Appendix E
Technical Noise Report

ESTIMATED NOISE LEVELS FOR AMAZON PRIME AIR MK30 DRONE

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September 2025

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5404 Cypress Center Drive
Suite 125
Tampa, FL 33609
813.207.7200
esassoc.com

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CONTENTS

ESTIMATED NOISE LEVELS FOR AMAZON PRIME AIR MK30 DRONE

Technical Noise Report

1 Introduction

This document presents the methodology and estimation of noise exposure of Amazon Prime Air (Prime Air) package delivery operations under 14 CFR Part 135. Prime Air is proposing to conduct package delivery operations with the MK30 drone at selected distribution hubs (the Prime Air Drone Delivery Center, or PADDC).

The MK30 is an electric powered drone that uses a vertical take-off and landing (VTOL) then transitions to fixed-wing flight using wing lift during en route flight. The drone systems include hardware and software designed for safety and efficiency. The airframe is composed of staggered wings, the propulsion system includes a rechargeable lithium-ion battery, and six (6) motors that include propellers designed for noise reduction. The package delivery system contains the package in a two-door interior receptacle, and a camera and avionics system that has redundancy for critical systems. The drone weighs approximately 78 lbs. and has a maximum takeoff weight of 83.2 lbs., which includes a maximum payload of 5 lbs. It has a maximum operating range of 7.5 mi and can fly up to 400 ft above ground level (AGL) at a maximum cruise speed of 73 mph (64 knots) during horizontal flight. An image of the MK30 drone is shown in **Figure 1**.

The MK30 operational flight profiles can be broken into the following general flight phases: launch, en route outbound, delivery, en route inbound, and landing. After launch, the MK30 would ascend to an altitude of less than 400 ft AGL and follow a predefined route to its delivery site.[1] The MK30 would typically fly en route at between approximately 180 to 377 ft AGL, except when descending to drop a package. Packages would be carried internally in the drone's fuselage. When making a delivery, the drone descends, opens a set of payload doors, and drops the package to the ground from approximately 13 ft AGL. Prime Air's drone would not touch the ground in any place other than the PADDC (except during safe contingent landings) and will remain airborne throughout the operation including the delivery phase.[2] After the package is dropped, the MK30 drone climbs vertically and follows its predefined route back to the PADDC at its assigned altitude.

1 Prime Air may modify operations, if warranted, to avoid or minimize any negative impacts.

2 The MK30 vehicle is built with multiple redundant safety features and "detect and avoid" technology. The drone is designed to handle unexpected situations; it is independently safe.

This document outlines the methodology and estimation of noise exposure expected with the proposed use of Prime Air's drone package delivery operations.[3] The methods presented below are suitable for the evaluation of Federal actions in compliance with the National Environmental Policy Act (NEPA) and other applicable environmental regulations or federal review standards at the discretion and approval of the FAA. In particular, this report is intended to function as a nonstandard equivalent methodology under FAA Order 1050.1G, and therefore requires prior written consent from the FAA's Office of Environment and Energy (AEE) for each project seeking a NEPA determination.[4] The results of the noise analysis are presented in terms of the annual Day-Night Average Sound Level (DNL), considering varying levels of operations for areas at ground level below each flight phase.

Source: Amazon Prime Air, 2023.

Figure 1
Amazon Prime Air MK30 Drone

2 Drone Delivery Operations

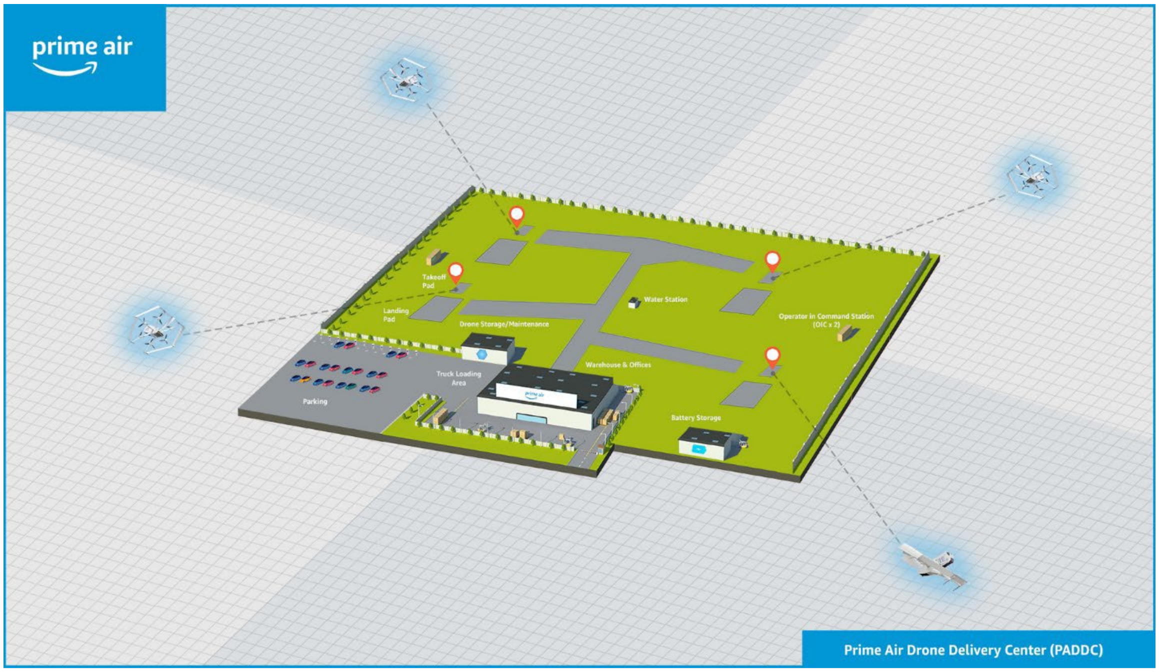
The PADDC and its associated flight routes are determined by Prime Air's business and operational needs. Takeoff pads at the PADDC are four meters by four meters. Landing pads are eight meters by eight meters. Both pads are contained within a launch area approximately 35 meters by 45 meters. A diagram of a representative PADDC layout is presented in **Figure 2**.

The MK30 drone is capable of vertical ascent and descent, hovering, and flying upright with forward-facing propellers for en route travel. Airspeeds during normal en route flight are expected to be approximately 58.3 knots. A typical flight will commence with a vertical ascent from the launch pad to the transition altitude of approximately 115 feet, from which it will continue a forward-facing climb to an

3 Environmental Assessment (EA) Noise Methodology Approval Request for Amazon Prime Air Commercial Package Delivery Operations with the MK30 Unmanned Aircraft (UA), September 2025. (See Attachment A).

4 See FAA Order 1050.1G, June 30, 2025, Appendix C, Section C-1.1, for discussion on the use of "equivalent methodology", available online at https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050.1G.pdf#page=56

outbound en route altitude between 180 and 279 feet AGL. The drone then maintains altitude and follows a predetermined route, traveling at 58.3 knots toward the designated delivery point. Prior to arrival at the delivery point, the drone will begin its descent down to a transition altitude of 140 feet and decelerate to zero-speed at which time it will arrive at the delivery point. The drone then begins a vertical descent to 13 feet AGL at which time the package is released. The drone will ascend back to a transition altitude of 197 feet, begin the outbound transition and climb phase to 345 feet, while accelerating to 58.3 knots until it reaches the inbound en route altitude between 279 and 377 feet along the predetermined route back to the PADDC. Prior to arriving at the PADDC, the drone will descend to the transition altitude of 197 feet, decelerate to zero speed, and begin a vertical descent to the landing pad.



Source: Amazon Prime Air, 2022.

Figure 2
Representative PADDC Layout

2.1 Flight Profiles

Flight profiles of drone operations are broken into five general phases: takeoff, transitions to and from vertical and horizontal flight, en route, delivery, and landing. These phases can be combined to represent the typical operational profile of the drone as outlined below. A graphical representation of the operational profile is presented in **Figure 3** and each phase is summarized in **Table 1**.

Takeoff, Vertical Ascent, Transition, and Outbound Climb

The drone departs from the launch pad once cleared for takeoff. It will ascend vertically to the transition altitude of 115 feet AGL in vertical flight mode.

Upon reaching the transition altitude, and while still positioned above the launch pad, the drone transitions from zero speed to its cruise speed of 58.3 knots and continues an outbound climb to the typical cruise altitude of 200 feet AGL (ranges from 180 and 279 feet AGL). This transition is accompanied by a shift from vertical flight mode to horizontal flight mode.

Fixed-wing Outbound Cruise

The drone proceeds to fly at the typical cruise altitude of 200 feet AGL (ranges from 180 to 279 feet AGL) and 58.3 knots to the backyard descent and transition.

Backyard Descent, Delivery, Ascent, Transition, and Inbound Climb

The drone decelerates from the en route speed of 58.3 knots and descends from the typical outbound cruise altitude of 200 feet AGL (ranges from 180 to 279 feet AGL) to a transition altitude of 140 feet AGL. The drone then transitions to vertical flight mode, where it will be positioned over the delivery point at zero speed.

The drone begins a vertical descent from the transition altitude to 13 feet AGL while maintaining position above the delivery point. Once at 13 feet AGL, the drone drops the package and ascends vertically back to the transition altitude of 197 feet AGL. The nearest allowable proximity of any individual, animal, or other obstacles to the delivery point during this maneuver is 16.4 feet.

Once at the transition altitude and positioned above the delivery point, the drone transitions from zero speed to en route speed while changing from vertical flight to horizontal flight and continues to climb to the typical inbound cruise altitude of 345 feet AGL (ranges from 279 to 377 feet AGL).

Fixed-wing Inbound Cruise

The drone continues to fly at the typical en route altitude of 345 feet AGL (ranges from 279 to 377 feet AGL) and speed of 58.3 knots towards the PADDC.

Landing Descent, Transition, Vertical Descent, and Landing

The drone decelerates as it approaches the PADDC and descends to the transition altitude of 197 feet AGL and where it transitions from horizontal flight to vertical flight, coming to a zero-speed position over its assigned landing pad.

The drone descends over its assigned landing pad in vertical flight until it touches down and shuts down the motors.

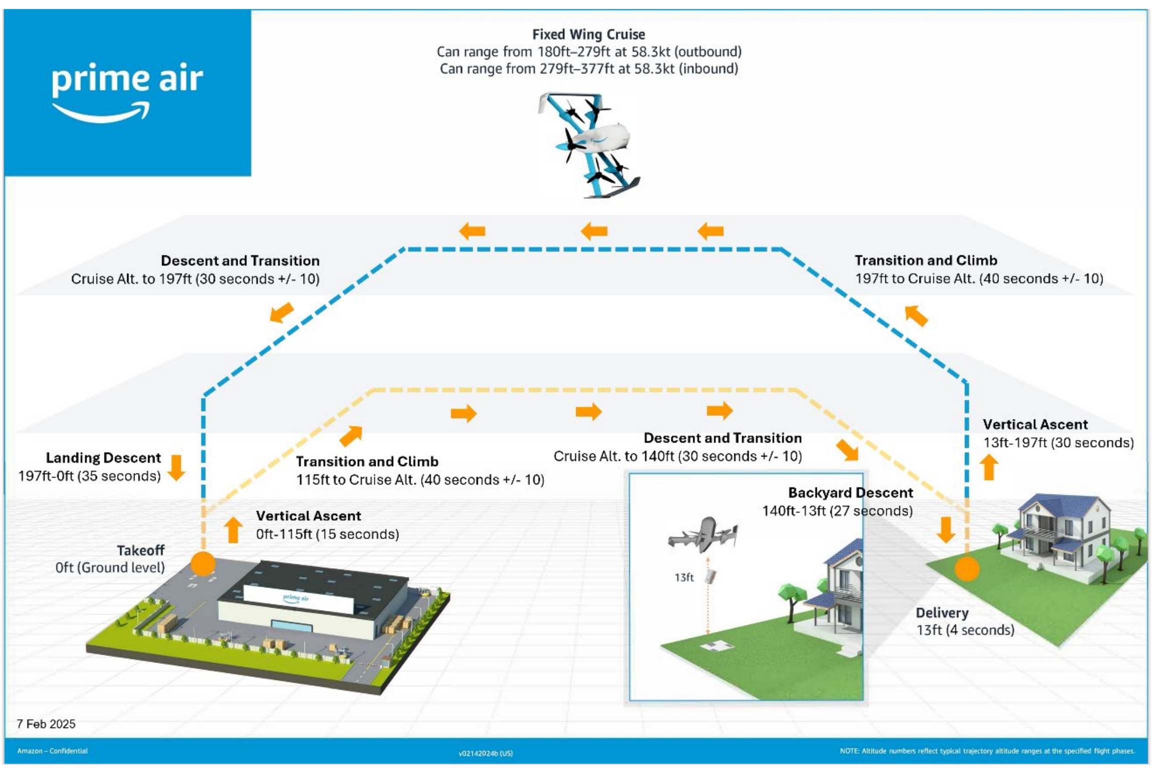
TABLE 1
REPRESENTATIVE OPERATIONAL PROFILE BY PHASE OF FLIGHT

Phase of Flight	Altitude (feet AGL)	Ground Speed (knots)	Duration (seconds)
Takeoff and Vertical Ascent	Ascent from 0 to 115	0	15
Transition and Outbound Climb	115 to 279	0 to 58.3	40
Fixed Wing Outbound Cruise	200[1]	58.3	Variable[3]
Delivery Descent and Transition	Descent from 200 to 140	58.3 to 0	30
Backyard Descent	Descent from 140 to 13	0	27
Delivery	13	0	4
Backyard Ascent	Ascent from 13 to 197	0	30
Transition and Inbound Climb	Ascent from 197 to 377	0 to 58.3	40
Fixed-Wing Inbound Cruise	377[2]	58.3	Variable[3]
Landing Descent and Transition	Descent from 377 to 197	58.3 to 0	30
Vertical Descent and landing	Descent from 197 to 0	0	35

Notes:

1 The outbound enroute altitude may range from 180 – 279 feet. For this analysis the outbound cruise altitude was assumed to be 200 feet.
2 The inbound enroute altitude may range from 279 – 377 feet. For this analysis the inbound cruise altitude was assumed to be 345 feet.
3. Duration of inbound and outbound cruise flight time varies based on distance to customer.

