operations (2016)
    - Forecast aircraft operations (2021)
    - Existing and forecast land use within study area
    - Non-standard modeling inputs, if any
    - Review assumptions regarding alternative contours
    - Input on supplemental metrics

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History of Part 150 at Louisville International Airport

- **Original NEM/NCP conducted in 1993, for 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

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**
- **Have a public workshop:**
  - Overview of Draft NEM Update
  - One-on-one time with NEM Update project team
  - Information sharing
  - Education

Louisville Regional Airport Authority®

NEM Update Schedule

Phase		Expected Completion Date
No.	Description	
1	Project Initiation	December 15, 2015
2	Data Collection and Forecast	May 15, 2016
3	Prepare Draft Noise Exposure Maps	September 15, 2016
4	Public Comment Period and Workshop	Sep-Oct, 2016
5	Prepare and Submit Noise Exposure Maps	November 15, 2016

Beyond FAA Requirements for NEM

- **Two supplemental noise metrics**
  - Number of aircraft noise events above 70 dB (N70)
    - Used to compare to outdoor speech interference
    - Alternative level to be set with CNF guidance
    - ***Note due to changes in the FAA noise model this metric may not be available***
  - Estimated time during a school day that instruction may be disrupted by aircraft noise at local educational facilities

Aviation Environmental Design Tool

- **As of May 29th 2015 all FAA sponsored aircraft noise evaluations must be conducted with the Aviation Environmental Design Tool (AEDT) version 2b**
  - This new tool replaces the Integrated Noise Model (INM) used for the previous SDF NEM update
- **The underlying noise modeling properties remain unchanged between AEDT and INM, however substantial updates have been made effecting the noise modeling process**

Beyond FAA Requirements for NEM

- **Custom Model Track development and AEDT input formatting process provides:**
  - Full year of flight tracks (365 days) from the SDF flight tracking system
    - Sophisticated geometric algorithms convert flight track data recorded by the airport for every identified aircraft operation into AEDT model tracks
    - Models each operation on the specific runway that it actually used
    - Models each operation in the time-of-day in which that operation occurred
    - Selects the specific airframe and engine combination to model
- **2014/2015 contours - adjust the number of modeled operations to agree with tower counts and airport records for a 2016 NEM submittal**
- **2021 forecast contours - adjust the model to account for changes provided in the forecast**

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Summary
NEM Update Process

- **Data collection (*Noise & Land Use Compatibility*)**
  - 365 days of aircraft operations (Noise)
  - Existing and forecast land use data (Land Use)
- **Develop five-year forecast of aircraft operations**
- **Develop noise model inputs**
- **Run the Aviation Environmental Design Tool**
  - 2016 and 2021 noise exposure contours
  - Supplemental noise metrics
- **Prepare draft Noise Exposure Map (NEM) documentation**

Thank You!

Noise Exposure Map Update

Community Noise Forum Presentation

November 23, 2015

Louisville Regional Airport Authority®


www.hmmh.com

Louisville Regional Airport Authority®

Louisville International Airport Noise Exposure Map Update

Community Noise Forum Meeting

May 23, 2016

Harris Miller Miller & Hanson Inc.

Louisville Regional Airport Authority®

Welcome and Introductions

- **Consultant Team Members Present**
  - Diana Wasiuk, Project Manager, HMMH
  - Justin Divens, Modeling Lead, HMMH

Louisville International NEM Update

Consultant Project Team

- **HMMH**
  - Project Management
  - Noise Lead
- **C&S Engineers, Inc.**
  - Aviation Forecast
  - Land Use
- **Guthrie/Mayes Public Relations**
  - Community/CNF Liaison

LOUISVILLE REGIONAL AIRPORT AUTHORITY®

Louisville International NEM Update

Presentation Overview

- NEM Progress to date
- Non-standard requests to FAA for review
- Modeling Assumptions
- Next steps

Louisville International NEM Update

Progress To Date

Develop Study Protocol
- Finalize Methodology
- Develop project schedule and milestones
- Brief CNF

Verification
- Existing Noise Exposure Maps & EA's
- Noise complaint data
- GIS and land use data
- Flight track and noise data from NOMS
- FAA activity forecasts
- Stakeholder outreach

Develop Noise Models
- Derive 2016/2021 flight tracks
- Develop 2016/2021 forecasts
- Seek non-standard approvals from FAA
- Validate model input

Develop NEMs
- Develop noise contours for existing and 5 year forecast conditions
- Collect land use data and policies
- Noise impact evaluation

Meetings

Community Noise Forum

Public Meetings

Louisville International NEM Update
Progress to Date

- **Develop Study Protocol**
  - Finalize Methodology
  - Develop project schedule and milestones
  - Brief CNF

Louisville International NEM Update

Progress To Date

- **Verification**
  - Existing Noise Exposure Maps & EA's
  - Noise complaint data
  - GIS and land use data
  - Flight track and noise data from NOMS
  - FAA activity forecasts
  - Stakeholder outreach

Louisville Regional Airport Authority®

Louisville International NEM Update

Progress To Date

- **Develop Noise Models**
  - Derive 2016/2021 flight tracks
  - Develop 2016/2021 forecasts
  - Seek non-standard approvals from FAA
  - Validate model input

Louisville International NEM Update

Progress To Date

- **Develop NEMs**
  - Develop noise contours for existing and 5 year forecast conditions
  - Collect land use data and policies
  - Noise impact evaluation

Louisville Regional Airport Authority®

Louisville International NEM Update

Progress To Date

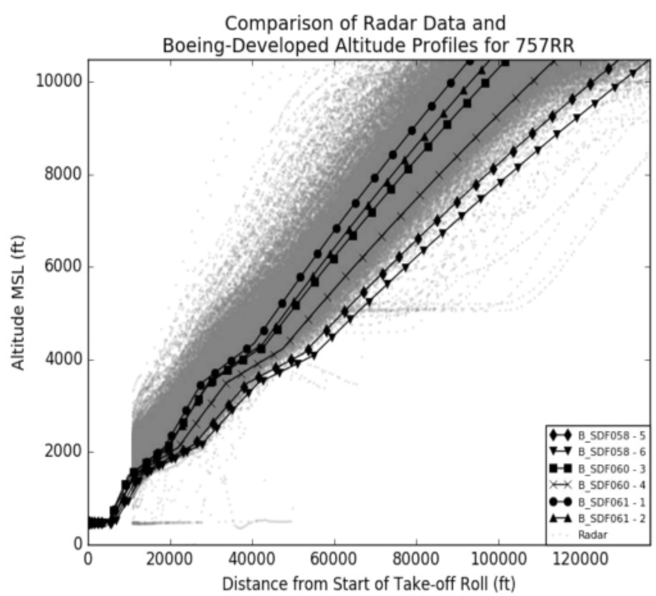
- **Forecast Overview**
  - Used information from the Master Plan Update, FAA forecasts, interviews and other available data
  - Forecasts 154,348 total operations for 2021
- **Submitted to FAA**
  - TBD
- **Approved by FAA**
  - TBD

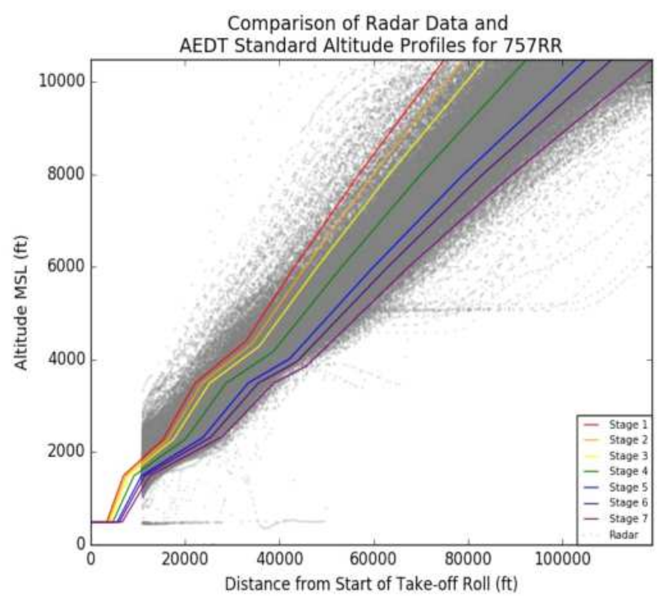
Documentation
Non-Standard Modeling Request

- **Aircraft and Substitutions (provided)**
  - Submitted to FAA on 5/5/2016

- **Profiles (provided)**
  - Submitted to FAA on 5/5/2016

Documentation
Non-Standard Modeling Request – Draft Profiles





Louisville International NEM Update

Modeling Assumptions - Runway Use

- **Existing Runway Use (2016 modeling conditions)**
  - 2014 calendar year data for runway use
  - Over 126,000 individual flight tracks
  - Each aircraft type listed in the existing operations has it's own runway use

- **Future Runway Use (2021 modeling conditions)**
  - Assume no changes to noise abatement
  - 2016 conditions adjusted for long term trends

Louisville International NEM Update

Modeling Assumptions - Runway Use

Runway	Departures	Arrivals
17L	30.5%	30.7%
17R	42.2%	16.5%
35L	10.3%	30.3%
35R	15.5%	21.2%
11	0.0%	0.0%
29	1.4%	1.3%
Total	100%	100%

Notes: Totals may not match exactly due to rounding.

Runway use based on 2014 SDF data due to closure of Runway 11/29 May 4th – Nov. 16th 2015.