Source: Amazon Prime Air, February 2025



Source: Prime Air, 2025.

Figure 3
Representative Operational Profile of the MK30

3 Methodology

As previously mentioned, there is not a standardized process for drone noise assessments. Therefore, ESA is applying technical guidance that was previously approved by the FAA Office of Environment and Energy for past analyses. The following subsections outline this methodology.

Prime Air conducted noise measurements of the MK30 drone in October 2024 at the Pendleton UAS Range located at the Eastern Oregon Regional Airport (KPDT). ESA, in coordination with the FAA, processed and analyzed the measurement data and calculated the noise levels for each of the flight phases.[5] The following subsections show either the A-weighted Sound Exposure Levels (SEL) or formulas to calculate the SELs used for this analysis, which can be matched to each flight phase detailed in **Table 1**.

3.1 Daytime Equivalent Operations and DNL

As mentioned, results are presented as DNL which applies a 10 dB weighting, or equivalent to 10 times the number of nighttime operations, for operations between 10:00 P.M. and 7:00 A.M. Therefore, the operations near point *i* can be weighted to develop a daytime equivalent number of operations ($N_{equiv,i}$).

$$eq.1.\ N_{Equiv,i} = W_{Day} \text{ x } N_{Day,i} + W_{Eve} \text{ x } N_{Eve,i} + W_{Night} \text{ x } N_{Night,i}$$

Where:

- $N_{Day,i}$ is the number of user-specified operations between 7 A.M. and 7 P.M. local time
- $N_{Eve,i}$ is the number of user-specified operations between 7 P.M. and 10 P.M. local time
- $N_{Night,i}$ is the number of user-specified operations between 10 P.M. and 7 A.M. local time
- W_{Day} is the day-time weighting factor, which is 1 operation for DNL
- W_{Eve} is the evening weighting factor, which is 1 operation for DNL
- W_{Night} is the night-time weighting factor, which is 10 operations for DNL

The number of daytime equivalent operations, $N_{DNL,i}$ can be simplified to

$$eq.2.\ N_{DNL,i} = N_{Day,i} + N_{Eve,i} + 10 \text{ x } N_{Night,i}$$

3.2 PADDC Infrastructure

Each PADDC accommodates four sets of launch and landing pads. In the context of this noise analysis, it is assumed that all operations would occur at one launch/landing pad, where it would be the closest to the noise-sensitive areas. This assumption is considered acoustically conservative. If the precise location of the nearest single launch or landing pad is unknown, the respective PADDC boundary should be used for the analysis.

[5] Prime Air MK30 Done Noise Measurement Report, Environmental Science Associates, April 2025. (See Attachment B).

3.3 Application of Acoustical Data

The summation of the SELs presented in subsequent sections are used to estimate the DNL for Prime Air's drone operations covered in this report. SEL results are detailed in the measurement report found in **Attachment B**.

For calculating SEL, four specific activities are considered:

- The drone taking off from the PADDC (includes transition between vertical and horizontal flight)
- En route travel of the drone in horizontal flight between the PADDC and the delivery point
- Delivery
- The drone landing at the PADDC (includes transition between vertical and horizontal flight)

3.3.1 Takeoff

The process for estimating SELs associated with takeoff as a function of distance from the PADDC is presented in Equation 3 and incorporates the parameters detailed in **Table 2**.

$$eq. 3.\ SEL = m \text{ x } Log_{10}(d) + b(dB)$$

Where:

- d is the distance along the ground in feet between the drone and receiver
- m and b are parameters provided in the tables below

TABLE 2
PARAMETERS FOR ESTIMATING TAKEOFF SOUND EXPOSURE LEVEL VERSUS DISTANCE

Range for d (feet from launch pad)	m	b
20 to 76	-14.51	109.35
76 to 195	-13.51	107.46
195 to 372	-14.66	110.09
372 to 772	-17.08	116.32
772 to 1,205	-17.05	116.23
1,205 and greater	0.00	63.7

Note: Distance is along ground from launch pad to receiver.
Source: ESA, 2025.

Application of the SEL is based on the position of the launch/landing pad, where it would be the closest to the noise-sensitive areas. However, if the exact location of the launch pad is not known, the outer boundary of the PADDC, at a point closest to the receiver, should be used as it considered to be acoustically conservative. It should be noted that the SEL values include the transition to horizontal flight and the acceleration to en route speed that would occur during the climb.

3.3.2 En Route

The anticipated outbound flight speed of the drone en route is 58.3 knots at a cruise altitude of 200 feet AGL. For inbound flight the anticipated cruise altitude is 345 feet AGL with the same 58.3 knot flight speed. As discussed in **Appendix B**, adjustments were applied to the measured data to account for how the varying speed impacts the duration of the overflight at the stationary receptor.

To compute the SEL, each measured SEL was first normalized based on the drone's intended speed and distance in its operational profile. This adjustment was necessary because each drone pass by occurred at slightly different altitudes and velocities, and each microphone was positioned at a different lateral distance from the flight path. After normalization, each microphone's corrected measurements were averaged, and the microphone with the highest corrected SEL (representing the most conservative estimate) was used to compute the en route SEL.

As shown in **Table 3**, the SEL is 63.7 dB when the drone is at maximum weight, at 200 feet from the stationary receiver and traveling at approximately 58.3 knots. The SEL is 60.9 dB when the drone is at empty weight, 345 feet from the stationary receiver, and traveling at approximately 58.3 knots.

TABLE 3
ESTIMATES OF EN ROUTE SOUND EXPOSURE LEVEL

Aircraft Configuration	Reference Air Speed (knots)	Reference Altitude (feet AGL)	Uncorrected Speed (knots)	Uncorrected Altitude (feet AGL)	Uncorrected SEL (dBA)	Corrected SEL (dBA)
Maximum Weight	58.3	200	60.8	116	66.1	63.7
Empty Wight	58.3	345	60.8	98	66.9	60.9

Source: ESA, 2025.

3.3.3 Delivery

The process for estimating SELs associated with delivery as a function of distance from a receiver relative to the position of the delivery point is presented in Equation 3 and incorporates the parameters detailed in **Table 4**.

TABLE 4
PARAMETERS FOR ESTIMATING DELIVERY SOUND EXPOSURE LEVEL VERSUS DISTANCE

Range for d (feet from launch pad)	m	b
25 to 76	-13.18	110.56
76 to 175	-18.65	120.84
175 to 372	-13.86	110.11
372 to 772	-15.63	114.67
772 to 1,396	-15.63	114.66
1,396	0.00	65.5

Note: Distance is along ground from delivery point to receiver.
Source: ESA, 2025.

The minimum distance used for calculation between the delivery point and a person is 16.4 feet.[6] The values in **Table 4** are valid for distances from the delivery point of 25 feet or greater. SEL values for distances between 16 and 25 feet are derived by linear extrapolation of the parameters used in the 25 to 76 foot range.

It should be noted that the SEL values include the noise contribution from the horizontal flight associated with the drone transition from en route to descent and transition, including the transition to vertical flight and transition back to en route altitude.

3.3.4 Landing

The process for estimating SELs associated with landing as a function of distance from the PADDC is presented in Equation 3 and incorporates the parameters detailed in **Table 5**.

TABLE 5
PARAMETERS FOR ESTIMATING LANDING SOUND EXPOSURE LEVEL VERSUS DISTANCE

Range for d (feet from launch pad)	m	b
20 to 76	-14.95	111.28
76 to 195	-16.17	113.58
195 to 375	-21.10	124.86
375 to 1,074	-21.10	124.87
1,074	0.00	60.9

Note: Distance is along ground from launch pad to receiver.
Source: ESA, 2025.

6 Prime Air's safety guidance stipulates that there should not be a person, animal or object within 5 meters of the delivery point, and if the drone detects a person, animal or object within 5 meters of the delivery point, it will abort the delivery.

If the location of the landing pad is known, the outer boundary of the PADDC (at a point closest to the noise sensitive receiver), should be used for the modeling location as a conservative approach. It should be noted that the SEL values include the descent from en route altitude and the deceleration from en route speed, and the transition to vertical flight that would occur after the initial descent.

3.4 DNL Estimation Methodology

The number of operations flying over a specific receiver's ground location will fluctuate depending on the proposed operating area and demand. For a given receiver location, i, and a single instance of sound source, A, the SEL for that sound source SEL_{iA} is (energy) summed for the average annual daily number of DNL daytime equivalent operations ($N_{DNL,iA}$) to compute the equivalent DNL in Equation 4.

$$eq. 4.\ DNL_{iA} = SEL_{iA} + 10 \text{ x } Log_{10}(N_{DNL,iA}) - 49.4, dB$$

The above equation applies to an SEL value representing one noise source such as a drone takeoff or landing. For cases where a receiver would be exposed to multiple noise sources (e.g. takeoff, transiting, en route, and departure), the complete DNL at that point was calculated with Equation 5.

$$eq. 5.\ DNL_i = 10 \text{ x } Log_{10}\left(10^{\left(\frac{DNL_{ia}}{10}\right)} + 10^{\left(\frac{DNL_{ib}}{10}\right)} + \cdots + 10^{\left(\frac{DNL_{iz}}{10}\right)}\right), dB$$

For each of the conditions presented below, results are presented in tabular format based on the equivalent daytime operations, in DNL daytime equivalent, for the estimated DNL. The proper output of DNL is dependent on the calculation of respective daytime equivalent operations.

3.4.1 DNL at PADDC

The takeoff and landing operations are anticipated to occur at one PADDC for this analysis. Therefore, the results at the PADDC will be calculated for a single set of receptors. Operations were assumed to takeoff and land along the same flight path.

Takeoff operations are represented by two phases of flight. The drone will take off and climb to the transition altitude as discussed in **Section 2**. The drone will then transition from vertical flight to horizontal flight and accelerate to en route speed of 58.3 knots and climb to en route altitude.

Landing operations are also represented by two phases of flight. The drone flies to the PADDC at en route altitude until it begins to descend to the transition altitude while slowing down and transitions from horizontal to vertical flight as described in **Section 2**. Then the drone descends from the transition altitude to the ground and shuts down.

The two noise sources representing the complete takeoff and landing cycle associated with a single delivery departing and returning at the PADDC were added together using Equation 5.

3.4.2 DNL for En Route

A receiver will be positioned directly under the flight path, and the DNL will be calculated based on the altitude and speed-adjusted delivery SEL presented in **Table 3**. The number of operations would be based on relevant materials and assume that a drone directly overflies the receiver while at maximum and empty weight for outbound and inbound flight, respectively, for a single delivery. The en route outbound and inbound noise level are added together with Equation 5.

3.4.3 DNL for Delivery Points

Delivery operations are represented by the deceleration of the drone from en route speed and transition from horizontal flight to vertical flight over the delivery point at the transition altitude of 140 feet AGL. The drone then begins a vertical descent to where the package is dropped at the delivery point at 13 feet AGL. The drone then climbs back to the transition altitude of 197 feet AGL where it will transition from vertical flight to horizontal flight, accelerating to en route speed.

4 Estimated Noise Exposure

This section outlines the estimated noise exposure for Prime Air's proposed operations for any given number of average annual day (AAD) deliveries. Results are based off the estimated number of DNL equivalent deliveries associated with the PADDC and presented in tabular format. Note that one delivery includes the outbound takeoff and inbound landing and is representative of two operations.

The DNL equivalent deliveries, $N_{DNL,i}$ as described in **Section 4.1**, is presented below as Equation 6.

$$eq.6.\ Deliveries_{DNL,i} = Deliveries_{Day} + 10 \text{ x } Deliveries_{Night}$$

$Deliveries_{Day}$ are between 7 A.M. and 10 P.M. and $Deliveries_{Night}$ are between 10 P.M. and 7 A.M. If a portion of a delivery (either takeoff or landing) occurs in the nighttime hours, then it is counted within $Deliveries_{Night}$.

For estimating noise exposure, the noise levels for each flight phase are considered separate based on the level of proposed operations for a given location. When a particular receptor is at the transition of different flight phases, the noise exposure is then determined by adding the noise from each phase.

4.1 Noise Exposure for Operations at the PADDC

For operations at the PADDC, noise generated by the drone includes takeoff, landing, and transitions from vertical to horizontal flight within the corresponding flight phases. It was assumed that all operations follow the same en route flight path, with outbound and inbound flights traversing it in opposing directions for a conservative approach.

Table 6 presents estimated extent of noise exposure for the number of average daily DNL equivalent deliveries (including the takeoff and climb, transition to en route outbound, transition from en route inbound, and descent and landing as detailed in **Section 2**) under the flight path for the PADDC. The analyses presented were rounded up conservatively to the nearest interval available from the data outlined in this section. SEL values in **Table 6** have been updated to incorporate the DNL 59.7 dB extents as well as updated base 10 logarithmic calculations for the landing phase.

TABLE 6
ESTIMATED EXTENT OF NOISE EXPOSURE FROM PADDC PER NUMBER OF DELIVERIES

Number of DNL Equivalent Deliveries		Estimated Extent of Noise Exposure (feet)					
Average Daily	Annual	DNL45	DNL 50	DNL 55	DNL 59.7	DNL 60	DNL 65
<= 1	<= 365	21	21	21	21	21	21
<= 5	<= 1,825	100	50	21	21	21	21
<= 10	<= 3,650	100	50	21	21	21	21
<= 15	<= 5,475	150	100	50	21	21	21
<= 20	<= 7,300	150	100	50	21	21	21
<= 40	<= 14,600	250	150	50	50	50	21
<= 60	<= 21,900	300	150	100	50	50	21
<= 80	<= 29,200	350	200	100	50	50	21
<= 100	<= 36,500	400	200	100	50	50	21
<= 120	<= 43,800	450	250	150	100	50	50
<= 140	<= 51,100	500	250	150	100	100	50
<= 160	<= 58,400	500	300	150	100	100	50
<= 180	<= 65,700	550	300	150	100	100	50
<= 200	<= 73,000	600	300	150	100	100	50
<= 220	<= 80,300	600	350	200	100	100	50
<= 240	<= 87,600	650	350	200	100	100	50
<= 260	<= 94,900	650	350	200	100	100	50
<= 280	<= 102,200	700	400	200	100	100	50
<= 300	<= 109,500	700	400	200	100	100	50
<=320	<= 116,800	750	400	200	100	100	50
<= 340	<= 124,100	750	400	250	150	100	50
<= 360	<= 131,400	800	450	250	150	150	50
<= 380	<= 138,700	800	450	250	150	150	50
<= 400	<= 146,000	850	450	250	150	150	50
<= 420	<= 153,300	850	450	250	150	150	100
<= 440	<= 160,600	900	500	250	150	150	100
<= 460	<= 167,900	900	500	250	150	150	100
<= 480	<= 175,200	900	500	300	150	150	100
<= 500	<= 182,500	950	500	300	150	150	100
<= 520	<= 189,800	950	500	300	150	150	100
<= 540	<= 197,100	1,000	550	300	150	150	100
<= 560	<= 204,400	1,000	550	300	150	150	100
<= 580	<= 211,700	1,000	550	300	150	150	100
<= 600	<= 219,000	1,050	550	300	150	150	100
<= 620	<= 226,300	1,050	550	300	200	150	100

Number of DNL Equivalent Deliveries		Estimated Extent of Noise Exposure (feet)					
Average Daily	**Annual**	**DNL45**	**DNL 50**	**DNL 55**	**DNL 59.7**	**DNL 60**	**DNL 65**
<= 640	<= 233,600	1,050	600	300	200	150	100
<= 660	<= 240,900	Note 3	600	350	200	200	100
<= 680	<= 248,200	Note 3	600	350	200	200	100
<= 700	<= 255,500	Note 3	600	350	200	200	100
<= 720	<= 262,800	Note 3	600	350	200	200	100
<= 740	<= 270,100	Note 3	650	350	200	200	100
<= 760	<= 277,400	Note 3	650	350	200	200	100
<= 780	<= 284,700	Note 3	650	350	200	200	100
<= 800	<= 292,000	Note 3	650	350	200	200	100
<= 820	<= 299,300	Note 3	650	350	200	200	100
<= 840	<= 306,600	Note 3	650	350	200	200	100
<= 860	<= 313,900	Note 3	700	400	200	200	100
<= 880	<= 321,200	Note 3	700	400	200	200	100
<= 900	<= 328,500	Note 3	700	400	200	200	100
<= 920	<= 335,800	Note 3	700	400	200	200	100
<= 940	<= 343,100	Note 3	700	400	200	200	100
<= 960	<= 350,400	Note 3	700	400	250	200	100
<= 980	<= 357,700	Note 3	750	400	250	250	100
<= 1,000	<= 365,000	Note 3	750	400	250	200	100
<= 1,020	<= 372,300	Note 3	750	400	250	250	100
<= 1,040	<= 379,600	Note 3	750	400	250	250	100
<= 1,060	<= 386,900	Note 3	750	400	250	250	100
<= 1,080	<= 394,200	Note 3	750	400	250	250	100
<= 1,100	<= 401,500	Note 3	750	450	250	250	100
<= 1,120	<= 408,800	Note 3	800	450	250	250	100
<= 1,140	<= 416,100	Note 3	800	450	250	250	150
<= 1,160	<= 423,400	Note 3	800	450	250	250	150
<= 1,180	<= 430,700	Note 3	800	450	250	250	150
<= 1,200	<= 438,000	Note 3	800	450	250	250	150
<= 1,220	<= 445,300	Note 3	800	450	250	250	150
<= 1,240	<= 452,600	Note 3	800	450	250	250	150
<= 1,260	<= 459,900	Note 3	850	450	250	250	150
<= 1,280	<= 467,200	Note 3	850	450	250	250	150
<= 1,300	<= 474,500	Note 3	850	450	250	250	150
<= 1,320	<= 481,800	Note 3	850	450	250	250	150
<= 1,340	<= 489,100	Note 3	850	450	250	250	150
<= 1,360	<= 496,400	Note 3	850	500	250	250	150

Number of DNL Equivalent Deliveries		Estimated Extent of Noise Exposure (feet)					
Average Daily	**Annual**	**DNL45**	**DNL 50**	**DNL 55**	**DNL 59.7**	**DNL 60**	**DNL 65**
<= 1,380	<= 503,700	Note 3	850	500	250	250	150
<= 1,400	<= 511,000	Note 3	900	500	250	250	150
<= 1,420	<= 518,300	Note 3	900	500	300	250	150
<= 1,440	<= 525,600	Note 3	900	500	300	250	150
<= 1,460	<= 532,900	Note 3	900	500	300	250	150
<= 1,480	<= 540,200	Note 3	900	500	300	250	150
<= 1,500	<= 547,500	Note 3	900	500	300	250	150
<= 1,520	<= 554,800	Note 3	900	500	300	300	150
<= 1,540	<= 562,100	Note 3	900	500	300	300	150
<= 1,560	<= 569,400	Note 3	950	500	300	300	150
<= 1,580	<= 576,700	Note 3	950	500	300	300	150
<= 1,600	<= 584,000	Note 3	950	500	300	300	150
<= 1,620	<= 591,300	Note 3	950	500	300	300	150
<= 1,640	<= 598,600	Note 3	950	500	300	300	150
<= 1,660	<= 605,900	Note 3	950	550	300	300	150
<= 1,680	<= 613,200	Note 3	950	550	300	300	150
<= 1,700	<= 620,500	Note 3	950	550	300	300	150
<= 1,720	<= 627,800	Note 3	1,000	550	300	300	150
<= 1,740	<= 635,100	Note 3	1,000	550	300	300	150
<= 1,760	<= 642,400	Note 3	1,000	550	300	300	150
<= 1,780	<= 649,700	Note 3	1,000	550	300	300	150
<= 1,800	<= 657,000	Note 3	1,000	550	300	300	150
<= 1,820	<= 664,300	Note 3	1,000	550	300	300	150
<= 1,840	<= 671,600	Note 3	1,000	550	300	300	150
<= 1,860	<= 678,900	Note 3	1,000	550	300	300	150
<= 1,880	<= 686,200	Note 3	1,050	550	300	300	150
<= 1,900	<= 693,500	Note 3	1,050	550	300	300	150
<= 1,920	<= 700,800	Note 3	1,050	550	300	300	150
<= 1,940	<= 708,100	Note 3	1,050	550	350	300	150
<= 1,960	<= 715,400	Note 3	1,050	550	350	300	150
<= 1,980	<= 722,700	Note 3	1,050	600	350	300	150
<= 2,000	<= 730,000	Note 3	1,050	600	350	300	150

Notes:

1. One delivery accounts for the outbound takeoff and inbound landing and is representative of two operations.
2. If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL equivalent deliveries, use the entry for 60 average daily DNL equivalent deliveries.
3. The DNL noise level extends more than 1,074 feet from the PADDC based on the level of operations specified as the aircraft continues along its en route flight path. En route results in Section 4.2 may be more applicable in these instances for determining noise levels.

Source: ESA, 2025.

4.2 Noise Exposure under En Route Paths

When the drone is en route, it is expected to fly the same outbound flight path between the PADDC and the delivery point and inbound flight path back to the PADDC. Therefore, each receiver under the en route path would experience two overflights for each delivery served by the corresponding en route flight path.

Table 7 provides the estimated DNL for a receiver on the ground directly under an en route path for various counts of daily average DNL equivalent deliveries. The en route noise calculated for each delivery includes both the outbound traversal of the en route path at 200 feet AGL and a ground speed of 58.3 knots and the inbound traversal of the en route path at 345 feet AGL and the same ground speed of 58.3 knots.

The drone may overfly locations at operational levels that differ from both an inbound and outbound traversal of the en route path by the drone as described above and presented in **Table 7**. For these circumstances, **Table 8** presents the equations for calculating the estimated DNL for a receiver directly under a specified given number of DNL equivalent average daily individual overflights, defined as N_o.

TABLE 7
ESTIMATED NOISE EXPOSURE DIRECTLY UNDER EN ROUTE FLIGHT PATHS

Number of DNL Equivalent Deliveries		Estimated Extent of Noise Exposure		
Average Daily	**Annual**	**Outbound DNL**[1]	**Inbound DNL**[2]	**Total En Route DNL**
<= 1	<= 365	14.3	11.5	16.1
<= 5	<= 1,825	21.3	18.5	23.1
<= 10	<= 3,650	24.3	21.5	26.1
<= 15	<= 5,475	26.1	23.3	27.9
<= 20	<= 7,300	27.3	24.5	29.1
<= 40	<= 14,600	30.3	27.5	32.2
<= 60	<= 21,900	32.1	29.3	33.9
<= 80	<= 29,200	33.3	30.5	35.2
<= 100	<= 36,500	34.3	31.5	36.1
<= 120	<= 43,800	35.1	32.3	36.9
<= 140	<= 51,100	35.8	33.0	37.6
<= 160	<= 58,400	36.3	33.5	38.2
<= 180	<= 65,700	36.9	34.1	38.7
<= 200	<= 73,000	37.3	34.5	39.1
<= 220	<= 80,300	37.7	34.9	39.6
<= 240	<= 87,600	38.1	35.3	39.9
<= 260	<= 94,900	38.4	35.6	40.3
<= 280	<= 102,200	38.8	36.0	40.6
<= 300	<= 109,500	39.1	36.3	40.9
<=320	<= 116,800	39.4	36.6	41.2
<= 340	<= 124,100	39.6	36.8	41.4
<= 360	<= 131,400	39.9	37.1	41.7

Number of DNL Equivalent Deliveries		Estimated Extent of Noise Exposure		
Average Daily	Annual	Outbound DNL[1]	Inbound DNL[2]	Total En Route DNL
<= 380	<= 138,700	40.1	37.3	41.9
<= 400	<= 146,000	40.3	37.5	42.2
<= 420	<= 153,300	40.5	37.7	42.4
<= 440	<= 160,600	40.7	37.9	42.6
<= 460	<= 167,900	40.9	38.1	42.8
<= 480	<= 175,200	41.1	38.3	42.9
<= 500	<= 182,500	41.3	38.5	43.1
<= 520	<= 189,800	41.5	38.7	43.3
<= 540	<= 197,100	41.6	38.8	43.5
<= 560	<= 204,400	41.8	39.0	43.6
<= 580	<= 211,700	41.9	39.1	43.8
<= 600	<= 219,000	42.1	39.3	43.9
<= 620	<= 226,300	42.2	39.4	44.1
<= 640	<= 233,600	42.4	39.6	44.2
<= 660	<= 240,900	42.5	39.7	44.3
<= 680	<= 248,200	42.6	39.8	44.5
<= 700	<= 255,500	42.8	40.0	44.6
<= 720	<= 262,800	42.9	40.1	44.7
<= 740	<= 270,100	43.0	40.2	44.8
<= 760	<= 277,400	43.1	40.3	44.9
<= 780	<= 284,700	43.2	40.4	45.1
<= 800	<= 292,000	43.3	40.5	45.2
<= 820	<= 299,300	43.4	40.6	45.3
<= 840	<= 306,600	43.5	40.7	45.4
<= 860	<= 313,900	43.6	40.8	45.5
<= 880	<= 321,200	43.7	40.9	45.6
<= 900	<= 328,500	43.8	41.0	45.7
<= 920	<= 335,800	43.9	41.1	45.8
<= 940	<= 343,100	44.0	41.2	45.9
<= 960	<= 350,400	44.1	41.3	46.0
<= 980	<= 357,700	44.2	41.4	46.0
<= 1,000	<= 365,000	44.3	41.5	46.1
<= 1,020	<= 372,300	44.4	41.6	46.2
<= 1,040	<= 379,600	44.5	41.7	46.3
<= 1,060	<= 386,900	44.6	41.8	46.4
<= 1,080	<= 394,200	44.6	41.8	46.5
<= 1,100	<= 401,500	44.7	41.9	46.5

Number of DNL Equivalent Deliveries		Estimated Extent of Noise Exposure		
Average Daily	Annual	Outbound DNL[1]	Inbound DNL[2]	Total En Route DNL
<= 1,120	<= 408,800	44.8	42.0	46.6
<= 1,140	<= 416,100	44.9	42.1	46.7
<= 1,160	<= 423,400	44.9	42.1	46.8
<= 1,180	<= 430,700	45.0	42.2	46.9
<= 1,200	<= 438,000	45.1	42.3	46.9
<= 1,220	<= 445,300	45.2	42.4	47.0
<= 1,240	<= 452,600	45.2	42.4	47.1
<= 1,260	<= 459,900	45.3	42.5	47.1
<= 1,280	<= 467,200	45.4	42.6	47.2
<= 1,300	<= 474,500	45.4	42.6	47.3
<= 1,320	<= 481,800	45.5	42.7	47.3
<= 1,340	<= 489,100	45.6	42.8	47.4
<= 1,360	<= 496,400	45.6	42.8	47.5
<= 1,380	<= 503,700	45.7	42.9	47.5
<= 1,400	<= 511,000	45.8	43.0	47.6
<= 1,420	<= 518,300	45.8	43.0	47.7
<= 1,440	<= 525,600	45.9	43.1	47.7
<= 1,460	<= 532,900	45.9	43.1	47.8
<= 1,480	<= 540,200	46.0	43.2	47.8
<= 1,500	<= 547,500	46.1	43.3	47.9
<= 1,520	<= 554,800	46.1	43.3	48.0
<= 1,540	<= 562,100	46.2	43.4	48.0
<= 1,560	<= 569,400	46.2	43.4	48.1
<= 1,580	<= 576,700	46.3	43.5	48.1
<= 1,600	<= 584,000	46.3	43.5	48.2
<= 1,620	<= 591,300	46.4	43.6	48.2
<= 1,640	<= 598,600	46.4	43.6	48.3
<= 1,660	<= 605,900	46.5	43.7	48.3
<= 1,680	<= 613,200	46.6	43.8	48.4
<= 1,700	<= 620,500	46.6	43.8	48.4
<= 1,720	<= 627,800	46.7	43.9	48.5
<= 1,740	<= 635,100	46.7	43.9	48.5
<= 1,760	<= 642,400	46.8	44.0	48.6
<= 1,780	<= 649,700	46.8	44.0	48.6
<= 1,800	<= 657,000	46.9	44.1	48.7
<= 1,820	<= 664,300	46.9	44.1	48.7
<= 1,840	<= 671,600	46.9	44.1	48.8