All helicopters, military and civilian, were modeled using Taxiway E4

Source: HMMH, LRAA, NOMS data

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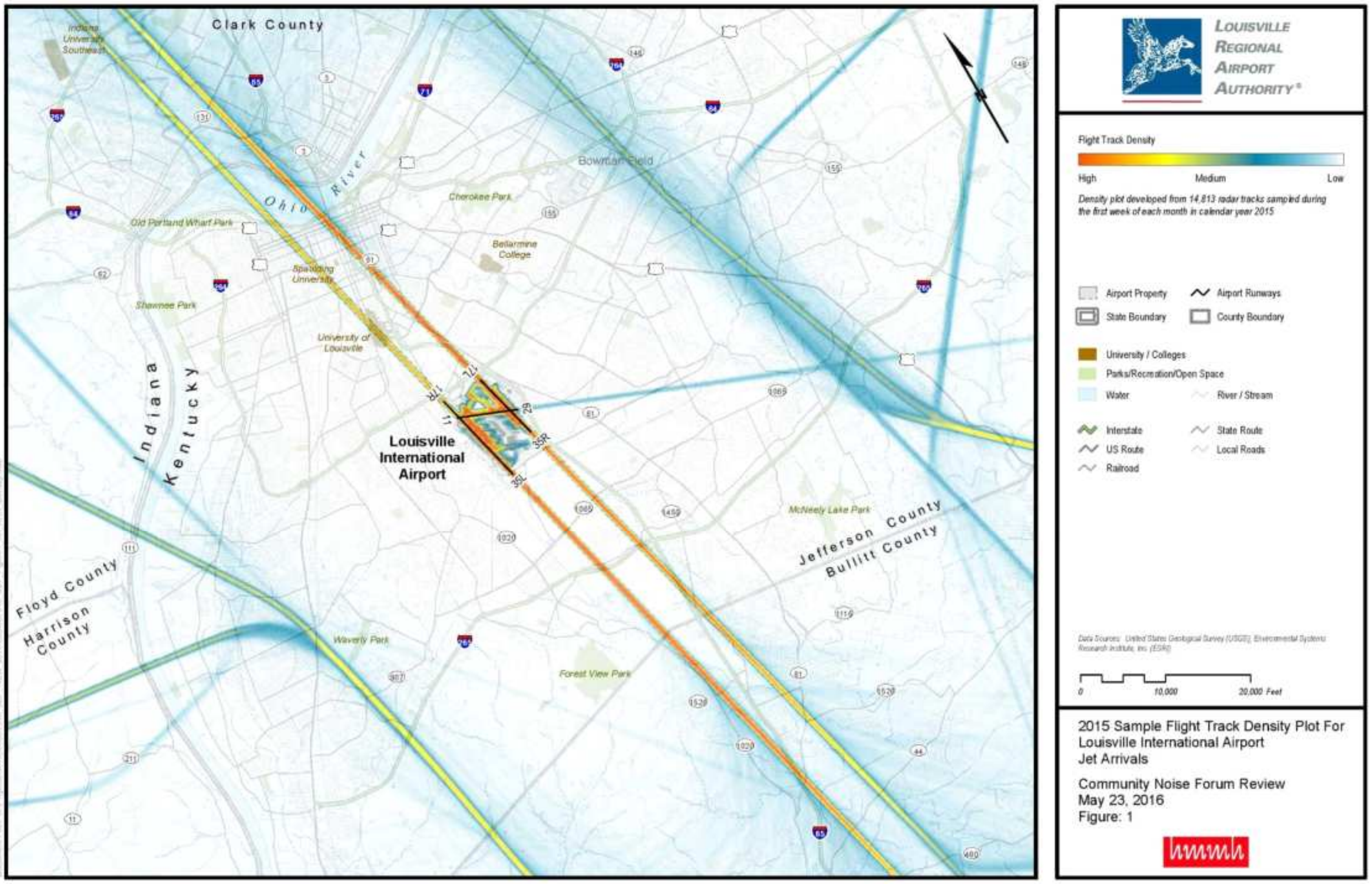
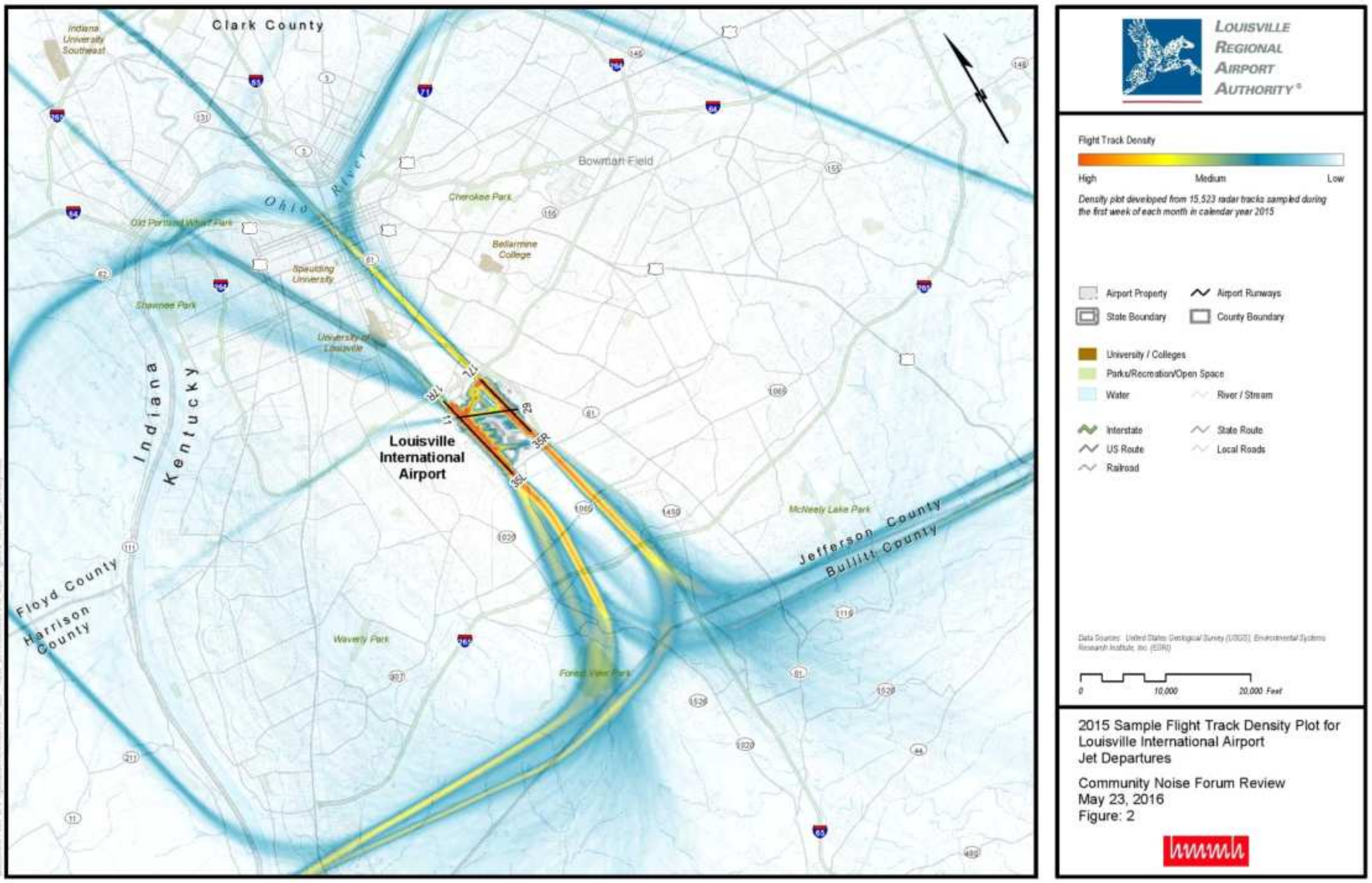
Louisville International NEM Update
Modeling Assumptions – Density Plots



Louisville International NEM Update

Modeling Assumptions – Density Plots



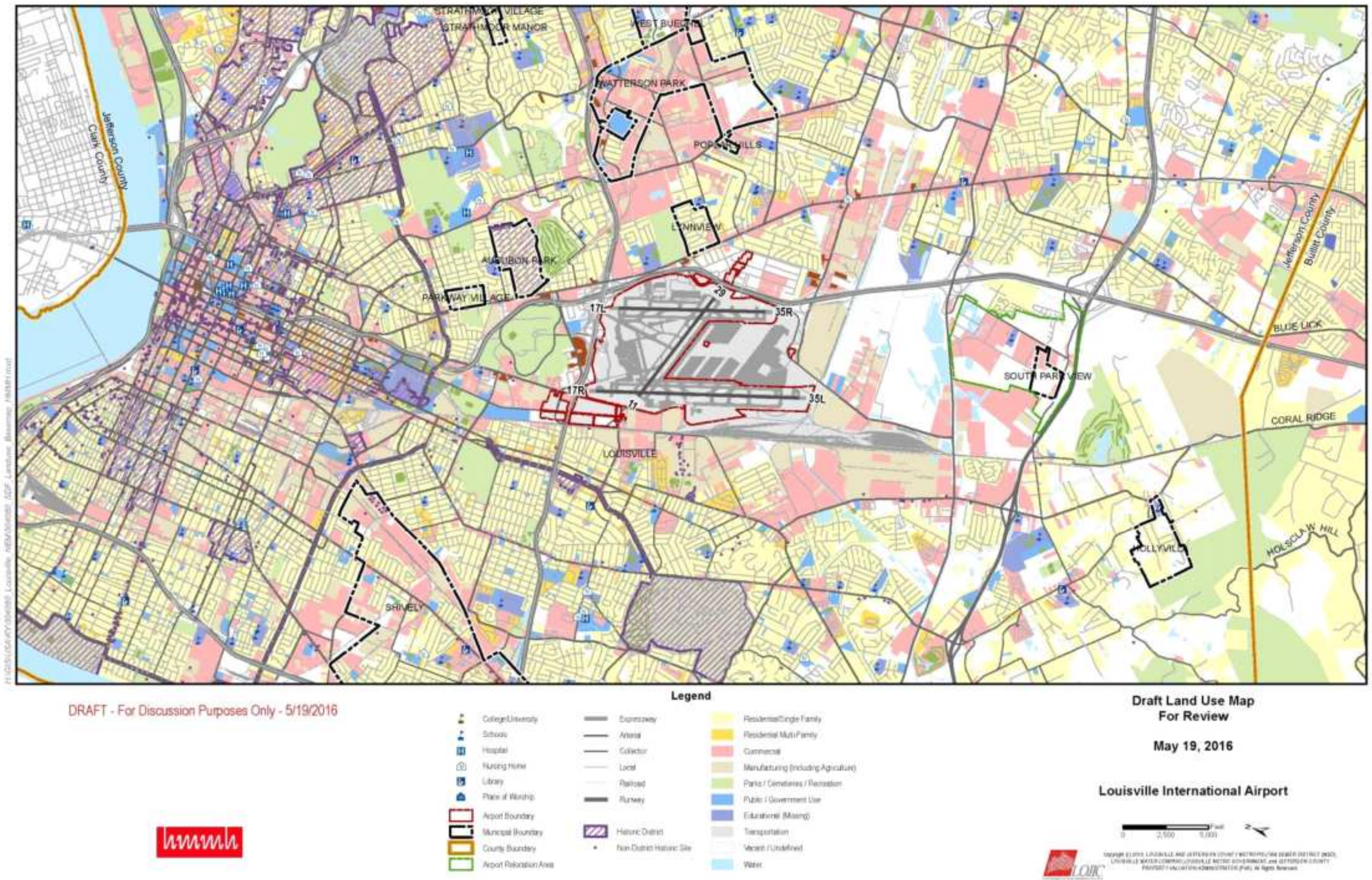
Louisville International NEM Update

Modeling Assumptions – Land Use Map

- **Developed from LOJIC data**
- **Field Verified approximately to extents the 65 dB DNL contours of the 2003 Noise Exposure Map**
- **Organized into FAA's land use categories**
    - A few local exceptions

Louisville International NEM Update

Modeling Assumptions – Density Plots



Going Forward

- CNF review documentation and provide comments
- FAA review and approve aircraft substitution and custom profiles request
- FAA review and approve proposed forecast
- AEDT noise model set ongoing
- Provide CNF with NEM sections as they are prepared
- Draft NEM document expected to be provided to Authority in September

Louisville Regional Airport Authority®

NEM Update Schedule

Phase		Expected Completion Date
No.	Description	
1	Project Initiation	Feb. 1, 2009
2	Data Collection and Forecast	April 30, 2010
3	Prepare Draft Noise Exposure Maps	July 15, 2010
4	Public Comment Period and Workshop	August, 2010
5	Prepare and Submit Noise Exposure Maps	September, 2010

Thank You!