Number of DNL Equivalent Deliveries		Estimated Extent of Noise Exposure		
Average Daily	Annual	Outbound DNL[1]	Inbound DNL[2]	Total En Route DNL
<= 1,860	<= 678,900	47.0	44.2	48.8
<= 1,880	<= 686,200	47.0	44.2	48.9
<= 1,900	<= 693,500	47.1	44.3	48.9
<= 1,920	<= 700,800	47.1	44.3	49.0
<= 1,940	<= 708,100	47.2	44.4	49.0
<= 1,960	<= 715,400	47.2	44.4	49.1
<= 1,980	<= 722,700	47.3	44.5	49.1
<= 2,000	<= 730,000	47.3	44.5	49.1

Notes:

1. The max weight en route noise calculated for each delivery includes both the outbound traversal of the en route path at 200 feet AGL and a ground speed of 58.3 knots.
2. The empty weight en route noise calculated for each delivery includes both the inbound traversal of the en route path at 345 feet AGL and a ground speed of 58.3 knots.

Source: ESA, 2025.

TABLE 8
ESTIMATED NOISE EXPOSURE DIRECTLY UNDER OVERFLIGHTS

Altitude of Overflight	SEL for One Overflight (dB)	DNL for One Overflight Between 7 A.M. and 10 P.M. (dB)	DNL Equation for the Number of DNL Equivalent Overflights
115 feet AGL	66.7	17.5	$10 \times \log_{10}(No) + 17.5$
160 feet AGL	64.9	15.7	$10 \times \log_{10}(No) + 15.5$
165 feet AGL	64.7	15.5	$10 \times \log_{10}(No) + 15.5$
180 feet AGL	64.3	15.1	$10 \times \log_{10}(No) + 15.1$
200 feet AGL	63.7	14.5	$10 \times \log_{10}(No) + 14.5$
300 feet AGL	61.5	12.3	$10 \times \log_{10}(No) + 12.3$
345 feet AGL	60.7	11.5	$10 \times \log_{10}(No) + 11.5$
N Feet AGL	$12.5 \times \log_{10}(200/N_{ft}) + 63.7$	$SEL_1 - 49.4$	$10 \times \log_{10}(No) + DNL_1$

Notes:

1. The DNL value for a given number of average DNL Equivalent Operations, N_o, can be found by using the equations associated with operation of the drone at a specified altitude and speed interval. In this case, one operation represents a single overflight.
2. All values in this table are for level flight at maximum weight and 58.3 knots.

Source: ESA, 2025.

4.3 Noise Exposure for Operations at Delivery Point

Table 9 presents the estimated DNL values for a range of potential daily average DNL equivalent delivery counts at a delivery point. The DNL values include the transition from en route speed to vertical flight at transition altitude, the delivery maneuver, and the transition from vertical flight at transition altitude to en route speed as discussed in **Section 3.4.3**. The minimum listener distance is 16.4 feet from the delivery point and corresponds to minimum distance between a person and delivery point. Values are also presented at 25 feet from the delivery point which corresponds to minimum distance from the available measurement data and analysis. Values were also calculated at distances of 50 feet, 75 feet, 100 feet, and 125 feet from the delivery point and are representative of distances from which nearby properties may experience noise from a delivery.[7]

TABLE 9
ESTIMATED NOISE EXPOSURE AT VARIOUS DISTANCES FROM A DELIVERY POINT PER NUMBER OF DNL EQUIVALENT DELIVERIES

Average Daily Deliveries	Annual Deliveries	DNL at 16.4 feet[1]	DNL at 25 feet[2]	DNL at 50 feet	DNL at 75 feet	DNL at 100 feet	DNL at 125 feet
<= 1	<= 365	45.1	42.7	38.8	36.4	34.1	32.3
<= 5	<= 1,825	52.1	49.7	45.8	43.4	41.1	39.3
<= 10	<= 3,650	55.1	52.7	48.8	46.4	44.1	42.3
<= 15	<= 5,475	56.9	54.5	50.5	48.2	45.9	44.1
<= 20	<= 7,300	58.2	55.7	51.8	49.5	47.2	45.3
<= 40	<= 14,600	61.2	58.8	54.8	52.5	50.2	48.4
<= 60	<= 21,900	62.9	60.5	56.5	54.2	51.9	50.1
<= 80	<= 29,200	64.2	61.8	57.8	55.5	53.2	51.4
<= 100	<= 36,500	65.1	62.7	58.8	56.4	54.1	52.3
<= 120	<= 43,800	65.9	63.5	59.6	57.2	54.9	53.1
<= 140	<= 51,100	66.6	64.2	60.2	57.9	55.6	53.8
<= 160	<= 58,400	67.2	64.8	60.8	58.5	56.2	54.4
<= 180	<= 65,700	67.7	65.3	61.3	59.0	56.7	54.9
<= 200	<= 73,000	68.2	65.7	61.8	59.5	57.2	55.3
<= 220	<= 80,300	68.6	66.2	62.2	59.9	57.6	55.8
<= 240	<= 87,600	69.0	66.5	62.6	60.2	57.9	56.1
<= 260	<= 94,900	69.3	66.9	62.9	60.6	58.3	56.5
<= 280	<= 102,200	69.6	67.2	63.2	60.9	58.6	56.8
<= 300	<= 109,500	69.9	67.5	63.5	61.2	58.9	57.1
<=320	<=116,800	70.2	67.8	63.8	61.5	59.2	57.4
<= 340	<= 124,100	70.5	68.0	64.1	61.8	59.5	57.6
<= 360	<= 131,400	70.7	68.3	64.3	62.0	59.7	57.9
<= 380	<= 138,700	70.9	68.5	64.6	62.2	59.9	58.1
<= 400	<= 146,000	71.2	68.8	64.8	62.5	60.2	58.4
<= 420	<= 153,300	71.4	69.0	65.0	62.7	60.4	58.6
<= 440	<= 160,600	71.6	69.2	65.2	62.9	60.6	58.8
<= 460	<= 167,900	71.8	69.4	65.4	63.1	60.8	59.0
<= 480	<= 175,200	72.0	69.5	65.6	63.3	61.0	59.1

7 The 2022 US Census national average lot size for single-family sold homes was 15,265 square feet. This is representative of a property with dimensions of a 123.55 x 123.55-foot square. 125 feet represents a 125-foot lateral width of the parcel rounded up to the nearest 25 feet. https://www.census.gov/construction/chars/ See file “Soldlotsize_cust.xls” sheet MALotSizeSold. Accessed January 18, 2024.

Average Daily Deliveries	Annual Deliveries	DNL at 16.4 feet[1]	DNL at 25 feet[2]	DNL at 50 feet	DNL at 75 feet	DNL at 100 feet	DNL at 125 feet
<= 500	<= 182,500	72.1	69.7	65.8	63.4	61.1	59.3
<= 520	<= 189,800	72.3	69.9	65.9	63.6	61.3	59.5
<= 540	<= 197,100	72.5	70.1	66.1	63.8	61.5	59.7
<= 560	<= 204,400	72.6	70.2	66.2	63.9	61.6	59.8
<= 580	<= 211,700	72.8	70.4	66.4	64.1	61.8	60.0
<= 600	<= 219,000	72.9	70.5	66.5	64.2	61.9	60.1
<= 620	<= 226,300	73.1	70.7	66.7	64.4	62.1	60.3
<= 640	<= 233,600	73.2	70.8	66.8	64.5	62.2	60.4
<= 660	<= 240,900	73.3	70.9	67.0	64.6	62.3	60.5
<= 680	<= 248,200	73.5	71.1	67.1	64.8	62.5	60.7
<= 700	<= 255,500	73.6	71.2	67.2	64.9	62.6	60.8
<= 720	<= 262,800	73.7	71.3	67.3	65.0	62.7	60.9
<= 740	<= 270,100	73.8	71.4	67.5	65.1	62.8	61.0
<= 760	<= 277,400	74.0	71.5	67.6	65.3	62.9	61.1
<= 780	<= 284,700	74.1	71.7	67.7	65.4	63.1	61.3
<= 800	<= 292,000	74.2	71.8	67.8	65.5	63.2	61.4
<= 820	<= 299,300	74.3	71.9	67.9	65.6	63.3	61.5
<= 840	<= 306,600	74.4	72.0	68.0	65.7	63.4	61.6
<= 860	<= 313,900	74.5	72.1	68.1	65.8	63.5	61.7
<= 880	<= 321,200	74.6	72.2	68.2	65.9	63.6	61.8
<= 900	<= 328,500	74.7	72.3	68.3	66.0	63.7	61.9
<= 920	<= 335,800	74.8	72.4	68.4	66.1	63.8	62.0
<= 940	<= 343,100	74.9	72.5	68.5	66.2	63.9	62.1
<= 960	<= 350,400	75.0	72.6	68.6	66.3	64.0	62.2
<= 980	<= 357,700	75.1	72.6	68.7	66.4	64.1	62.2
<= 1,000	<= 365,000	75.1	72.7	68.8	66.4	64.1	62.3
<= 1,020	<= 372,300	75.2	72.8	68.9	66.5	64.2	62.4
<= 1,040	<= 379,600	75.3	72.9	68.9	66.6	64.3	62.5
<= 1,060	<= 386,900	75.4	73.0	69.0	66.7	64.4	62.6
<= 1,080	<= 394,200	75.5	73.1	69.1	66.8	64.5	62.7
<= 1,100	<= 401,500	75.6	73.1	69.2	66.9	64.6	62.7
<= 1,120	<= 408,800	75.6	73.2	69.3	66.9	64.6	62.8
<= 1,140	<= 416,100	75.7	73.3	69.3	67.0	64.7	62.9
<= 1,160	<= 423,400	75.8	73.4	69.4	67.1	64.8	63.0
<= 1,180	<= 430,700	75.9	73.5	69.5	67.2	64.9	63.1
<= 1,200	<= 438,000	75.9	73.5	69.6	67.2	64.9	63.1
<= 1,220	<= 445,300	76.0	73.6	69.6	67.3	65.0	63.2

Average Daily Deliveries	Annual Deliveries	DNL at 16.4 feet[1]	DNL at 25 feet[2]	DNL at 50 feet	DNL at 75 feet	DNL at 100 feet	DNL at 125 feet
<= 1,240	<= 452,600	76.1	73.7	69.7	67.4	65.1	63.3
<= 1,260	<= 459,900	76.2	73.7	69.8	67.5	65.1	63.3
<= 1,280	<= 467,200	76.2	73.8	69.8	67.5	65.2	63.4
<= 1,300	<= 474,500	76.3	73.9	69.9	67.6	65.3	63.5
<= 1,320	<= 481,800	76.4	73.9	70.0	67.7	65.3	63.5
<= 1,340	<= 489,100	76.4	74.0	70.0	67.7	65.4	63.6
<= 1,360	<= 496,400	76.5	74.1	70.1	67.8	65.5	63.7
<= 1,380	<= 503,700	76.5	74.1	70.2	67.8	65.5	63.7
<= 1,400	<= 511,000	76.6	74.2	70.2	67.9	65.6	63.8
<= 1,420	<= 518,300	76.7	74.3	70.3	68.0	65.7	63.9
<= 1,440	<= 525,600	76.7	74.3	70.4	68.0	65.7	63.9
<= 1,460	<= 532,900	76.8	74.4	70.4	68.1	65.8	64.0
<= 1,480	<= 540,200	76.9	74.4	70.5	68.1	65.8	64.0
<= 1,500	<= 547,500	76.9	74.5	70.5	68.2	65.9	64.1
<= 1,520	<= 554,800	77.0	74.6	70.6	68.3	66.0	64.2
<= 1,540	<= 562,100	77.0	74.6	70.6	68.3	66.0	64.2
<= 1,560	<= 569,400	77.1	74.7	70.7	68.4	66.1	64.3
<= 1,580	<= 576,700	77.1	74.7	70.8	68.4	66.1	64.3
<= 1,600	<= 584,000	77.2	74.8	70.8	68.5	66.2	64.4
<= 1,620	<= 591,300	77.2	74.8	70.9	68.5	66.2	64.4
<= 1,640	<= 598,600	77.3	74.9	70.9	68.6	66.3	64.5
<= 1,660	<= 605,900	77.3	74.9	71.0	68.6	66.3	64.5
<= 1,680	<= 613,200	77.4	75.0	71.0	68.7	66.4	64.6
<= 1,700	<= 620,500	77.5	75.0	71.1	68.8	66.4	64.6
<= 1,720	<= 627,800	77.5	75.1	71.1	68.8	66.5	64.7
<= 1,740	<= 635,100	77.6	75.1	71.2	68.9	66.5	64.7
<= 1,760	<= 642,400	77.6	75.2	71.2	68.9	66.6	64.8
<= 1,780	<= 649,700	77.7	75.2	71.3	69.0	66.6	64.8
<= 1,800	<= 657,000	77.7	75.3	71.3	69.0	66.7	64.9
<= 1,820	<= 664,300	77.7	75.3	71.4	69.0	66.7	64.9
<= 1,840	<= 671,600	77.8	75.4	71.4	69.1	66.8	65.0
<= 1,860	<= 678,900	77.8	75.4	71.5	69.1	66.8	65.0
<= 1,880	<= 686,200	77.9	75.5	71.5	69.2	66.9	65.1
<= 1,900	<= 693,500	77.9	75.5	71.6	69.2	66.9	65.1
<= 1,920	<= 700,800	78.0	75.6	71.6	69.3	67.0	65.2
<= 1,940	<= 708,100	78.0	75.6	71.6	69.3	67.0	65.2
<= 1,960	<= 715,400	78.1	75.7	71.7	69.4	67.1	65.3

Average Daily Deliveries	Annual Deliveries	DNL at 16.4 feet[1]	DNL at 25 feet[2]	DNL at 50 feet	DNL at 75 feet	DNL at 100 feet	DNL at 125 feet
<= 1,980	<= 722,700	78.1	75.7	71.7	69.4	67.1	65.3
<= 2,000	<= 730,000	78.2	75.7	71.8	69.5	67.2	65.3

Notes:

1. Minimum possible listener distance from drone.
2. Minimum measured distance to listener from drone.
3. The DNL values presented in this table reflect the drone conducting delivery descent and transition, backyard descent, delivery, backyard ascent, and transition and inbound climb flight maneuvers associated with a delivery.
4. If a value for deliveries is not specifically defined in this table, use the next highest value. For example, if there are 50 average daily DNL equivalent deliveries, use the entry for 60 average daily DNL equivalent deliveries.

Source: ESA, 2025.

Attachment A

Federal Aviation Administration

Memorandum

Date: March 25, 2026

To: Dave Senzig, Manager (Acting), Noise Division, Office of Environment and Energy (AEE-100)

From: Chris Hurst, Flight Standards (AFS), General Aviation and Commercial Branch, AFS-752
CHRISTOPHER A HURST Digitally signed by CHRISTOPHER A HURST Date: 2026.03.25 08:57:39 -05'00'

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for MK-30 Amazon Prime Air Operations in Chicago IL

AFS requests AEE approval of the noise methodology to be used for the Environmental Assessment (EA) for Amazon Prime Air (Amazon) operations using the Amazon MK30 unmanned aircraft (UA) in Chicago, IL to expand its package delivery services as a 14 CFR Part 135 operator as described below.

As required under the National Environmental Policy Act (NEPA), the FAA must consider the potential for environmental impacts in informing the agency's decision to approve Federal actions, including the potential for noise impacts as detailed in FAA Order 1050.1G.

As the FAA does not currently have a standard approved noise model for UA, this letter serves as a request for written approval from AEE to use the methodology proposed in the following sections to support the noise analysis for the EA.

Description of Aircraft and Proposed Operations

AFS is evaluating Amazon's proposal to conduct package delivery operations from four Prime Air Drone Delivery Centers (PADCCs) located in Chicago, IL and associated operating areas under its existing Part 135 air carrier certificate and related operating authorizations using the MK30 UA. Amazon is proposing to perform package delivery operations within the proposed Chicago, IL operating areas to transport packages to delivery sites including residential homes.

The MK30 UA has six (6) propulsors allowing it to take-off and land vertically and transition to wing borne flight (WBF). Its airframe is composed of staggered tandem wings for stable WBF. The drone weighs 77.9 lbs. (35.5 kg) and has a maximum takeoff weight of 83.2 lbs. (37.8 kg), which includes a maximum payload of 5 lbs. (3 kg). It has a maximum operating range of 7.5 mi (12 km). It is a hybrid multicopter fixed-wing UA that uses electric power from rechargeable lithium- ion batteries and can fly up to 400 ft (122 m) above ground level (AGL) at a maximum cruise speed of 73 mph (64 knots) during WBF. It is launched vertically using powered lift and converts to using wing lift during en route flight. A typical flight profile can be broken into the following general flight phases: launch, en route outbound, delivery, en route inbound, and landing. After launch, Amazon's MK30 UA would rise to an altitude of less than 400 ft (122 m) AGL and follow a predefined route to its delivery site.

Aircraft would typically fly en route at between approximately 180 to 377 ft (55 to 115 m) AGL, except when descending to drop a package. Packages would be carried internally in the UA's fuselage. When making a delivery, the UA descends, opens a set of payload doors, and drops the package to the ground from approximately 13 ft (4 m) AGL.

Amazon's UA would not touch the ground in any place other than the PADDC (except during safe contingent landings) and will remain airborne throughout the operation including the delivery stage. After the package is dropped, the MK30 UA climbs vertically and follows its predefined route back to the PADDC at its assigned altitude.

Amazon is seeking to amend its current Operation Specifications (OpSpec) and other Federal Aviation Administration (FAA) authorizations needed to integrate the MK30 and expand drone commercial package delivery operations.

Prime Air anticipates operating up to 1,000 delivery flights per operating day, up to 16.5 hours per day, and 7 days per week, from each of the four PADDCs. These operational levels would result in a projected total of approximately 365 operating days and 365,000 delivery operations per year for each PADDC, based on the scope of the Proposed Action. The operations would occur between 6 A.M. and 10:30 P. M. and are anticipated to be distributed evenly across each of the four operating areas. The MK30's proposed operating range is 7.5 mi from each PADDC, with a potential operating area for each PADCC of 175 sq mi. The drone departure and arrival paths from and to each PADDC would generally correspond to the geographical location of the package delivery address. Based on those overall levels Amazon expects deliveries to be distributed among delivery locations throughout the operating areas with a minimum number of 0.1 deliveries per day or less and maximum of 4.0 per day at any one location on an AAD basis.

Noise Analysis Methodology

AFS requests to use the noise analysis methodology described in ESA Report No. 202200549.05 for the "Estimated Noise Levels for Amazon Prime Air MK30 Drone Technical Noise Report" dated September 2025.

Federal Aviation Administration

Memorandum

Date: March 26, 2026

To: Chris Hurst, Flight Standards (AFS), General Aviation and Commercial Branch (AFS-752)

From: David Senzig, Manager (Acting), Noise Division, Office of Environment and Energy (AEE-100)

DAVID ALAN SENZIG
2026.03.26 07:28:21
-04'00'

Subject: Environmental Assessment (EA) Noise Methodology Approval Request for Amazon Prime Air Commercial Package Delivery Operations with the MK30 Unmanned Aircraft (UA) from Chicago, Illinois

The Office of Environment and Energy (AEE) has reviewed the proposed non-standard noise modeling methodology to be used for Amazon Prime Air (Amazon) operations using the MK30 unmanned aircraft (UA) from Chicago, Illinois. This request is in support of an Environmental Assessment (EA) for Amazon to provide package delivery services as a 14 CFR Part 135 operator in Chicago and surrounding operating areas.

The Proposed Action is for Amazon to use the MK30 UA to conduct package delivery operations under its existing Part 135 air carrier certificate from four Prime Air Drone Delivery Centers (PADCCs) to potential delivery locations such as residential homes within a set of four proposed operating areas in Chicago. Typical operations of the MK30 UA will consist of departure from a launch/takeoff pad at the PADCC followed by a vertical climb to a typical enroute altitude of 180 to 377 feet above ground level (AGL). The UA then transitions from vertical to horizontal wing borne flight (WBF) for transit to a delivery location. Approaching the delivery location, the UA will transition from horizontal WBF to vertical flight and then descend vertically over the delivery point. At 13 feet AGL, the UA drops the package at the delivery point and ascends vertically back to enroute altitude. Once back at enroute altitude, the UA again transitions from vertical to horizontal WBF for transit back to its originating PADDC. When the UA arrives at the PADDC, the UA will transition from horizontal WBF to vertical flight and vertically descend to its assigned landing pad. Once it lands, the UA is serviced and prepared for the next delivery.

Under the scope of the Proposed Action Amazon projects conducting a maximum of 365,000 deliveries between the Beginning of Morning Civil Twilight and the End of Evening Civil Twilight but never outside the hours 06:00 to 22:30. It is expected that 10% of the deliveries will occur outside of 07:00 to 22:00; therefore, the nighttime operation noise penalty will result in an equivalent average daily deliveries at each site of 1,900 total deliveries on an average annual daily (AAD) basis at each of the four PADCC's and associated operating areas. Based on those overall levels Amazon expects deliveries to be distributed among delivery locations with a minimum number of 0.1 deliveries per day or less and maximum of 4.0 per day at any one location within the proposed operating area on an AAD basis.

As the FAA does not currently have a standard approved noise model for assessing UA, and in accordance with FAA Order 1050.1F, all non-standard noise analysis in support of the noise impact analysis for the National Environmental Policy Act (NEPA) must be approved by AEE. This letter serves as AEE's response to the method developed in ESA Report No. 202200549.05 for the "Estimated Noise Levels for Amazon Prime Air MK30 Drone Technical Noise Report" dated September 2025.

The proposed methodology appears to be adequate for this analysis; therefore, AEE concurs with the methodology proposed for this project. Please understand that this approval is limited to this particular Environmental Review, location, vehicle, and circumstances. Any additional projects using this or other methodologies or variations in the vehicle will require separate approval.

Attachment B

PRIME AIR MK30 DRONE NOISE MEASUREMENT REPORT

Technical Report

April 2025

PRIME AIR MK30 DRONE NOISE MEASUREMENT REPORT

Technical Report

April 2025

5404 Cypress Center Drive
Suite 125
Tampa, FL 33609
813.207.7200
esassoc.com

Bend	**Orlando**	**San Jose**
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Los Angeles	**San Diego**	
Oakland	**San Francisco**	

202200549.04

TABLE OF CONTENTS

Page:

Tables:

Figures:

1 Introduction

This document details Amazon Prime Air's (Prime Air's) recent National Environmental Policy Act (NEPA) Noise Data Collection Campaign, aimed at estimating the noise signature of the MK30 drone. The collected data will be used to evaluate operations under NEPA. The test campaign took place at the Pendleton UAS Range, situated at the Eastern Oregon Regional Airport (KPDT) in Pendleton, Oregon. The data analyzed in this report comes from flights conducted on October 11, 12, 15, 16, 19, and 23, 2024.

Prime Air's package delivery operations are managed through a network of Prime Air Drone Delivery Centers (PADDCs). Each PADDC serves a specific area, preventing an over-concentration of flights around any single center. The MK30 drone has a round-trip range of approximately 15 miles. PADDCs are strategically located in established, and planned development, parking lots of Amazon Prime warehouses, and adhere to local zoning and land use regulations.

The MK30 is an electric powered drone that uses a vertical take-off and landing (VTOL) then transitions to fixed-wing flight using wing lift during en route flight. The drone systems include hardware and software designed for safety and efficiency. The airframe is composed of staggered wings, the propulsion system includes a rechargeable lithium-ion battery, and six (6) motors that include propellers designed for noise reduction. The package delivery system contains the package in a two-door interior receptacle, and a camera and avionics system that has redundancy for critical systems. The drone weighs approximately 78 lbs. and has a maximum takeoff weight of 83.2 lbs., which includes a maximum payload of 5 lbs. It has a maximum operating range of 7.5 mi and can fly up to 400 ft above ground level (AGL) at a maximum cruise speed of 73 mph (64 knots) during horizontal flight. An image of the MK30 drone is shown in **Figure 1**.

The MK30 operational flight profiles can be broken into the following general flight phases: launch, en route outbound, delivery, en route inbound, and landing. After launch, the MK30 would ascend to an altitude of less than 400 ft AGL and follow a predefined route to its delivery site.[1] The MK30 would typically fly en route at between approximately 180 to 377 ft AGL, except when descending to drop a package. Packages would be carried internally in the drone's fuselage. When making a delivery, the drone descends, opens a set of payload doors, and drops the package to the ground from approximately 13 ft AGL. Prime Air's drone would not touch the ground in any place other than the PADDC (except during safe contingent landings) and will remain airborne throughout the operation including the delivery stage.[2] After the package is dropped, the MK30 drone climbs vertically and follows its predefined route back to the PADDC at its assigned altitude. The typical operational flight parameters can be seen below in **Table 1** and **Figure 2**. Note that these are the flight profiles for operational flights and not the flight test profiles for this noise flight test campaign.

[1] Prime Air may modify operations, if warranted, to avoid or minimize any negative impacts.

[2] The MK30 vehicle is built with multiple redundant safety features and "detect and avoid" technology. The drone is designed to handle unexpected situations; it is independently safe.

A custom measurement system was utilized, employing GRAS 46AO 1/2" pressure microphones and National Instruments data acquisition hardware, following the FAA's draft UA package delivery noise measurement protocol.[3] Flights were conducted across three flight profiles, which included takeoff/landing/delivery, hover, and overflight, to characterize the sound exposure levels (SEL) of the MK30 drone. These SEL values will be a key input to the NEPA Environmental Assessment for assessing the potential noise impact of Prime Air's proposed drone package delivery operations.

Figure 1. Amazon Prime Air MK30 Drone

Source: Amazon Prime Air, 2024.

[3] Measuring Drone Noise for Environmental Review Process, October 2023.