Noise Exposure Map Update

Community Noise Forum Presentation

May 23, 2016

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Louisville International Airport Noise Exposure Map Update

Community Noise Forum Meeting

September 26, 2016

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Welcome and Introductions

- **Consultant Team Members Present**
  - Diana Wasiuk, Project Manager, HMMH
  - Justin Divens, Modeling Lead, HMMH

Louisville International NEM Update

Presentation Overview

- NEM Progress to date
- Modeling Assumptions Review
- AEDT Update
- Next Steps

Louisville Regional Airport Authority®

Louisville International NEM Update

Progress To Date

Currently under development

Develop Study Protocol
- Finalize Methodology
- Develop project schedule and milestones
- Brief CNF

Verification
- Existing Noise Exposure Maps & EA's
- Noise complaint data
- GIS and land use data
- Flight track and noise data from NOMS
- FAA activity forecasts
- Stakeholder outreach

Develop Noise Models
- Derive 2016/2021 flight tracks
- Develop 2016/2021 forecasts
- Seek non-standard approvals from FAA
- Validate model input

Develop NEMs
- Develop noise contours for existing and 5 year forecast conditions
- Noise impact evaluation
- Public review and workshop
- Final draft
- Submittal to FAA

Meetings

Community Noise Forum

Public Meetings

Louisville International NEM Update

Progress To Date

- All non-standard requests have been approved by FAA
- Forecast has been reviewed by FAA
- Modeling assumptions have been finalized
- Modeling of 2016 and 2021 contours is underway

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Louisville International NEM Update

Draft 2016 NEM: 2016 Existing Conditions Operations Summary

Category	Number of Forecast Annual Operations	Number of Annual Operations Modeled	Number of Daily Average Operations Modeled
Air Carrier	108,312	108,312	296.7
Air Taxi	26,109	26,109	71.5
General Aviation	12,039	11,516*	31.5
Military	3,336	3,336	9.1
Total	149,796	149,273	409.0

Notes:
*** Explain circuit counting discrepancy between FAA Air Traffic and AEDT model.**
Totals may not be exact due to rounding

Louisville International NEM Update

Draft 2016 NEM: 2016 Existing Conditions Operations – Average Annual Day

Operation Type	Arrivals		Departures	
	Day	Night	Day	Night
Air Carrier - Cargo	27.91	73.64	29.93	71.62
Air Taxi - Cargo	0.01	2.99	0.08	2.93
Air Carrier - Passenger	60.39	19.20	65.19	14.39
General Aviation	15.31	1.18	15.58	0.91
Military	4.18	0.39	4.45	0.12
Total	**107.80**	**97.40**	**115.22**	**89.97**

- **For a more detailed version of this table with aircraft type included, please see page 10 in the Noise Modeling Inputs Memo provided**

Louisville Regional Airport Authority®

Louisville International NEM Update

Draft 2021 NEM: 2021 Forecast Conditions Operations Summary

Category	Number of Forecast Annual Operations	Number of Annual Operations Modeled	Number of Daily Average Operations Modeled
Air Carrier	127,327	127,327	348.8
Air Taxi	13,429	13,429	36.8
General Aviation	12,254	11,693*	32.0
Military	3,336	3,336	9.1
Total	156,345	155,784	426.8

Notes:
*** Explain circuit counting discrepancy between FAA Air Traffic and AEDT model.**
Totals may not be exact due to rounding

Louisville International NEM Update

Draft 2021 NEM: 2021 Forecast Conditions Operations – Average Annual Day

Operation Type	Arrivals		Departures	
	Day	Night	Day	Night
Air Carrier - Cargo	32.55	77.87	34.14	76.27
Air Taxi - Cargo	0.01	3.05	0.08	2.99
Air Carrier - Passenger	60.93	18.40	65.84	13.50
General Aviation	15.58	1.21	15.86	0.93
Military	4.18	0.39	4.45	0.12
Total	**113.26**	**100.91**	**120.37**	**93.80**

- **For a more detailed version of this table with aircraft type included, please see page 14 in the Noise Modeling Inputs Memo provided**

Louisville Regional Airport Authority®

Louisville International NEM Update

Draft 2016 NEM: Modeled Overall Runway Use Percentages

	Departures			Arrivals		
Runway	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**
11	0.05%	0.01%	**0.03%**	0.04%	0.01%	**0.03%**
17L	31.03%	31.12%	**31.08%**	40.12%	16.00%	**28.06%**
17R	35.11%	48.55%	**41.83%**	23.23%	15.80%	**19.52%**
29	2.23%	0.04%	**1.13%**	1.84%	0.11%	**0.98%**
35L	9.01%	10.93%	**9.97%**	20.10%	41.39%	**30.74%**
35R	22.56%	9.35%	**15.95%**	14.66%	26.70%	**20.68%**
Total	100.00%	100.00%	**100.00%**	100.00%	100.00%	**100.00%**

- **For a more detailed version of this table with operation type included, see page 3 in the noise modeling inputs memo provided**

hmmh

Louisville International NEM Update
Annual Average Contraflow Percentages

Year	Arrival	Departure
2007	63%	79%
2008	63%	78%
2009	63%	78%
2010	72%	80%
2011	72%	76%
2012	66%	83%
2013	73%	82%
2014	70%	81%

Louisville International NEM Update

Draft 2021 NEM: Modeled Overall Runway Use Percentages

	Departures			Arrivals		
Runway	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**
11	0.05%	0.01%	**0.03%**	0.04%	0.01%	**0.03%**
17L	31.03%	31.12%	**31.08%**	40.12%	16.00%	**28.06%**
17R	35.11%	48.55%	**41.83%**	23.23%	15.80%	**19.52%**
29	2.23%	0.04%	**1.13%**	1.84%	0.11%	**0.98%**
35L	9.01%	10.93%	**9.97%**	20.10%	41.39%	**30.74%**
35R	22.56%	9.35%	**15.95%**	14.66%	26.70%	**20.68%**
Total	100.00%	100.00%	**100.00%**	100.00%	100.00%	**100.00%**

- **For a more detailed version of this table with operation type included, see page 3 in the noise modeling inputs memo provided**

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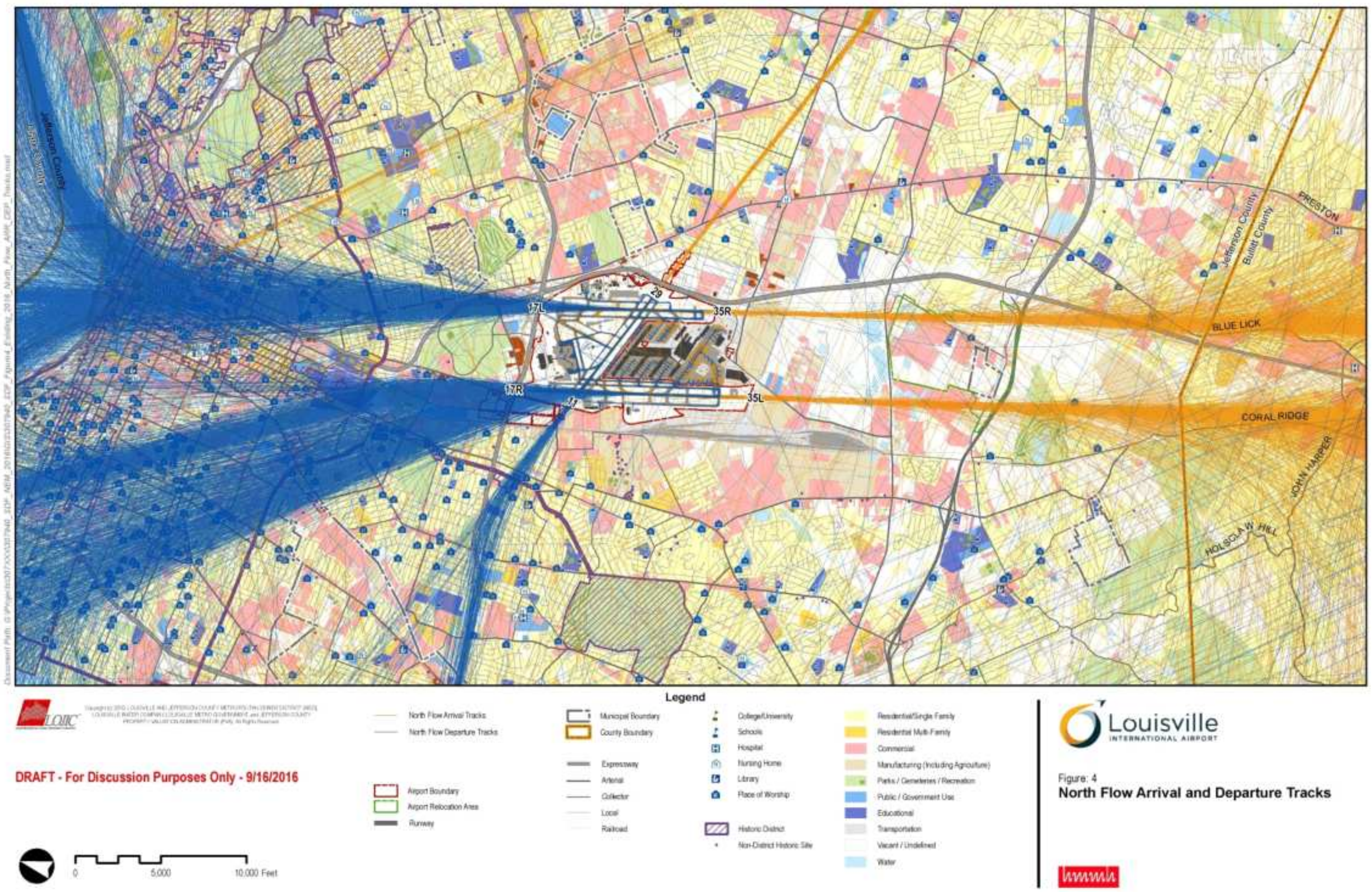
Louisville International NEM Update