Table 1. Phases of Flight for Typical Flight Profile of the MK30 Drone

Phase of Flight	Altitude (feet AGL)	Ground Speed (knots)	Duration (seconds)
Takeoff and Vertical Ascent	Ascent from 0 to 115	0	15
Transition and Outbound Climb	115 to 200	0 to 58.3	40
Fixed Wing Outbound Cruise	200[1]	58.3	Variable[3]
Delivery Descent and Transition	Descent from 200 to 140	58.3 to 0	30
Backyard Descent	Descent from 140 to 13	0	27
Delivery	13	0	4
Backyard Ascent	Ascent from 13 to 197	0	30
Transition and Inbound Climb	Ascent from 197 to 345	0 to 58.3	40
Fixed-Wing Inbound Cruise	377[2]	58.3	Variable[3]
Landing Descent and Transition	Descent from 345 to 197	58.3 to 0	30
Vertical Descent and landing	Descent from 197 to 0	0	35

Source: Prime Air, 2025.

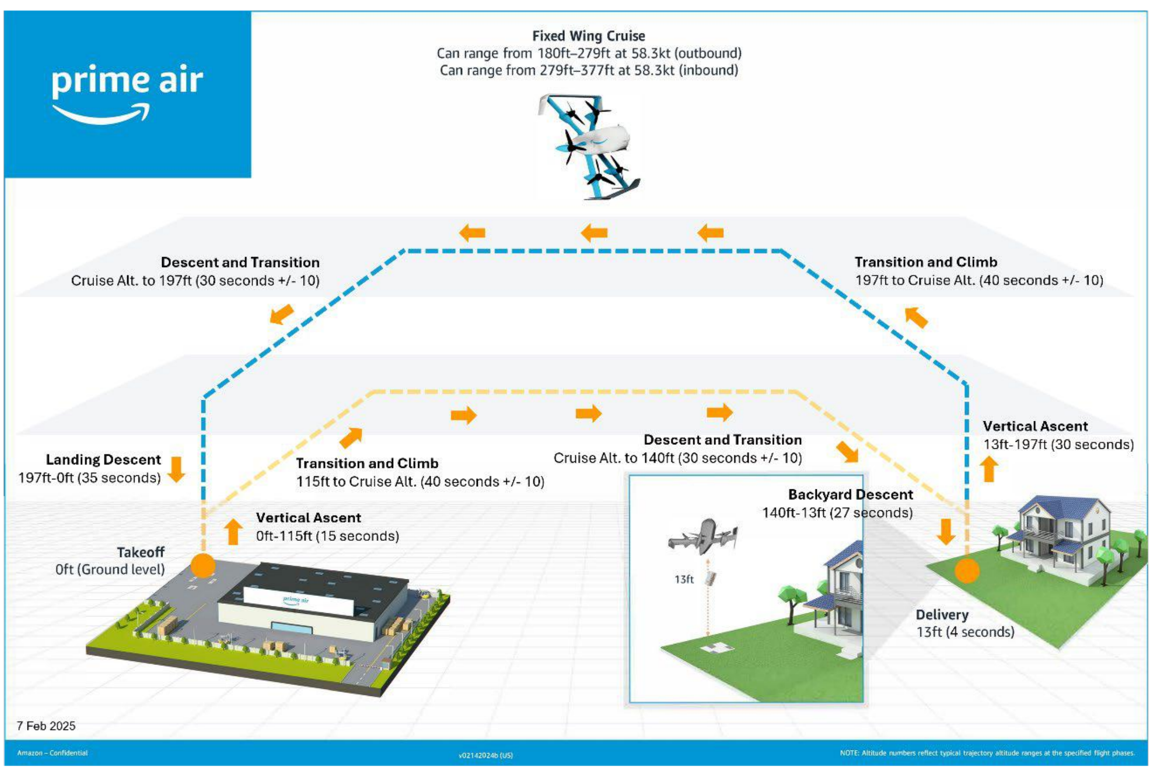
Notes:

[1] The outbound enroute altitude may range from 180 – 279 feet. For this analysis the outbound cruise altitude was assumed to be 200 feet.

[2] The inbound enroute altitude may range from 279 – 377 feet. For this analysis the inbound cruise altitude was assumed to be 345 feet.

[3] Duration of inbound and outbound cruise flight time varies based on distance to customer.

Figure 2. Representative Operational Profile of the MK30



Source: Prime Air, 2025.

2 Test Descriptions

2.1 Overview

This section describes the methodology utilized to characterize the noise signature of the MK30 drone. The following sections describe the measurement system, and detailed description of the test plan, including flight trajectories and microphone locations.

2.2 Measurement System

Prime Air utilized a proprietary Mobile Acoustic Noise Test Array (MANTA) system for experimental measurements. This system provides time synchronized audio with respect to the drone. Microphone locations are surveyed for accurate positioning. The audio, drone-synchronized time and location data allow accurate determination of sound pressure level (SPL), distance, and incidence angle required for post-processing.

The system is composed of commercially available hardware with internal and external calibrations. The data acquisition system (DAQ) is a series of daisy-chained National Instruments cDAQ-9185 units and cDAQ-9189 units with NI-9234 analog modules capable of 51.2 kHz sampling rate at 24-bit resolution. New and calibrated GRAS 46AO ½" CCP Pressure Standard Microphones were used with the factory sensitivity values for the test. Calibration tones of the microphones were collected using a GRAS 42AG sound calibrator with a 1000 Hz signal at 114dB at the start and completion of each flight. Sensitivity values can be found in **Table 2**. While the primary components of the system are detailed above, the complete system hardware can be found in **Table 3**.

Measurement accuracy can be decomposed into system and field-installation components. Although MANTA has a GPS assigned to each microphone unit, only the time solution is used in the final product. By assigning a separate GPS unit to each microphone, the system is able to time synchronize with the on-board vehicle system to within 1 ms accuracy. Although the GPS location solution is not part of the delivered data product, it is used to confirm microphone placement with respect to desired survey locations using a nearest neighbor algorithm. This reduces geographic microphone placement from ±1 m to ±5 mm before installation error. When including a ±30◦. installation error via a 1.6m tall tripod on non-level ground, horizontal and vertical location accuracy approach ±0.8m and ±0.1m, respectively.

Table 2. Microphone Data

Microphone ID	Hardware	Serial Number	Sensitivity (mV/Pa)
00	GRAS 46AO	573631	10.77
01	GRAS 46AO	573508	9.47
02	GRAS 46AO	573632	11.60
03	GRAS 46AO	573507	12.54
04	GRAS 46AO	573633	10.81
05	GRAS 46AO	573636	10.41
06	GRAS 46AO	573506	11.12
07	GRAS 46AO	573505	12.78
08	GRAS 46AO	573504	9.39
08	GRAS 46AO	573504	9.39
10	GRAS 46AO	573521	10.10
11	GRAS 46AO	573626	10.19
12	GRAS 46AO	573639	9.78

Source: Prime Air, 2024.

Note: Microphones calibrated with GRAS 42AG; Serial Number: 282324.

Table 3. Measurement System Hardware

Hardware	Quantity	Description
National Instruments cDAQ-9185	7	National Instruments cDAQ chassis with 4 module slots. 1 slot was utilized and populated with a NI-9234 4 channel Sound and Vibration module. 1 channel input was used for the GRAS 46AO microphone input.
National Instruments cDAQ-9189	3	National Instruments cDAQ chassis with 8 module slots. 1 slot was utilized and populated with a NI-9234 4 channel Sound and Vibration module. 2 channel inputs were used for the GRAS 46AO microphone input.
National Instruments Sound and Vibration Module NI-9234	10	The Sound and Vibration module used for microphone input to the system. The nidaqmx task was configured to capture microphone input at 51.2kHz at 24bits.

Source: Prime Air, 2024.

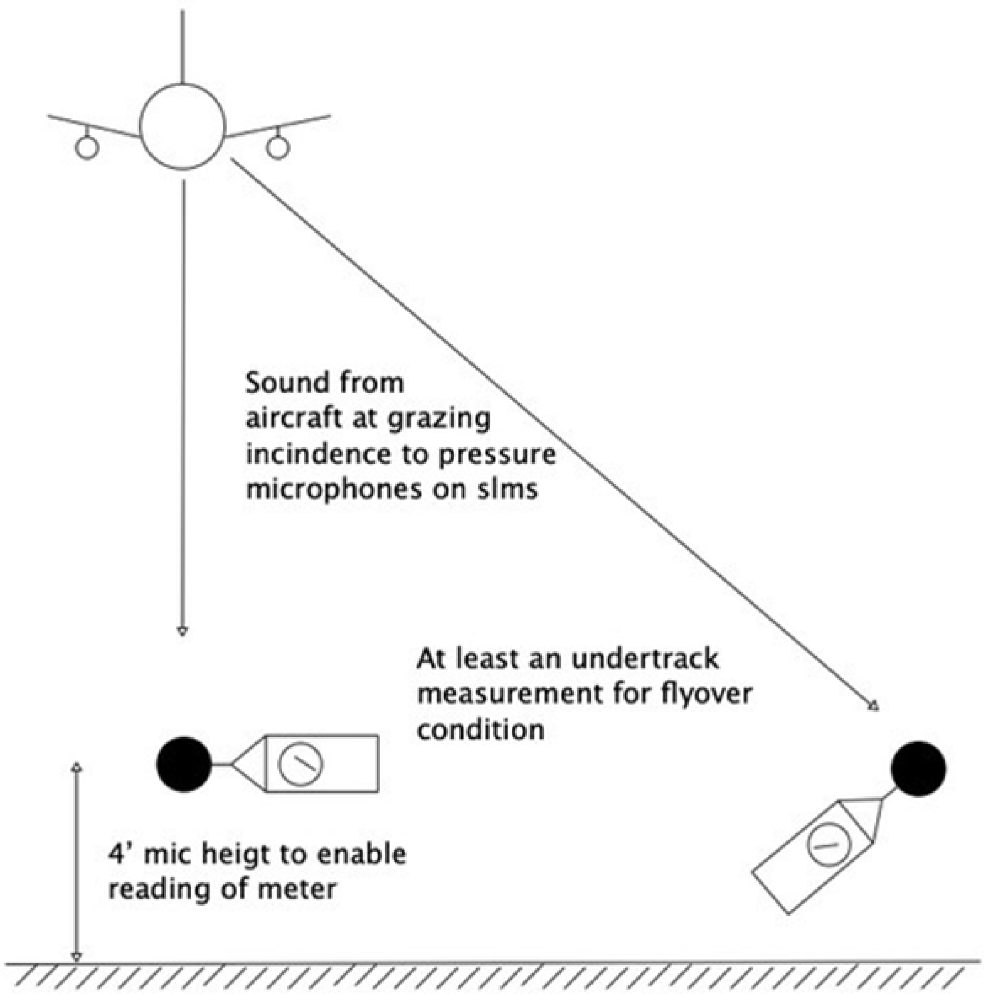
Note: All cDAQs were daisy chained together and utilized the Time-Sensitive Networking protocol to keep all data synchronized.

2.3 Microphone Locations

The microphone setup consisted of 13 pressure field microphones. In accordance with the FAA guidelines, each microphone was placed at 90 degree incidence to the sound source (drone) and is illustrated in **Figure 3**. There were no corrections applied to the measurement data due to the orientation of the microphones.

As shown in **Table 4**, microphones 00-04 were located under the takeoff, delivery, and landing flight trajectory. Microphones 05-08 were located behind the flight trajectory. Microphones 09-12 were located lateral to the flight trajectory. The table identifies the microphones used in calculating the various flight profiles. **Figure 4** provides the layout of microphones over an aerial basemap.

Figure 3. Microphone Orientation



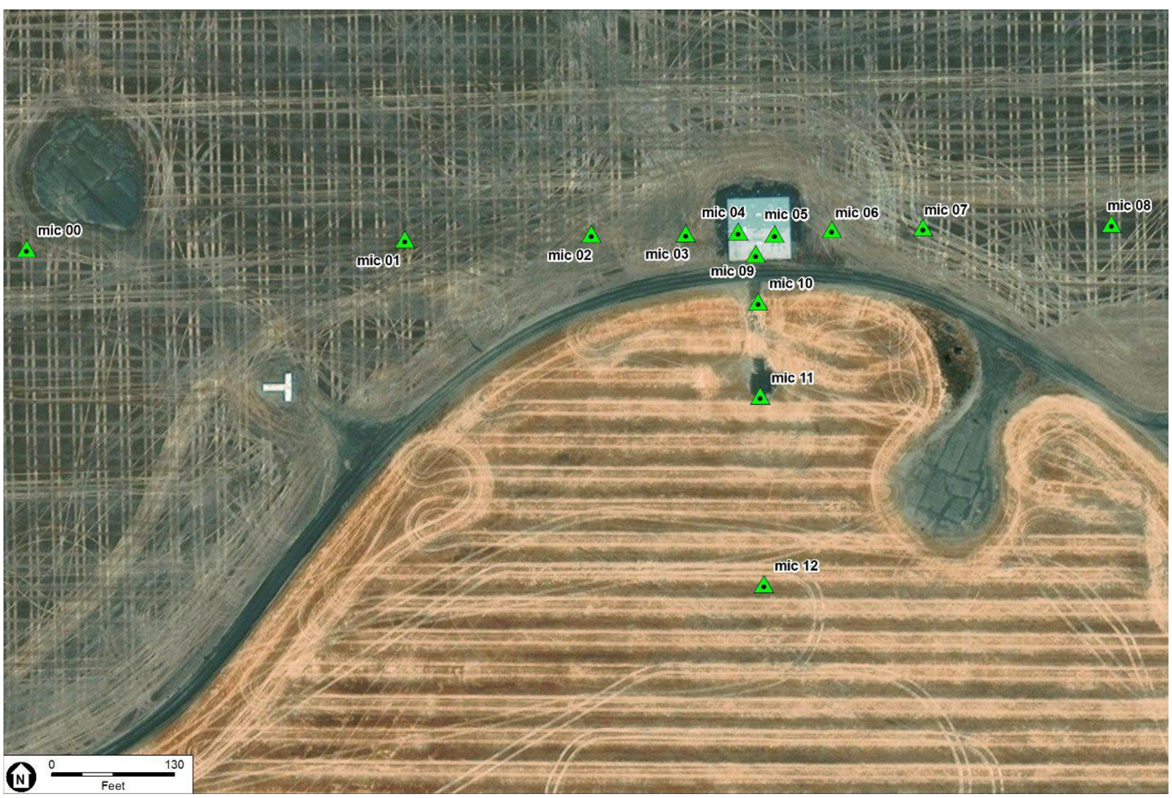
Source: FAA.

Table 4. Microphone Location and Applicable Flight Profile

Microphone ID (position)	Distance from VTOL / Delivery (ft)	Latitude	Longitude	Applicable Flight Profile		
				Takeoff/ Landing	Delivery	Enroute/ Overflight
00 (Undertrack)	772	45.70246	-118.8586	Yes	Yes	No
01 (Undertrack)	372	45.70247	-118.8571	Yes	Yes	No
02 (Undertrack)	195	45.70247	-118.8563	Yes	Yes	No
03 (Undertrack)	75	45.70247	-118.8559	Yes	Yes	No
04 (Undertrack)	20	45.70247	-118.8557	Yes	Yes	No
05 (Behind)	19	45.70246	-118.8555	Yes	Yes	No
06 (Behind)	79	45.70247	-118.8553	Yes	Yes	No
07 (Behind)	176	45.70247	-118.8549	Yes	Yes	No
08 (Behind)	375	45.70247	-118.8541	Yes	Yes	No
09 (Lateral)	25	45.7024	-118.8556	Yes	Yes	Yes
10 (Lateral)	76	45.70227	-118.8556	Yes	Yes	Yes
11 (Lateral)	175	45.70199	-118.8556	Yes	Yes	Yes
12 (Lateral)	375	45.70144	-118.8556	Yes	Yes	Yes

Source: Prime Air, 2024.

Figure 4. Location of Microphones to Launch Pad



Source: Prime Air, 2024; ESA, 2025.

2.4 Test Limitations

The test plan consists of flights with a “dog-bone” and “half dog-bone” trajectory while the MANTA (detailed in 2.2) is positioned at the vicinity of the delivery/takeoff/landing PADDC and along a parallel and perpendicular line to the flyover trajectory. Close-in and distant measurements were captured for all VTOL phases of flight.

Additionally, some phases of the test flight profiles were slightly modified from typical operations. The duration of the delivery backyard climb was, on average, 16 seconds shorter than expected for typical operation. During the test flight the drone also climbed to a lower altitude of approximately 200 feet AGL, compared to the typical 345-foot AGL ceiling. To adjust, noise measurements were manually added at the point just before the MK30 stops climbing, where the climb rate is constant, to account for the total missing duration.

Similarly, for the return to the PADDC, the VTOL descent was, on average, 10 seconds shorter than typical operations. To adjust, noise measurements were manually added at the point just after the MK30 starts its vertical descent, where the descent rate is constant, to account for the total missing duration. Both adjustments provided a conservative (i.e., louder) approach to assessing noise exposure of the MK30.

3 Measurement Profiles

3.1 Overview

The noise measurement data for each test was reviewed and takeoff, delivery, landing, and overflight events were hand-selected for each test flight based on the drone’s altitude, speed, location, and distance from the PADDC and MANTA. Events were reviewed for each test flight and each microphone in the MANTA was checked for data quality, and were discarded based on the following criteria:

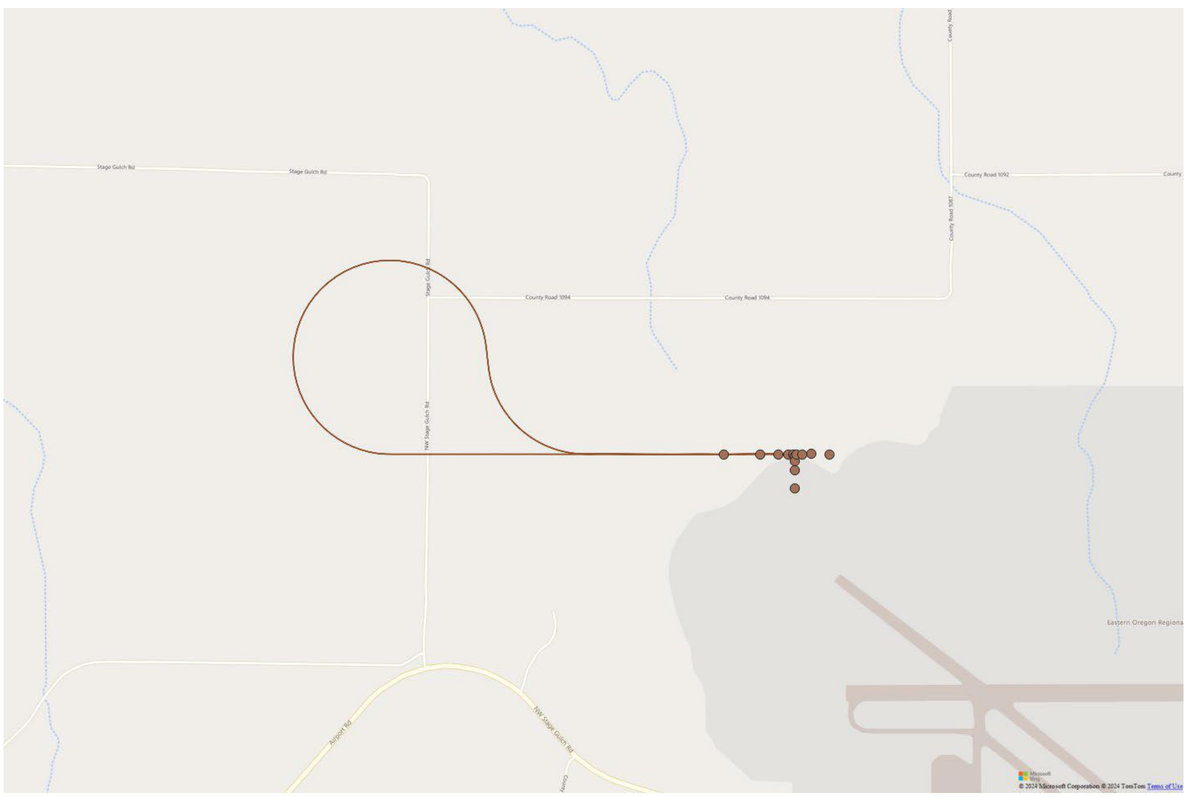
- Ambient noise level of the microphone is not reasonably close to the other microphones in the MANTA array.
- Average wind speed exceeding 5 knots during the event.
- Maximum sound level as measured by the 1-second Leq time history of the noise event not exceeding 10 dBA above the ambient noise level.
- Suspected contamination of the noise data (e.g. elevated or inconsistent ambient, sharp spikes in noise level, etc.).
- For overflight tests, data from the undertrack microphones (parallel to the direction of flight) were discarded.

3.2 Flight Test Profiles

3.2.1 Takeoff – Delivery – Landing (VTOL)

Two sets of tests were conducted with the drone performing VTOL flights at the PADDC location at the center of the MANTA to simulate takeoff, delivery, and landing operations. A total of six test flights were measured with the drone carrying no payload, and an additional seven test flights were measured with the drone carrying maximum payload. For each of these test flights the drone was flown in a "half dog-bone" flight pattern, as shown in **Figure 5**. As depicted, the drone takes off from the PADDC, and heads west before making a righthand turn through a full 270 degrees while attaining a cruise altitude of approximately 200 feet AGL. The drone then makes a left-hand 90 degree turn to re-align with the outbound flight path while descending back to PADDC elevation. The drone performs this flight pattern twice per test flight. The first outbound leg represents the takeoff phase of flight, the first inbound and second outbound legs combined represent the delivery phase of flight, and the second inbound leg represents the landing phase of flight. The drone only touches down after the second inbound leg representing the landing phase.

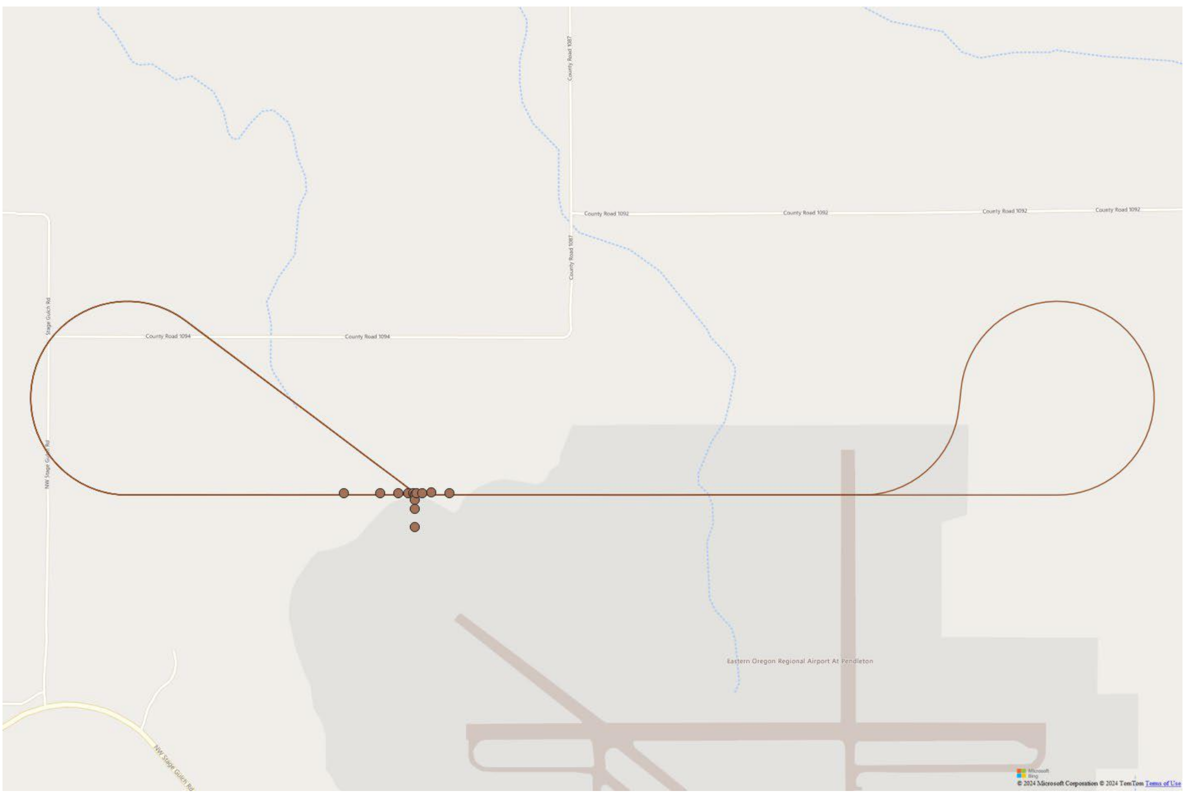
Figure 5. Takeoff, Delivery, and Landing Flight Pattern (Empty and MTOW)



3.2.2 Forward Flight (Flyover)

Two sets of tests were conducted with the drone overflying the MANTA to simulate an en route pass-by. A total of seven overflights were measured with the drone carrying no payload, and an additional six overflights were measured with the drone carrying maximum payload. For each of these overflights the drone was flown in a "dog-bone" flight pattern, as shown in **Figure 6**. As depicted, the drone takes off from the PADDC, heads northwest to transition and makes a lefthand turn while attaining a cruise altitude of 104 feet AGL at empty weight and 123 feet AGL at max weight.[4] It then flies over the MANTA, then performs another lefthand turn through a full 270 degrees before turning right 90 degrees to realign with the eastbound portion of the flight path before overflying the MANTA again, and finally reversing the original outbound route back to the PADDC. This maneuver was repeated for each flight in both the max and empty weight test scenarios.

Figure 6. Flyover Flight Pattern (Empty and MTOW)



[4] Empty and max weight en route flight tests were flown at different altitudes to ensure measurement was above ambient noise levels.

3.3 Test Condition: Takeoff (Max Weight)

3.3.1 Weather Conditions

The average weather conditions for each test at max weight are shown in **Table 5**. There were no weather exceedances that would deem measurements invalid.

Table 5. Takeoff (Max Weight) Weather Conditions

Test Number	Temperature (°F)	Average Wind Speed (knots)	Wind Direction (Degrees)	Average Wind Gust Speed (knots)	Relative Humidity (%)
1	49.3	4.4	114	6.2	56.5
2	55.5	2.0	165	3.5	43.9
3	59.7	4.0	275	7.4	36.4
4	60.1	3.6	233	7.0	35.6
5	50.0	3.4	101	4.3	52.7
6	45.8	4.0	90	4.9	62.5
7	47.8	4.0	121	6.2	60.2

Source: Prime Air, 2024; ESA, 2025.

3.3.2 Test Points and Validity

Appendix B and **Appendix C** present the tabulated and time history results, respectively, for all measurements. Out of the 91 data points, 17 were identified as invalid, as detailed in the **Table 6**. Therefore, 74 data points were deemed valid.

Table 6. Takeoff (Max Weight) Excluded Measurements

Microphone ID (position)	Test Number	Reason Not Included
Mic 00 (Undertrack)	7	Measurement too close to ambient
Mic 05 (Behind)	4	Elevated ambient levels across measurement
Mic 08 (Behind)	1, 5, 6, 7	Measurement too close to ambient
Mic 09 (Lateral)	1, 2, 3, 4, 5	Elevated ambient levels across measurement
Mic 12 (Lateral)	2, 3, 4, 5, 6, 7	Measurement too close to ambient

Source: Prime Air, 2024; ESA, 2025.

Notes: Measurement data that has been excluded under this noise analysis are presented in Appendix B and Appendix C.

3.4 Test Condition: Delivery (Max Weight)

3.4.1 Weather Conditions

The average weather conditions for each test at max weight are shown in **Table 7**. There were no weather exceedances that would deem measurements invalid.