2016/2021 North Flow Arrival and Departure Tracks



Louisville International NEM Update

2016/2021 South Flow Arrival and Departure Tracks

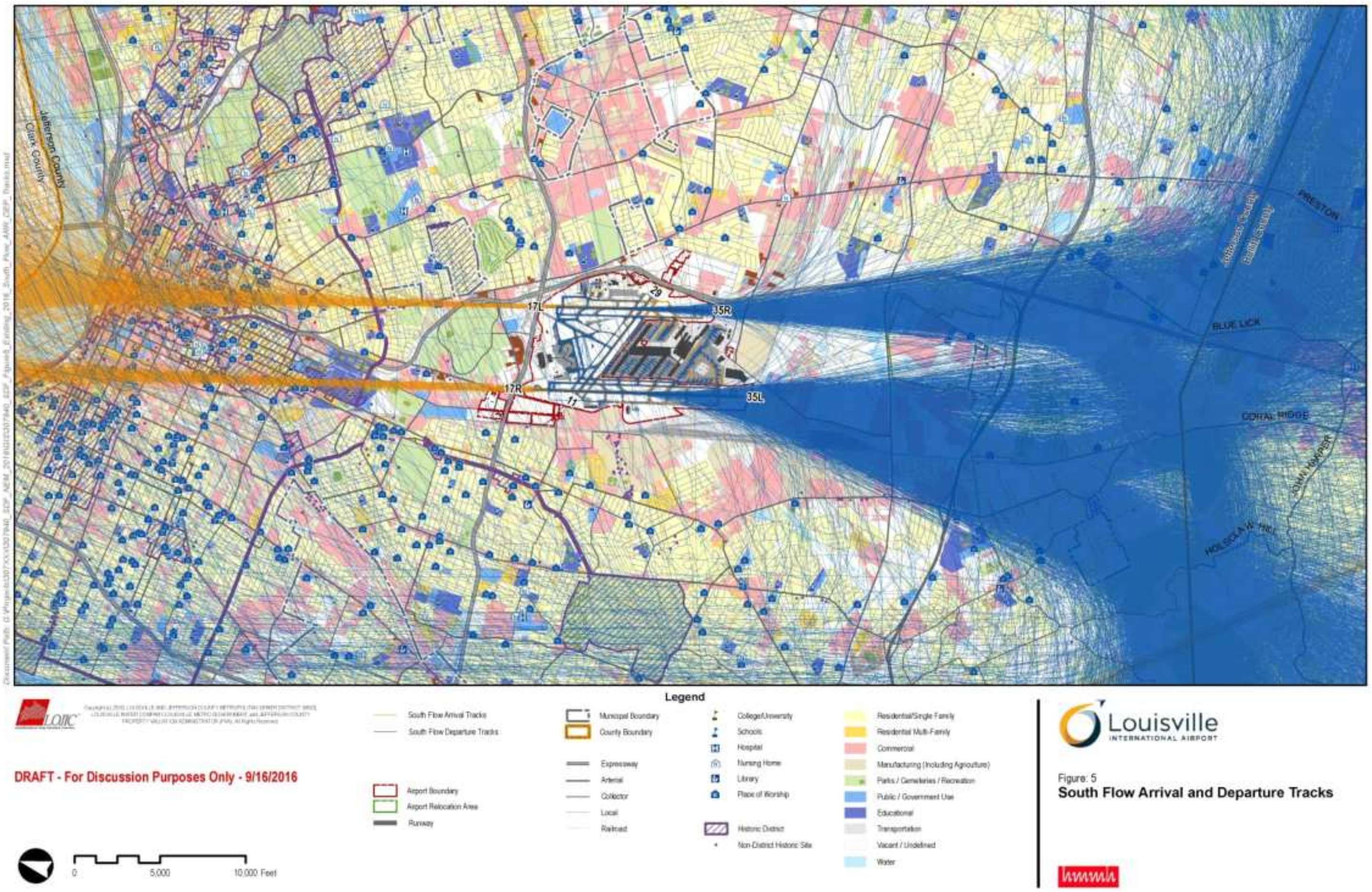
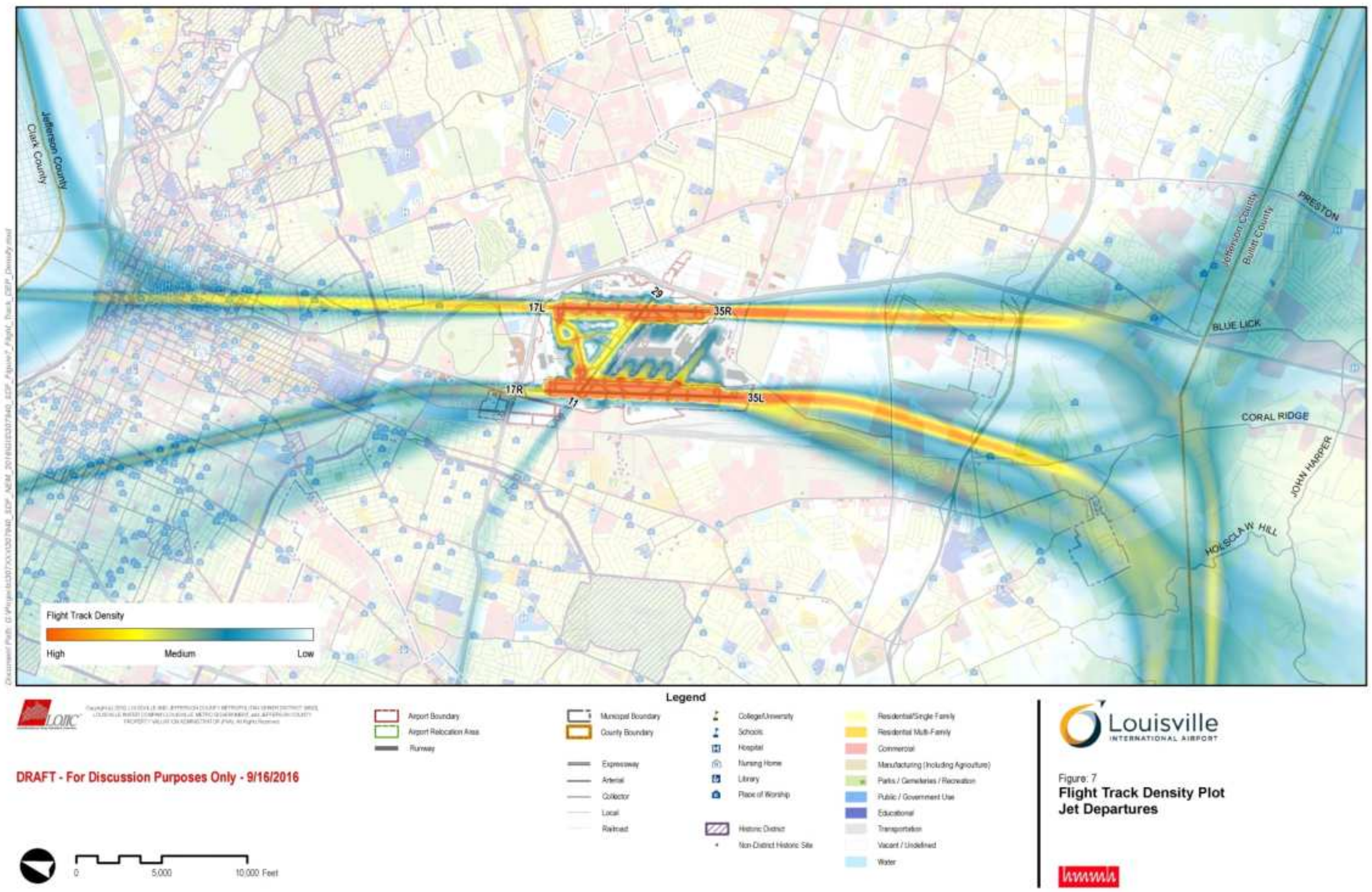


Figure: 5
South Flow Arrival and Departure Tracks

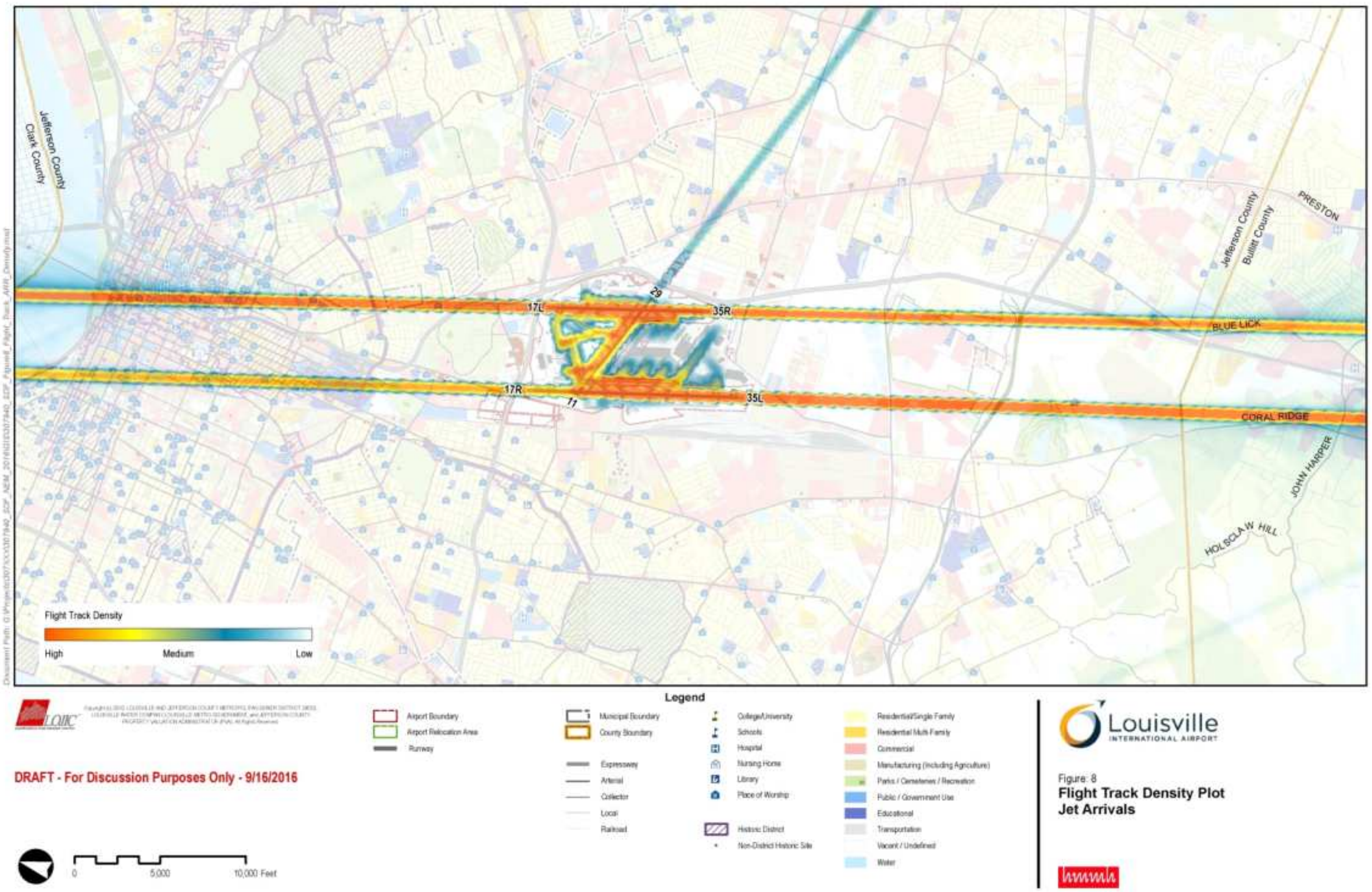
Louisville International NEM Update

2016/2021 Flight Track Density Plot for Jet Departures



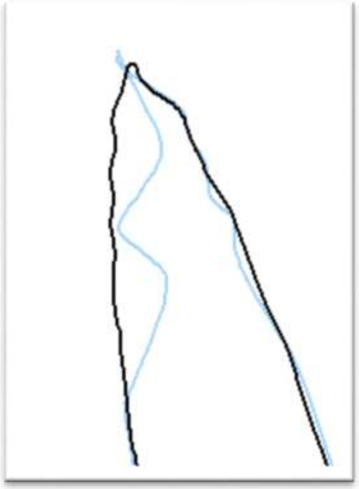
Louisville International NEM Update

2016/2021 Flight Track Density Plot for Jet Arrivals



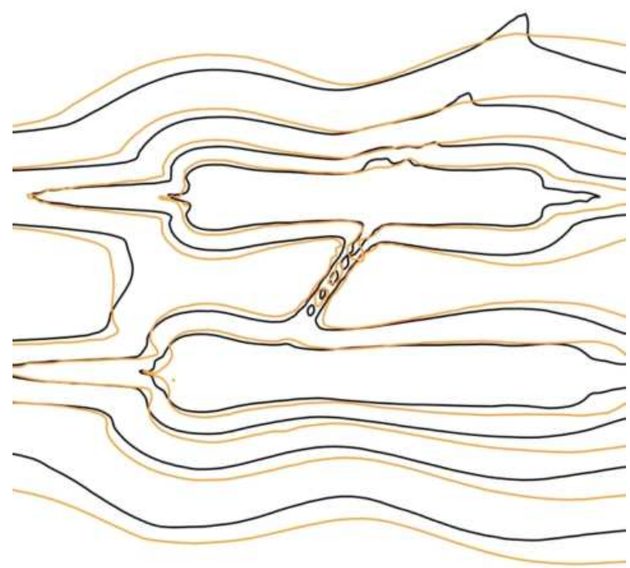
Louisville International NEM Update
AEDT Update

- **Incorporating actual radar data for flight track development for 2016 and 2021**
  - Scaling operations of radar flight tracks
- **Bumpy contours**
  - Caused by grid density (too low)
  - INM had a "recursive grid" option, that would increase the density of the grid points where needed. AEDT does not have the recursive option.
  - Fixed by increasing grid density
    - More than twice as many grid points now
    - Increased run time



Louisville International NEM Update
AEDT Update

- **In the AEDT model, FAA requires the use of the atmospheric absorption type "*SAE-ARP-5534*"**
  - This is different than the atmospheric absorption type used in INM.
  - FAA has acknowledged that some airports are seeing a "swelling" in their contours due to this change, primarily along sideline.
- **Long run times due to lack of distributed computing**



Louisville International NEM Update
Next Steps

- **Finalize draft contours**
  - CNF review
- **Development of draft NEM document**
- **Public review period for draft NEM document**
  - 30-day review and comment period
  - Public workshop
  - Response to comments
- **Submittal to FAA**

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Appendix K Material Related to Comment Period and Public Workshop

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Appendix L Public Comments Received at the Public Workshop and During the Public Review Process

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COMMENT RESPONSE MATRIX

Comment ID	Commenter		Comment Medium	Comment sub-ID	Comment	Response to Comment
	First Name	Last Name				
1	Karen	Chan (sp?)	Comment Form	1.1	The Noise Exposure Maps boundaries should not be approved based on a "formulary" to determine noise levels -- actual sound samples should be taken during fly overs along the border of the DNL 65. There are areas outside of the DNL 65 (Old Louisville) where decibel reading exceed 100 -- suggesting that the formulas used to calculate the DNL 65 areas are not producing accurate levels.	The Part 150 process prohibits the use of noise monitoring data to refine the noise exposure contours generated by the AEDT. Part 150 requires airports to use an FAA-approved noise model to calculate noise exposure for operations for the existing conditions and a five-year forecast cases (2016 and 2021 in this study). As discussed in Chapter 4 of this NEM documentation, "real-life" data on SDF operations over a full calendar year, including nighttime/early morning, were used in developing the modeling inputs, including flight tracks, runway use, altitude profiles, fleet mix, and more. This NEM update was developed in accordance with the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.
				1.2	Also, averaging noise during periods when plans are not flying over is ridiculous - it does not reflect the intensity of noise during high activity period.	The Part 150 process does not allow the use of single-event sound levels for determining land use compatibility; rather it requires the use of the Day-Night Average Sound Level (DNL) metric. It should be noted that the 'average' in DNL is decibel averaging, not simple arithmetic averaging. Due to its logarithmic nature, DNL is primarily affected by the highest noise levels. As discussed in Chapter 3 of this NEM document, FAA's Part 150 guidelines specify that all land uses are compatible with aircraft noise below 65 DNL. The FAA's threshold does not mean you are not affected by aircraft noise. However, Part 150 guidelines address mitigation measures which reduce noncompatible land uses within the 65 DNL contour. Those measures often provide "spillover" benefit to areas outside the contours. This NEM update was developed in accordance with the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See

Comment ID	Commenter First Name	Commenter Last Name	Comment Medium	Comment sub-ID	Comment	Response to Comment
						http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.
2	Bryan	Mathews	Comment Form	2.1	While great focus must remain on the economic benefits related to the airport, always be mindful of the impact that noise and pollution can have on our residential neighborhoods.	We understand that there are other environmental concerns associated with aircraft operations, however the regulation that governs the development and updates of NEMs limit the analysis to noise impacts as defined in title 14 of the Code of Federal Regulations (CFR). This NEM update was developed in accordance with the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.
3	Will	McCartney	Comment Form	3.1	My home is located on the 65 dB line on both the 2010 & 2016 maps. Since I am on the line is there a way to request a location specific test for my property. I experience significant noise levels during the warm-up periods duing 4 to 5 am. Also my property is listed as commercial, but it is dually zoned and it is being used residential.	The Part 150 process does not permit airports to use activity interference associated with individual aircraft operations or the frequency of operations during specific time periods as a basis for determining land-use compatibility. Also, Part 150 does not permit airports to use effects of aircraft operations other than noise for determining land-use compatibility. As discussed in Chapter 4 of this NEM, the calculation of DNL does take into account the noise contribution of every aircraft operation that takes place over each entire analysis year, so times of frequent activity are considered. As noted in Section 1.5 of this document, DNL accounts for the increased sensitivity to noise during the nighttime period, i.e., between 10 pm and 7 am, by adding 10 decibels to all nightttime noise. This weighting is equivalent to considering the effect of each nighttime aircraft operation to be the same as 10 identical daytime operations. FAA mandates the use of the AEDT model for calculating noise for all phases of flight. AEDT applies the take-off thrust appropriate for each aircraft type at the beginning of each take-off roll and therefore captures the noise difference that occurs when an aircraft's power settings transition from near idle to take-off trust.

Comment ID	Commenter First Name	Commenter Last Name	Comment Medium	Comment sub-ID	Comment	Response to Comment
						General requirements for the development, submittal, and review of the NEM are provided in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5
4	Will	McCartney	Comment Form	4.1	I understand that places of worship qualify as noise sensitive. Although our church is listed in the 60 dB range, I would like someone to contact us about noise reduction.	As stated on page 3 of the NEM document, the purpose of this project is to update the NEMs. Once the NEMs are accepted by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. A property outside of the 65 dB DNL contour is considered compatible land use. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.
5	Sandra	Lamp	Comment Form	5.1	During UPS peak season, the noise issue from aircraft make it impossible to sleep through. I hear the planes beginning around 4:00 or 4:30 a.m. Once they wake me up, it is impossible to go back to sleep due to the frequency of the noise occurring an the loudness. On nights when there is a low ceiling, the planes sound as though they are taking off/landing on Southern Pkwy. Any action taken to reduce the noise in my area is appreciated.	The Part 150 process does not permit airports to use activity interference associated with individual aircraft operations or the frequency of operations during specific time periods as a basis for determining land-use compatibility. Part 150 does not permit airports to use effects of aircraft operations other than noise for determining land-use compatibility. As discussed in Chapter 4 of this NEM, the calculation of DNL does take into account the noise contribution of every aircraft operation that takes place over each entire analysis is year, so times of frequent activity are considered. As noted in Section 1.5 of this document, DNL accounts for the increased sensitivity to noise during the nighttime period, i.e., between 10 pm and 7 am, by adding 10 decibels to all nightttime noise. This weighting is equivalent to considering the effect of each nighttime aircraft operation to be the same as 10 identical daytime operations. As stated on page 3 of the NEM document, the purpose of this project is to update the NEMs. Once

Comment ID	Commenter		Comment Medium	Comment sub-ID	Comment	Response to Comment
	First Name	Last Name				
						the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.
6	Steve	Baumgardner	Comment Form	6.1	Do not agree that current 65 dec range is sufficient for all hours of operations. Noise level at 927 Cardinal Drive between 4:00 am and 4:30 am is not acceptable for uninterruptable sleep. Worse now versus 2-3 years ago. Fly over patterns not loudest for us. Jet ground noise is worse.	The Part 150 process does not permit airports to use activity interference associated with individual aircraft operations or the frequency of operations during specific time periods as a basis for determining land-use compatibility. Also, Part 150 does not permit airports to use effects of aircraft operations other than noise for determining land-use compatibility. As discussed in Chapter 4 of this NEM, the calculation of DNL does take into account the noise contribution of every aircraft operation that takes place over each entire analysis year, so times of frequent activity are considered. As noted in Section 1.5 of this document, DNL accounts for the increased sensitivity to noise during the nighttime period, i.e., between 10 pm and 7 am, by adding 10 decibels to all nightttime noise. This weighting is equivalent to considering the effect of each nighttime aircraft operation to be the same as 10 identical daytime operations. FAA mandates the use of the AEDT model for calculating noise for all phases of flight. AEDT applies the take-off thrust appropriate for each aircraft type at the beginning of each take-off roll and therefore captures the noise difference that occurs when an aircraft's power settings transition from near idle to take-off trust. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville

Comment ID	Commenter		Comment Medium	Comment sub-ID	Comment	Response to Comment
	First Name	Last Name				
						International Airport, please contact the airport noise office at 502-363-8516.
7	Sarah	Hitt	Comment Form	7.1	The noise in Audubon park due to aircraft is ridiculously high. Something needs to be done about it. From the looks of the map I can see nothing is changing and it is very frustrating.	The Part 150 process does not permit airports to use activity interference associated with individual aircraft operations or the frequency of individual operations during specific time periods as a basis for determining land-use compatibility. Also, Part 150 does not permit airports to use effects of aircraft operations other than noise for determining land-use compatibility. As discussed in Chapter 4 of this NEM, the calculation of DNL does take into account the noise contribution of every aircraft operation that takes place over each entire analysis year, so times of frequent activity are considered. As noted in Section 1.5 of this document, DNL accounts for the increased sensitivity to noise during the nighttime period, i.e., between 10 pm and 7 am, by adding 10 decibels to all nighttime noise. This weighting is equivalent to considering the effect of each nighttime aircraft operation to be the same as 10 identical daytime operations. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.

Comment ID	Commenter		Comment Medium	Comment sub-ID	Comment	Response to Comment
	First Name	Last Name				
8	Steve	Baumgardner	Comment Form	8.1	I assume based upon verbal questions that 65 dec level is an average. My wife and I experience higher levels of noise during the morning warm up period, when multiple planes are warming or starting engines. Every morning we are awakened between 4:00 am and 4:30 am due to the multiple start ups. We are just outside the 65 dec area in Audubon Pk. This by far is louder than flight path noise for us. Can you verify the dec level for Audubon Park Robin Rd and corner of Cardinal Drive. Is it higher than 65 dec during this period?	The Part 150 process does not permit airports to use activity interference associated with individual aircraft operations or the frequency of individual operations during specific time periods as a basis for determining land-use compatibility. Also, Part 150 does not permit airports to use effects of aircraft operations other than noise for determining land-use compatibility. As discussed in Chapter 4 of this NEM, the calculation of DNL does take into account the noise contribution of every aircraft operation that takes place over each entire analysis year, so times of frequent activity are considered. As noted in Section 1.5 of this document, DNL accounts for the increased sensitivity to noise during the nighttime period, i.e., between 10 pm and 7 am, by adding 10 decibels to all nightttime noise. This weighting is equivalent to considering the effect of each nighttime aircraft operation to be the same as 10 identical daytime operations. FAA mandates the use of the AEDT model for calculating noise for all phases of flight. AEDT applies the take-off thrust appropriate for each aircraft type at the beginning of each take-off roll and therefore captures the noise difference that occurs when an aircraft's power settings transition from near idle to take-off trust. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.
9	Dom	Crawford	Letter	9.1	The remarks that follow result from an isolated and necessarily cursory reading of the draft NEM update report, and not from any process of study, reflection and dialogue as anticipated in CFR Part 150's provisions for noise compatibility study - a process last undertaken in Louisville more than 15 years ago. These conclusions, like those of the report itself, must thus be	Comment noted.

Comment ID	Commenter First Name	Commenter Last Name	Comment Medium	Comment sub-ID	Comment	Response to Comment
					considered at best underinformed. Some limited observations, accordingly. The "History" segment on pp 1-2 neglects the most significant elements of Louisville's initial and updated NCPs: in the first instance, large-scale residential relocation, supplanting property condemnation; and in the second, extensive home insulation, in lieu of proposed operational measures. The report correctly indicates that the first shift was supported by a supplemental NCP, while the second was not.	
				9.2	The "Record of Approval" cited near the end of the "History" segment on p2 can be seen in Chapter 2 (and Appendix C) as in fact the vehicle of disapproval of the principal operational measures proposed by the 2003 NCP - NA-2, 3 and 7. These measures were disapproved on operational grounds, related to safety-yet while NA-2 and NA-7 are consequently shown as "not implemented," NA-3 is listed as "implemented locally." This seems a plain instance of noncompliance with the 2009 FAA decision.	By working locally with the CNF and Air Traffic control tower, measure NA-3 was implemented locally and not funded through the Part 150 process .
				9.3	The "Overview" on p3 indicates "the LRAA is updating the NEM only at this time," taking no action on the NCP. Yet on p61, the narrative reports that "use of the RNAV procedure at night could result in only compatible land uses within the [southwest] contour" - but then concludes that "this NEM proposes to amend [NCP] mitigation measure M-3 to include eligible residential structures anywhere within the DNL 65 dB contour." These are clearly NCP components; what's the basis for their inclusion here, absent any Noise Compatibility Study activity, and attendant identification and evaluation of alternatives?	As noted by the commenter, a NEM update does not result in changes to the NCP. The narrative was added as a suggested way to address non-compatible land use at a later date if it was determined that further mitigation is required.

Comment ID	Commenter		Comment Medium	Comment sub-ID	Comment	Response to Comment
	First Name	Last Name				
				9.4	The comparison of contours on pp 61-62 also alludes to growth in the contour from the 2011 forecast for 2016 to the "existing conditions" 2016 contour of the current update. It's not clear, however, which was used in the statistics depicting noise exposure for historic and other residential properties - and no graphical comparison is provided between the two maps.	Tables 17 through 20, beginning on pages 57, reflect the 2016 NEM's Existing and 2021 Forecast scenarios only.
				9.5	Unlike the most recent NCP, the NEM update provides no demographic data on the DNL 60 contour, despite its ready accessibility in modelling output. This deprives the community of essential data to evaluate prospective local measures to supplement Federal mitigation programs.	Federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. The 60dB DNL contour is available in this NEM update for reference purposes only and is included on the noise exposure maps. If required, demographic data for the DNL 60 contour could be provided locally after the maps are accepted. This NEM update was developed in accordance with the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.
				9.6	There's no indication of verification and validation (V&V) of modeling results, indispensable to a robust analytical process. In the last full noise study, V&V was attained by live noise monitoring at numerous sites, which in fact prompted modification of several modeling assumptions to align more closely to observed results. Absent some similar validating step, it's difficult to treat these current results as credible.	FAA requires the use of the AEDT model for calculating aircraft noise for the purpose of the Part 150 process. The AEDT was developed under FAA oversight and underwent significant testing and validation prior to its release. This NEM update was developed in accordance with the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.

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	First Name	Last Name				
10	Nancy	Bowman-Denton	Email	10.1	While the Louisville International Airport Draft Noise Exposure Map Update addresses many noise issues surrounding the Louisville International Airport, it does not address the concerns of the Beechmont area just west of the airport and south of the Waterson. The Beechmont concerns, as previously addressed to the bimonthly LRAA Community Noise Forum, are the ground noise and the engine run up noise prior to take off. This noise has noticeably increased since the construction of the new taxiway which necessitated the closure of Crittenen Drive. In addition, berms were removed during this construction, and although a wall was built further out between the airport and Beechmont, the top of this wall is three feet below the elevation of the tarmac of the new taxiway and existing runway. It was admitted at the Community Noise Forum that the wall was not built to be a noise buffer. Therefore, the result has been a taxiway built closer to the Beechmont neighborhood with no sound barriers between the airport and neighborhood.	FAA mandates the use of the AEDT model for calculating noise for all phases of flight. AEDT applies the take-off thrust appropriate for each aircraft type at the beginning of each take-off roll and therefore captures the noise difference that occurs when an aircraft's power settings transition from near idle to take-off trust. Manmade structures such as berms and walls are not modeled in AEDT and therefore do not impact the size of the contour in the Beechmont area. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.
				10.2	What we have suggested at the Community Forums over this past year, and what we would like this study and report to specifically address, are the ground and engine run up noise. There are no actual measurements taken to assess how loud and disturbing this noise is. Instead the current process is to feed data into an algorithm to produce the maps. Again, the problem with this process is that there is no actual measurement of any noise decibel levels in the Beechmont area. The failure to specifically measure noise decibel levels and to address the ground and engine run up noise leaves many neighborhoods such as	FAA mandates the use of the AEDT model for calculating noise for all phases of flight. AEDT applies the take-off thrust appropriate for each aircraft type at the beginning of each take-off roll and therefore captures the noise difference that occurs when an aircraft's power settings transition from near idle to take-off trust. Manmade structures such as berms and walls are not modeled in AEDT and therefore do not increase or decrease the size of the contour. The Part 150 process prohibits the use of noise monitoring data to refine the noise exposure contours generated by the AEDT. Part 150 requires airports to use an FAA-approved noise model to calculate noise exposure for operations for the existing conditions and a five-year forecast cases (2016 and 2021 in this

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					Beechmont out of any consideration for the programs specifically created to mitigate some of the adverse affects of our airports.	study). As discussed in Chapter 4 of this NEM documentation, "real-life" data on SDF operations over a full calendar year, including nighttime/early morning, were used in developing the modeling inputs, including flight tracks, runway use, altitude profiles, fleet mix, and more. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.
11	Richard	May	Letter	11.1	As a resident of Old Louisville, I think it is important to acknowledge that the noise pollution caused by UPS planes has an adverse effect on residents living in flight paths. The planes are too low and too frequent. The sound levels as measured by a few residents, including myself, range from 75 -100 decibels indoors and as high as 110 decibels outside. The planes sometimes come in every 4-6 minutes and this occurs regularly on nights from 12pm to 5am. Many residents are unable to get a sound sleep due to the continuous overhead flights throughout the night. Currently, the noise is unbearable and with the proposed expansion that will triple the cargo capacity at the UPS Louisville hub, we have to address the noise pollution now before it worsens.	The Part 150 process does not permit airports to use activity interference associated with individual aircraft operations or the frequency of individual operations during specific time periods as a basis for determining land-use compatibility. Also, Part 150 does not permit airports to use effects of aircraft operations other than noise for determining land-use compatibility. As discussed in Chapter 4 of this NEM, the calculation of DNL does take into account the noise contribution of every aircraft operation that takes place over each entire analysis year, so times of frequent activity are considered. As noted in Section 1.5 of this document, DNL accounts for the increased sensitivity to noise during the nighttime period, i.e., between 10 pm and 7 am, by adding 10 decibels to all nightttime noise. This weighting is equivalent to considering the effect of each nighttime aircraft operation to be the same as 10 identical daytime operations. FAA mandates the use of the AEDT model for calculating noise for all phases of flight. AEDT applies the take-off thrust appropriate for each aircraft type at the beginning of each take-off roll and therefore captures the noise difference that occurs when an aircraft's power settings transition from near idle to take-off trust. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are

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						approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.
				11.2	With the billions of dollars that UPS has invested in this facility, I sincerely doubt they are going to close up shop and move to Cincinnati, or anywhere else. Actually, residents welcome their success in Louisville, but we are asking them to recognize that the success and growth of their company will have a negative effect on their neighbors if they don't consider major sound reduction measures and we ask that they be respectful and work with us toward a mutually satisfying agreement.	Comment noted. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.
				11.3	Recent studies by HMMH have produced maps showing areas affected by the airplane noise. The 2016 NEM Baseline DNL Contour shows Old Louisville as falling into the 60db zone which means we are not eligible for Federal assistance with sound proofing our homes. In April of this year, Governor Matt Bevin vetoed a bill that would allow residents in the 60db zone to get Federal assistance, so residents are being offered no help at all in insulating our homes from the UPS noise pollution. The fact that we are not included in the 65db is baffling. Anyone who lives in Old Louisville can tell you the noise levels are deafening at times. The DNL Contour is determined by averaging noise levels over a 24-hour period. I declare that to be an unfair way to assess the noise levels.	The Part 150 process does not allow the use of single-event sound levels for determining land use compatibility; rather it requires the use of Day-Night Average Sound Level (DNL) metric. It should be noted that the 'average' in DNL is decibel averaging, not simple arithmetic averaging. Due to its logarithmic nature, DNL is primarily affected by the highest noise levels. As discussed in Chapter 3 of this NEM document, FAA's Part 150 guidelines specify that all land uses are compatible with aircraft noise below 65 DNL. The FAA's threshold does not mean you are not affected by aircraft noise. However, the FAA will only approve measures which reduce noncompatible land uses within the 65 DNL contour. Those measures often provide "spillover" benefit to areas outside the contours. Part 150 does not permit airports to use activity interference associated with individual aircraft

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					Averaging out sound levels only obscures the reality of those living in a flight path and this method should be replaced with something connected to reality. Having your head held under running water is torture and so is being subjected to constant drips. Either method, it is still torture.	operations or the frequency of individual operations during specific time periods as a basis for determining land-use compatibility. Part 150 does not permit airports to use effects of aircraft operations other than noise for determining land-use compatibility. As discussed in Chapter 4 of this NEM, the calculation of DNL does take into account the noise contribution of every aircraft operation that takes place over each entire analysis year, so times of frequent activity are considered. As noted in Section 1.5 of this document, DNL accounts for the increased sensitivity to noise during the nighttime period, i.e., between 10 pm and 7 am, by adding 10 decibels to all nighttime noise. This weighting is equivalent to considering the effect of each nighttime aircraft operation to be the same as 10 identical daytime operations. This NEM update was developed in accordance with the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.
				11.4	I want to state this strongly - if UPS is going to triple their capacity, it is safe to assume their profits will increase in correlation to that growth. Therefore, as good citizens and neighbors, they should invest some of this profit money into making sure that other lives are not diminished by their success. UPS should not be making greater profits while residents who live in their flight paths stand to lose so much. We lose not only a quality of life, but the potential loss of our property value. Subsequently, the city of Louisville will lose money from property taxation, as well. I would like to see UPS help residents in the 60db Contour by creating a fund that we can access by applying for sound abatement	Comment noted. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516.

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					assistance that we are not Federally eligible for. The growth of UPS can be a win-win situation for all if their growth is done not solely with the intent of increasing their profits. It has to be done with acknowledgement of their impact on the surrounding area and done with a plan that makes people's lives a priority equal to their profits. These comments are being submitted to accompany the Louisville Interantional Airport Draft Noise Exposure Map to be submitted to the FAA.	
12	Ray	Brundig	Email	12.1	Please add this to the official record of public comments on airport noise. There are specific points to be raised about the Noise Exposure Map Update. Graphs in Appendix G of the SDF Noise Exposure Map Update show actual radar data plotted against measures such as altitude and true air speed compared to distance from start of take-off roll. The radar data graphs start on page G-8 for the 757RR, on page G-23 for the 76300, on page G-39 for the MD11, and on page G-54 for the MD11PW. The graphs compare standard altitude and speed profiles for AEDT and Boeing standards, since their purpose is to establish use of the Boeing profiles rather than the AEDT profiles. The radar data are consistently graphed starting at a distance of 10,000 feet from the start of the take-off roll. (This is approximate: the data appear about halfway between the origin axis and the 20,000' distance line). The graphs leave open the route and timing that led to the observed data. A flight, for example, could have circled	The user-defined profiles included in the SDF NEM modeling were created collaboratively with Boeing, to address SDF-specific departures used by cargo operators at SDF. The 757RR and 767300 profiles were adjusted to account for the use of "de-rate thrust" departure procedures which are utilized by cargo operators at SDF. The MD11GE and MD11PW profiles were adjusted to account for the use of "ICAO A" style departure procedures that cargo operators at SDF indicate they use. In the figures showing "Comparison of Radar Data and Altitude Profiles" for each profile, the Y-axis is displayed using feet MSL, or mean sea-level altitude. Therefore, ground level is at approximately 500 ft. MSL for SDF. Furthermore, the radar track data is cut off (or "clipped") at the runway end for the sample shown. This is required because of the quality and/or integrity of radar data close to the ground. As the aircraft approaches ground level, radar data quality deteriorates due to ground reflection, building reflection, and terrain obstruction. It is important to note that the profiles used by AEDT for modeling calculations are not "clipped" in any way, and are shown by the solid lines in each of the altitude figures. In these figures, the "clipped" radar data is for comparison purposes only. It is also worth noting that Runway 17R/35L is approximately 11,887 feet long.

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					within the 10,000' perimeter while slowly gaining speed and altitude. It strikes me that this would have the desirable effect for the aircraft operators of reducing engine wear, and therefore cost. It also would have the undesirable effect for the surrounding residential areas of increasing the noise. The flights would be closer to the ground for a longer time. For example, please refer to the graph on page G-55, Comparison of Radar Data and Boeing-Developed Altitude Profiles for MD11PW. Radar data start at what appears to be 500' in altitude and 10,000' in distance. Most of flights being tracked rise with the profiles but are relatively lower in the nearer distances. Several, in fact, travel in a relatively flat line to distances of 60,000', indicating the flights were not much above 500' even when they had traveled eleven miles from the airport. The actual data, then, seem to support the idea that reduced engine wear and lowered cost are valued by the LRAA and its users to an extent that is incompatible with the health and homes of the community.	
				12.2	My wife and I have lived in Louisville's Highlands since the mid 80's and in our own home at 1718 Edgeland Avenue for most of that time. The noise from Louisville International Airport and from Bowman Field is noticeable, especially when the UPS flights are in the air. I note that our home is less than 20,000' from the northern end of the eastern runway at Louisville International, and somewhat closer to Bowman field, which is also under LRAA control. I am concerned about the long term health effects of the noise and the general degradation of the environment and housing values in my neighborhood	As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516. Environmental impacts other than noise are not covered in the NEM phase of the Part150 process. This NEM update was developed in accordance with the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal

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					and other areas inside the old city limits. It seems likely that conditions will worsen; the air carriers will pursue increased profits through increased traffic and it is unlikely their concern for the community will offset that pursuit. Further, new technologies being deployed in air transportation promise greater efficiencies in takeoffs and landings and that will open more slots for scheduling. My conclusion is that the degradation of our health and home are considered a cost of business to the LRAA and its users.	Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.
13	G. David	Pearl, Jr.	Letter	13.1	Re: Noise Exposure Map Thank you for the opportunity to review the updated Noise Exposure Map for the Louisville International Airport with Louisville Regional Airport Authority members. It was good to see the detail and the metrics for determining exposure. I also appreciated the feedback and guidance you and others there gave individuals during the review.	LRAA appreciates this recognition of its efforts and of all stakeholders to participate in the Part 150 process.
				13.2	As you may remember, I have spoken on the phone with you several times regarding noise in the city of Lynnview. I understand the need to follow established logistics to determine the span of responsibility for the Airport Authority. However, the residents of Lynnview do feel a bit cheated by the latest revision of the map. We understand logistically that if air traffic patterns are as presented, then noise patterns equally should follow suit. I agree that complicated algorithms measure with accuracy noise, given a set of proven factors. We accept the results of the resent study but we would like to know if there was any effort to determine if residual noise could flow past the established boundaries, specifically east of the airport. We	As discussed in Chapter 4 of this NEM documentation, "real-life" data on operations over a full calendar year, including nighttime/early morning periods, were used in developing the modeling inputs, including flight tracks, runway use, altitude profiles, fleet mix, and more. As stated on page 3 of the NEM document, the purpose of this project is to update the noise exposure maps (NEMs). Once the NEMs are approved by the FAA, the LRAA will continue to implement its Noise Compatibility Program (NCP) summarized in Section 2. The federal guidelines establish the 65dB DNL contour as the limit for providing federal funding for noise mitigation. For more information regarding the NCP at Louisville International Airport, please contact the airport noise office at 502-363-8516. This NEM update was developed in accordance with

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					would welcome future studies in our neighborhood, especially at times when UPS operations are in full swing in the early morning hours of 3 a.m. until 7:00 a.m.	the requirements for the development, submittal, and review of NEMs as stated in title 14, Code of Federal Regulation (14CFR) Part150, subparts A and B and Appendix A. See http://www.ecfr.gov/cgi-bin/text-idx?SID=7213b40adfb88527e96a68909a9ae15f&mc=true&node=pt14.3.150&rgn=div5 The development of the NEM was conducted in close coordination with the Community Noise Forum with multiple reviews throughout the process.
				13.3	Additionally, it appears that the Air National Guard, has increased operational activity during weekend hours, specifically 7:00 a.m. until 10:00 a.m. on Saturday and Sunday.	As mentioned on page 37 of the NEM document, operations by the Kentucky Air National Guard C-130 aircraft were included in the NEM modeling.
				13.4	Also, we would like to know if there is any data, regarding ground level noise that is captured not as a result of air traffic, but on the ground traffic like taxiing to and from the terminals etc.	Start of take-off roll was included while taxi operations were not included in the NEM modeling. Customarily aircraft taxi operations are not included in Part 150 modeling since they do not result in DNL contour changes beyond the airport property boundry.
				13.5	Does the data include private air traffic that is part of the smaller aviation destination within the airport area?	As shown in Table 5 of the NEM document, arrivals and departures of "General Aviation" aircraft were included in the NEM modeling. The modeling does not include overflights by aircraft not arriving or departing SDF.
				13.6	Lynnview in January, 2017 will have 3 new members on our city council. As such we would welcome the opportunity for one of those members to be an active member of the Airport Neighbors Alliance, and possibly a member of any other board or activity associated with future noise related studies. Again, I want to thank you for your time and for your personal commitment to our community.	We will notify the Airport Neighbors Alliance of your interest in participation in the organization.

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SCANNED PUBLIC COMMENTS

SIGN IN SHEET

Louisville International Airport

Noise Exposure Map Update

Public Workshop Tuesday, November 29, 2016

NAME	ADDRESS	PHONE	EMAIL
Steve Baumgardner	927 Cardinal Dr	502 643 9911	Baumgardners@TWC.com
Maxie Cooper	4817 ~~[illegible]~~ Preston Dr	964-6042	
Jack Hamilton	4918 Warbler Way	969.6942	
Will McCartney	1214 Durrett Ln.	974-1928	will.mccartney@gmail.com
Patti Garcia	1241 Pigeon Pass Rd 40213	454-4283	pkg1949@yahoo.com
Bryan Mathews	CM Johnson's office	574-1121	Bryan.Mathews@louisvilleky.gov
Wendy Harrower	3034 Larue Ct.	636.2448	Wendyh@cscus.com
Pete Becker	3105 Chickadee Road	649-1577	Petebecker@HotMail.com
Tony Derricks	3034 Larue Ct	636-2448	tderricks@cscus.com
Bonita Poynter	6101 Loretta St	759-8315	Bonita.Poynter@ARC.com
Mary Rose Evans	817 Perennial Dr	634-1846	maryroseevans@mac.com
Mike Zanone	614 Maylawn Ave	637-3591	MZanone@InsightBB.com

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Louisville International Airport

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Ann Glenn	4825 Redstart Rd	533 4759	annjill28@gmail.com
G. David Pearl	1306 Pigeon Pass Rd	468-2233	gdavidpearl@gmail.com
Shane Smith	Schnitzelburg		
Natalie Chaudoin	LRAA		

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Louisville International Airport

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NAME	ADDRESS	PHONE	EMAIL
Jacqueline Armstrong	1154 S. 3RD ST	860-614-1918	lobstaah@twc.com
Sandy Lamp	4808 Southern Pkwy	502 368-2650	sandy.lamp@att.net
[illegible]	1110 Forrest St		dwh3962@yahoo.com
Yvonne Miles	846 Linwood Ave		

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Louisville International Airport

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NAME	ADDRESS	PHONE	EMAIL
Karan Chavis	1412 St James Court, Louisville KY 40208	979-492-6934	Chavis_k@hotmail.com

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Louisville International Airport

Noise Exposure Map Update

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NAME	ADDRESS	PHONE	EMAIL
Sarah A. Hitt	1012 Audubon Pkwy		saysay34@aol.com
[illegible]	932 Audubon Pkwy	636-3687	[illegible]
[illegible]	5621 Southland	645-8400	
Keith Ingram	900 Packard Ave	502 445-4313	keith2904@bellsouth.net
B.J. Sinnwell	700 Admin Dr	502 363 8512	brian.sinnwell@flylouisville.com

1

COMMENT FORM

Louisville International Airport

Noise Exposure Map Update

Public Workshop Tuesday, November 29, 2016

Please PRINT your comments

(1) The Noise Exposure Maps boundaries Should not be approved based on "formulary" to determine Noise levels - Actual Sound samples should be taken during fly overs along the border of the ~~[illegible]~~ "DNL 65" There are areas outside of the DNL 65 (Old Louisville") where decible reading exceed 100 - suggesting that the formulas used to calculate the DNL 65 areas are not producing accurate levels - 1.1

(2) Also averaging Noise during periods when planes are not flying over is ridiculous - it does not reflect the intensity of noise during high activity period. 1.2

Name: Karen [illegible]

Address: 1412 St James Ct

City: Louisville

State/Zip: KY 40208

Phone: 979-492-6936

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

2

COMMENT FORM

Louisville International Airport

Noise Exposure Map Update

Public Workshop Tuesday, November 29, 2016

Please PRINT your comments

While great focus must remain on the economic benefits related to the airport, always be mindful of the impact that noise and pollution can have on our residential neighborhoods.

2.1

Name: Bryan Mathews
Address: 601 West Jefferson st, ste 315 - CM Johnson's office
City: Louisville
State/Zip KY 40202
Phone: 502-574-1121 Bryan.Mathews@louisvilleky.gov

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

3

COMMENT FORM

Louisville International Airport

Noise Exposure Map Update

Public Workshop Tuesday, November 29, 2016

Please PRINT your comments

My home is located on the 65 dB line on both the 2018 + 2016 maps. Since I am on the line, is there a way to request a location specific test for my property. I experience significant noise levels during the warm-up periods during 4 to 5 AM. Also my property is listed as commercial but it is dually zoned and it is being used / residential. 3.1

Name: Will McCartney
Address: 1214 Durrett Ln.
City: Louisville
State/Zip KY 40213
Phone: (502) 974-1928

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

4

COMMENT FORM

Louisville International Airport

Noise Exposure Map Update

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Please PRINT your comments

I understand that places of worship qualify as noise sensitive. Although our church is listed in the 60 dB range, I would like someone to contact us about noise reduction. 4.1

Name: Will McCartney, pastor Farmdale Baptist Church
Address: 1238 Durrett Ln.
City: Louisville
State/Zip KY 40213
Phone: (502) 366-1434

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

5

COMMENT FORM
Louisville International Airport
Noise Exposure Map Update
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Please PRINT your comments

During UPS peak season, the noise issue from aircraft makes it impossible to sleep through. I hear the planes ~~when~~ beginning around 4:00 or 4:30 a.m. Once they wake me up, it is impossible to go back to sleep due to the frequency of the noise occurring and the loudness.

On nights when there is a low ceiling, the planes sound as though they are taking off / landing on Southern Pkwy.

Any action taken to reduce the noise in my area is appreciated.

5.1

Name: Sandra Lamp
Address: 4808 Souther Pkwy
City: Louisville
State/Zip KY 40214
~~**Phone:**~~ sandy.lamp@att.net

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

6

COMMENT FORM
Louisville International Airport
Noise Exposure Map Update
Public Workshop Tuesday, November 29, 2016

Please PRINT your comments

Do not agree that current 65 dbc range is sufficient for all hours of operation. Noise level at 927 Cardinal Drive between 4:00 pm and 4:30 am is not acceptable for uninterruptable sleep. Worse now versus 23 years ago.

Fly over patterns not loudest for us. Jet ground noise is worse.

6.1

Name: Steve Baumgardner
Address: 927 Cardinal Dr.
City: Louisville
State/Zip Ky 40213
Phone: 502 6340779 Cell 502 643 7911

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

7

COMMENT FORM

Louisville International Airport

Noise Exposure Map Update

Public Workshop Tuesday, November 29, 2016

Please PRINT your comments

THE NOISE IN AUDUBON PARK DUE TO AIRCRAFT IS RIDICULOUSLY HIGH. SOMETHING NEEDS TO BE DONE ABOUT IT. FROM THE LOOKS OF THE MAP I CAN SEE THAT NOTHING IS CHANGING AND IT IS VERY FRUSTRATING. 7.1

Name: SARAH HITT
Address: 1012 AUDUBON PKWY
City: LOU
State/Zip KY 40213
Phone: [redacted]

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

6

COMMENT FORM
Louisville International Airport
Noise Exposure Map Update
Public Workshop Tuesday, November 29, 2016

Please PRINT your comments

I ASSUME based upon verbal questions that 65 dBL level is AN AVERAGE. My wife and I experience higher levels of noise during the morning warm up period, when multiple planes ARE warming or starting Engines. Every morning we are awakened between 4:00 AM and 4:30 AM due to the multiple start ups. We are just outside the 65 DBL AREA in Audubon PK.

This by far is louder than flight path noise for us. Can you verify the dBL level for Audubon Park Robin Rd and corner of Cardinal Drive, Is it higher than 65 dBL during this period? 6.1

Email: BAUMGARDNER@TWC.com

Name: Steve Baumgardner
Address: 927 Cardinal Drive
City: Louisville (Audubon PK)
State/Zip Ky 40213
Phone: 502-643 7911 Home 502-6340779

This information is optional*

*Before including your address, telephone number, email address, or other personal identifying information in your comment, be advised that your entire comment including your personal identifying information may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

9

DORN CRAWFORD
932 AUDUBON PARKWAY
LOUISVILLE, KENTUCKY 40213

29 November 2016

MEMORANDUM FOR Mr Bob Slattery, Noise/Environmental Programs Coordinator, LRAA
(*Bob.Slattery@FlyLouisville.com*)

SUBJECT: Comments on the SDF NEM Update

The remarks that follow result from an isolated and necessarily cursory reading of the draft NEM update report, and not from any process of study, reflection and dialogue as anticipated in CFR Part 150's provisions for noise compatibility study – a process last undertaken in Louisville more than 15 years ago. These conclusions, like those of the report itself, must thus be considered at best underinformed. Some limited observations, accordingly: 9.1

The "History" segment on pp 1-2 neglects the most significant elements of Louisville's initial and updated NCPs: in the first instance, large-scale residential relocation, supplanting property condemnation; and in the second, extensive home insulation, in lieu of proposed operational measures. The report correctly indicates that the first shift was supported by a supplemental NCP, while the second was not.

The "Record of Approval" cited near the end of the "History" segment on p2 can be seen in Chapter 2 (and Appendix C) as in fact the vehicle of *disapproval* of the principal operational measures proposed by the 2003 NCP – NA-2, 3 and 7. These measures were disapproved on operational grounds, related to safety – yet while NA-2 and NA-7 are consequently shown as "not implemented," NA-3 is listed as "implemented locally." This seems a plain instance of noncompliance with the 2009 FAA decision. 9.2

The "Overview" on p3 indicates "the LRAA is updating the NEM only at this time," taking no action on the NCP. Yet on p61, the narrative reports that "use of the RNAV procedure at night could result in only compatible land uses within the [southwest] contour" – but then concludes that "this NEM proposes to amend [NCP] mitigation measure M-3 to include eligible residential structures anywhere within the DNL 65 dB contour." These are clearly NCP components; what's the basis for their inclusion here, absent any Noise Compatibility Study activity, and attendant identification and evaluation of alternatives? 9.3

The comparison of contours on pp 61-62 also alludes to growth in the contour from the 2011 forecast for 2016 to the "existing conditions" 2016 contour of the current update. It's not clear, however, which was used in the statistics depicting noise exposure for historic and other residential properties – and no graphical comparison is provided between the two maps. 9.4

Unlike the most recent NCP, the NEM update provides no demographic data on the DNL 60 contour, despite its ready accessibility in modelling output. This deprives the community of essential data to evaluate prospective local measures to supplement Federal mitigation programs. 9.5

Mr Bob Slattery
29 November 2016

There's no indication of verification and validation (V&V) of modeling results, indispensable to a robust analytical process. In the last full noise study, V&V was attained by live noise monitoring at numerous sites, which in fact prompted modification of several modeling assumptions to align more closely to observed results. Absent some similar validating step, it's difficult to treat these current results as credible. 9.6

Sincerely,

Dorn Crawford

Slattery, Bob

From:	Nancy <nbdenton@bellsouth.net>
Sent:	Monday, December 05, 2016 11:18 AM
To:	Slattery, Bob
Cc:	greathoj@twc.com; Nancy
Subject:	Response to Louisville International Airport Draft Noise Exposure Map Update

Bob Slattery,

While the Louisville International Airport Draft Noise Exposure Map Update addresses many noise issues surrounding the Louisville International Airport, it does not address the concerns of the Beechmont area just west of the airport and south of the Waterson. 10.1

The Beechmont concerns, as previously addressed to the bimonthly LRAA Community Noise Forum, are the ground noise and the engine run up noise prior to take off. This noise has noticeably increased since the construction of the new taxiway which necessitated the closure of Crittenen Drive. In addition, berms were removed during this construction, and although a wall was built further out between the airport and Beechmont, the top of this wall is three feet below the elevation of the tarmac of the new taxiway and existing runway. It was admitted at the Community Noise Forum that the wall was not built to be a noise buffer. Therefore, the result has been a taxiway built closer to the Beechmont neighborhood with no sound barriers between the airport and neighborhood.

Also addressed at the Louisville Regional Airport Noise Forum meetings, and of particular concern, are the frequency and loudness of the ground and engine run up noise in the early morning hours, from midnight to daybreak. Many Beechmont neighbors have complained that the noise is so loud it wakes them up. With the projected increase in the number of flights as well as size of the planes over the next few years, we can only expect this to become more problematic. 10.2

What we have suggested at the Community Forums over this past year, and what we would like this study and report to specifically address, are the ground and engine run up noise. There are no actual measurements taken to assess how loud and disturbing this noise is. Instead the current process is to feed data into an algorithm to produce the maps. Again, the problem with this process is that there is no actual measurement of any noise decibel levels in the Beechmont area.

The failure to specifically measure noise decibel levels and to address the ground and engine run up noise leaves many neighborhoods such as Beechmont out of any consideration for the programs specifically created to mitigate some of the adverse affects of our airports.

Nancy A. Bowman -Denton
Beechmont Neighborhood Association

Sent from my iPad

Bob Slattery,

As a resident of Old Louisville, I think it is important to acknowledge that the noise pollution caused by UPS planes has an adverse effect on residents living in flight paths. The planes are too low and too frequent. The sound levels as measured by a few residents, including myself, range from 75 – 100 decibels indoors and as high as 110 decibels outside. The planes sometimes come in every 4-6 minutes and this occurs regularly on nights from 12pm to 5am. Many residents are unable to get a sound sleep due to the continuous overhead flights throughout the night. Currently, the noise is unbearable and with the proposed expansion that will triple the cargo capacity at the UPS Louisville hub, we have to address the noise pollution now before it worsens. 11.1

With the billions of dollars that UPS has invested in this facility, I sincerely doubt they are going to close up shop and move to Cincinnati, or anywhere else. Actually, residents welcome their success in Louisville, but we are asking them to recognize that the success and growth of their company will have a negative effect on their neighbors if they don't consider major sound reduction measures and we ask that they be respectful and work with us toward a mutually satisfying agreement. 11.2

Recent studies by HMMH have produced maps showing areas affected by the airplane noise. The 2016 NEM Baseline DNL Contour shows Old Louisville as falling into the 60db zone which means we are not eligible for Federal assistance with sound proofing our homes. In April of this year, Governor Matt Bevin vetoed a bill that would allow residents in the 60db zone to get Federal assistance, so residents are being offered no help at all in insulating our homes from the UPS noise pollution. The fact that we are not included in the 65db is baffling. Anyone who lives in Old Louisville can tell you the noise levels are deafening at times. The DNL Contour is determined by averaging noise levels over a 24-hour period. I declare that to be an unfair way to assess the noise levels. Averaging out sound levels only obscures the reality of those living in a flight path and this method should be replaced with something connected to reality. Having your head held under running water is torture and so is being subjected to constant drips. Either method, it is still torture. 11.3

I want to state this strongly - if UPS is going to triple their capacity, it is safe to assume their profits will increase in correlation to that growth. Therefore, as good citizens and neighbors, they should invest some of this profit money into making sure that other lives are not diminished by their success. UPS should not be making greater profits while residents who live in their flight paths stand to lose so much. We lose not only a quality of life, but the potential loss of our property value. Subsequently, the city of Louisville will lose money from property taxation, as well. I would like to see UPS help residents in the 60db Contour by creating a fund that we can access by applying for sound abatement assistance that we are not Federally eligible for. 11.4

The growth of UPS can be a win-win situation for all if their growth is done not solely with the intent of increasing their profits. It has to be done with acknowledgement of their impact on the surrounding area and done with a plan that makes people's lives a priority equal to their profits.

These comments are being submitted to accompany the Louisville Interantional Ariport Draft Noise Exposure Map to be submitted to the FAA.

Richard May, 1707 S. 3rd Street, Louisville, KY 40208

Richard May
1707 S. 3rd St.
Louisville, KY
40208

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LRAA
Attn: Bob Slattery
P.O. Box 9129
Louisville, KY 40209-9129

402093012 B002

Slattery, Bob

From: Ray Brundige <brundige@iglou.com>
Sent: Monday, December 05, 2016 2:32 PM
To: Slattery, Bob
Subject: Noise / Environmental Programs Comments

12.1

Please add this to the official record of public comments on airport noise.

There are specific points to be raised about the Noise Exposure Map Update.

Graphs in Appendix G of the SDF Noise Exposure Map Update show actual radar data plotted against measures such as altitude and true air speed compared to distance from start of take-off roll. The radar data graphs start on page G-8 for the 757RR, on page G-23 for the 76300, on page G-39 for the MD11, and on page G-54 for the MD11PW.

The graphs compare standard altitude and speed profiles for AEDT and Boeing standards, since their purpose is to establish use of the Boeing profiles rather than the AEDT profiles.

The radar data are consistently graphed starting at a distance of 10,000 feet from the start of the take-off roll. (This is approximate: the data appear about halfway between the origin axis and the 20,000' distance line).

The graphs leave open the route and timing that led to the observed data. A flight, for example, could have circled within the 10,000' perimeter while slowly gaining speed and altitude. It strikes me that this would have the desirable effect for the aircraft operators of reducing engine wear, and therefore cost. It also would have the undesirable effect for the surrounding residential areas of increasing the noise. The flights would be closer to the ground for a longer time.

For example, please refer to the graph on page G-55, Comparison of Radar Data and Boeing-Developed Altitude Profiles for MD11PW. Radar data start at what appears to be 500' in altitude and 10,000' in distance. Most of flights being tracked rise with the profiles but are relatively lower in the nearer distances. Several, in fact, travel in a relatively flat line to distances of 60,000', indicating the flights were not much above 500' even when they had traveled eleven miles from the airport.

The actual data, then, seem to support the idea that reduced engine wear and lowered cost are valued by the LRAA and its users to an extent that is incompatible with the health and homes of the community.

12.2

My wife and I have lived in Louisville's Highlands since the mid 80's and in our own home at 1718 Edgeland Avenue for most of that time. The noise from Louisville International Airport and from Bowman Field is noticeable, especially when the UPS flights are in the air. I note that our home is less than 20,000' from the northern end of the eastern runway at Louisville International, and somewhat closer to Bowman field, which is also under LRAA control.

I am concerned about the long term health effects of the noise and the general degradation of the environment and housing values in my neighborhood and other areas inside the old city limits. It seems likely that conditions will worsen; the air carriers will pursue increased profits through increased traffic and it is unlikely their concern for the community will offset that pursuit. Further, new technologies being deployed in air transportation promise greater efficiencies in takeoffs and landings and that will open more slots for scheduling.

My conclusion is that the degradation of our health and home are considered a cost of business to the LRAA and its users. 12.2

- Ray Brundige

502-451-7165 (Home)
502-445-5379 (Mobile)

December 2, 2016

13

G. David Pearl, Jr.
1306 Pigeon Pass Road
Louisville, Ky 40213

LRAA
Attn: Bob Slattery
P.O. Box 9129
Louisville, KY 40209-9129

RE: Noise Exposure Map

13.1 Thank you for the opportunity to review the updated Noise Exposure Map for the Louisville International Airport with Louisville Regional Airport Authority members. It was good to see the detail and the metrics for determining exposure. I also appreciated the feedback and guidance you and others there gave individuals during the review.

13.2 As you may remember, I have spoken on the phone with you several times regarding noise in the city of Lynnview. I understand the need to follow established logistics to determine the span of responsibility for the Airport Authority. However, the residents of Lynnview do feel a bit cheated by the latest revision of the map. We understand logistically that if air traffic patterns are as presented, then noise patterns equally should follow suit. I agree that complicated algorithms measure with accuracy noise, given a set of proven factors. We accept the results of the resent study but we would like to know if there was any effort to determine if residual noise could flow past the established boundaries, specifically east of the airport. We would welcome future studies in our neighborhood, especially at times when UPS operations are in full swing in the early morning hours of 3 a.m. until 7:00 a.m. 13.3 Additionally, it appears that the Air National Guard, has increased operational activity during weekend hours, specifically 7:00 a.m. until 10:00 a.m. on Saturday and Sunday. 13.4 Also, we would like to know if there is any data, regarding ground level noise that is captured not as a result of air traffic, but on the ground traffic like taxiing to and from the terminals etc. 13.5 Does the data include private air traffic that is part of the smaller aviation destination within the airport area?

13.6 Lynnview in January, 2017 will have 3 new members on our city council. As such we would welcome the opportunity for one of those members to be an active member of the Airport Neighbors Alliance, and possibly a member of any other board or activity associated with future noise related studies.

Again, I want to thank you for your time and for your personal commitment to our community.

Regards,

G. David Pearl