Table 7. Delivery (Max Weight) Weather Conditions

Test Number	Temperature (°F)	Average Wind Speed (knots)	Wind Direction (Degrees)	Average Wind Gust Speed (knots)	Relative Humidity (%)
1	49.1	4.1	123	6.0	56.6
2	55.6	1.2	260	3.7	43.5
3	59.8	5.0	283	7.4	36.3
4	60.3	4.6	222	6.2	35.2
5	50.6	2.9	92	4.3	52.3
6	45.8	4.5	93	4.9	62.8
7	47.9	4.2	112	6.2	59.7

Source: Prime Air, 2024; ESA, 2025.

3.4.2 Test Points and Validity

Appendix B and **Appendix C** present the tabulated and time history results, respectively, for all measurements. Out of the 91 data points, 14 were identified as invalid, as detailed in **Table 8**. Therefore, 77 data points were deemed valid.

Table 8. Delivery (Max Weight) Excluded Measurements

Microphone ID (position)	Test Number	Reason Not Included
Mic 00 (Undertrack)	7	Elevated ambient levels across measurement
Mic 08 (Behind)	5, 6, 7	Measurement too close to ambient
Mic 09 (Lateral)	1, 2, 3, 4, 5	Elevated ambient levels across measurement
Mic 12 (Lateral)	2, 3, 4	Elevated ambient levels across measurement
Mic 12 (Lateral)	5, 6	Measurement too close to ambient

Source: Prime Air, 2024; ESA, 2025.

Notes: Measurement data that has been excluded under this noise analysis are presented in Appendix B and Appendix C.

3.5 Test Condition: Landing (Empty Weight)

3.5.1 Weather Conditions

The average weather conditions for each test at empty weight are in **Table 9**. Test 3 wind speed exceeded the weather threshold for wind and would invalidate the measurement.

Table 9. Landing (Empty Weight) Weather Conditions

Test Number	Temperature (°F)	Average Wind Speed (knots)	Wind Direction (Degrees)	Average Wind Gust Speed (knots)	Relative Humidity (%)
1	51.5	3.4	309	6.8	61.3
2	62.4	1.2	298	6.0	33.0
3	61.4	5.2	321	7.8	34.7
4	59.9	3.4	271	5.2	44.6
5	42.6	4.8	118	5.6	83.0
6	56.8	1.0	108	2.1	51.1

Source: Prime Air, 2024; ESA, 2025.

3.5.2 Test Points and Validity

Appendix B and **Appendix C** present the tabulated and time history results, respectively, for all measurements. Out of the 78 data points, 35 were identified as invalid, as detailed in **Table 10**. Therefore, 43 data points were deemed valid.

Table 10. Landing (Empty Weight) Excluded Measurements

Microphone ID (position)	Test Number	Reason Not Included
Mic 00-12 (all)	3[1]	Exceeds crosswind component
Mic 01	4	Elevated ambient levels across measurement
Mic 05	1, 4, 6	Elevated ambient levels across measurement
Mic 08	4, 5, 6	Elevated ambient levels across measurement
Mic 09	1, 6	Elevated ambient levels across measurement
Mic 10	2	Elevated ambient levels across measurement
Mic 12	2	Elevated ambient levels across measurement
Mic 00	1, 2, 4, 5, 6	Measurement too close to ambient
Mic 01	5	Measurement too close to ambient
Mic 08	1	Measurement too close to ambient
Mic 11	5	Measurement too close to ambient
Mic 12	1, 4, 6	Measurement too close to ambient

Source: Prime Air, 2024; ESA, 2025.

Notes:

Measurement data that has been excluded under this noise analysis are presented in Appendix B and Appendix C.

[1] Test 3 was invalid for all microphone positions and accounts for 13 data points.

3.6 Test Condition: Flyover (Empty Weight)

3.6.1 Weather Conditions

The average weather conditions for each test at empty weight are shown in **Table 11**. Test 3-1, 3-2, and 4-2 wind speeds exceeded the weather threshold for wind and would invalidate the measurement.

Table 11. Flyover (Empty Weight) Weather Conditions

Test Number	Temperature (°F)	Average Wind Speed (knots)	Wind Direction (Degrees)	Average Wind Gust Speed (knots)	Relative Humidity (%)
1-1	45.3	4.0	102	4.5	62.8
1-2	45.5	3.8	93	4.5	62.2
2-1	65.1	2.4	177	4.1	38.7
2-2	65.1	3.0	213	4.1	38.4
3-1	62.2	5.9	326.2	10.9	34.6
3-2	62.8	7.5	312.6	10.9	35.6
4-1	63.3	4.3	300	11.1	34.1
4-2	63.9	6.4	353.4	10.7	33.9
5-1	61.3	2.2	320	9.9	37.8
5-2	61.7	3.0	341	9.9	37.4
6-1	61.3	4.4	34	9.1	37.3
6-2	61.0	2.6	22	7.4	37.0
7-1	45.5	4.2	102	4.7	61.5
7-2	45.7	3.9	105	4.7	61.3

Source: Prime Air, 2024; ESA, 2025.

3.6.2 Test Points and Validity

Appendix B and **Appendix C** present the tabulated and time history results, respectively, for all measurements. Out of the 56 data points, 25 were identified as invalid, as detailed in **Table 12**. Therefore, 31 data points were deemed valid.

Table 12. Flyover (Empty Weight) Excluded Measurements

Microphone ID (position)	Test Number	Reason Not Included
Mic 09 - 12	3-1, 3-2, 4-2	Exceeds crosswind component
Mic 09	4-1	Measurement too close to ambient
Mic 10	6-2	Measurement too close to ambient
Mic 11	6-1	Elevated ambient levels across measurement
Mic 12	1-1, 1-2, 2-2, 4-1, 5-1, 5-2, 6-1, 6-2, 7-1, 7-2	Measurement too close to ambient

Source: Prime Air, 2024; ESA, 2025.

Notes: Measurement data that has been excluded under this noise analysis are presented in Appendix B and Appendix C.

3.7 Test Condition: Flyover (Max Weight)

3.7.1 Weather Conditions

The average weather conditions for each test at max weight are shown in **Table 13**. There were no weather exceedances that would deem measurements invalid.

Table 13. Flyover (Max Weight) Weather Conditions

Test Number	Temperature (°F)	Average Wind Speed (knots)	Wind Direction (Degrees)	Average Wind Gust Speed (knots)	Relative Humidity (%)
1-1	53.4	1.6	96.6	4.4	53.8
1-2	53.2	2.9	82.3	4.1	53.6
2-1	48.4	3.3	77.3	5.8	62.8
2-2	49.3	3.6	123.5	5.8	60.9
3-1	54.5	1.7	132.1	3.5	52.2
3-2	54.9	2.2	306.5	3.5	51.3
4-1	56.7	2.1	170.8	3.9	48.7
4-2	56.1	1.9	214.0	4.1	49.2
5-1	50.9	3.3	116.9	4.7	59.1
5-2	51.1	2.7	131.5	4.7	58.6
6-1	65.5	1.6	191.3	4.1	53.5
6-2	65.3	3.7	245.7	7.0	56.7

Source: Prime Air, 2024; ESA, 2025.

3.7.2 Test Points and Validity

Appendix B and **Appendix C** present the tabulated and time history results, respectively, for all measurements. Out of the 48 data points, 12 were identified as invalid, as detailed in **Table 14**. Therefore, 36 data points were deemed valid.

Table 14. Flyover (Max Weight) Excluded Measurements

Microphone ID (position)	Test Number	Reason Not Included
Mic 12	All	Measurement too close to ambient

Source: Prime Air, 2024; ESA, 2025.

Notes: Measurement data that has been excluded under this noise analysis are presented in Appendix B and Appendix C.

4 Measurement Analysis

A range of metrics were calculated for each event and at each microphone. These metrics include ambient noise level (defined as the noise level when the drone's rotors are not powered), Leq, Maximum Sound Level (Lmax), and SEL. Additional parameters regarding flight performance and weather conditions were also considered. It should be noted that the empty weight takeoff and max weight landing cases are not used in any subsequent analyses.

4.1 Overflight Analysis

As noted in the previous section, only the microphones positioned perpendicular to the flight path were utilized for analyzing the overflight data. For each event and microphone, the measured SEL was adjusted using correction factors to normalize the noise to the speed and distances specified by Prime Air's typical flight profile, as described in Section 1. **Table 15** below outlines the parameters used for normalization.

Table 15. Enroute Normalization Parameters

Test Case	Normalization Speed (knots)	Normalization Distance (ft)
Empty Weight	58.3	345
Max Weight	58.3	200

Source: Prime Air, 2024; ESA, 2025.

The SELs for each microphone were averaged and the highest resulting SEL was selected for use as the computed en route noise level. The results of this analysis are presented in **Table 16** below along with the undertrack distance and point of closest approach (POCA) slant distance. The most conservative empty-weight en route noise level was computed to be 61.0 dBA. The most conservative max-weight en route noise level was computed to be 63.9 dBA. **Figure 7** and **Figure 8** present the range of measured en route SEL's for empty weight and max weight, respectively.

Table 16. En Route Averaged A-Weighted SELs (Empty and Max Weight)

Test Case	Microphone ID (Position)	Undertrack Distance (ft)	POCA Slant Distance (ft)	Normalized SEL[1] (dBA)
Empty Weight	09 (Lateral)	18.4	99.3	60.4
	10 (Lateral)	57.8	112.8	60.9
	11 (Lateral)	152.8	180.8	59.1
Max Weight	09 (Lateral)	20.0	118.4	63.0
	10 (Lateral)	56.0	128.9	63.7
	11 (Lateral)	152.7	191.7	61.7

Source: Prime Air, 2024; ESA, 2025.

Notes: Microphone ID 12 (lateral) is excluded as results were not sufficiently above ambient noise levels.

[1] Measured levels normalized to 58.3 kts before averaging. Using 12.5*log10(POCA Slant / Normalized Adjustment Slant); empty weight normalized to 345 feet; max weight normalized to 200 feet.

Figure 7. Range of MK30 Averaged A-Weighted SELs from En Route at Empty Weight

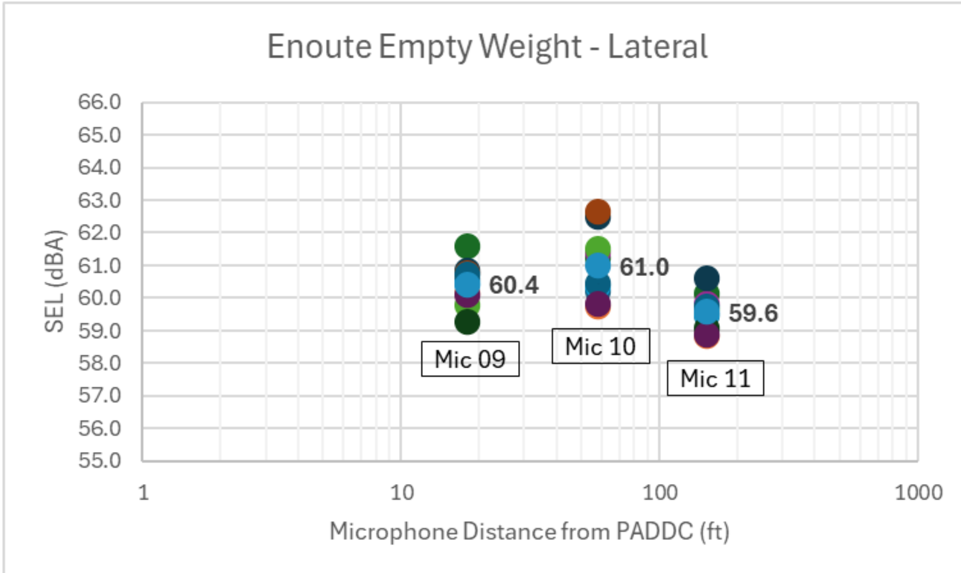
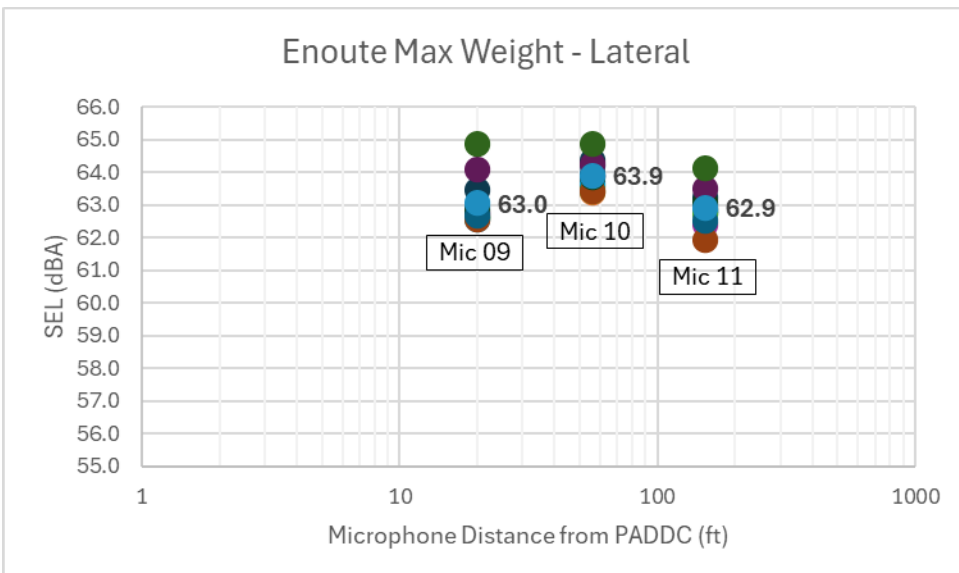


Figure 8. Range of MK30 Averaged A-Weighted SELs from En Route at Max Weight



4.2 VTOL Analysis

For each microphone and each test flight, the takeoff, delivery, and landing SELs were averaged. **Table 17** presents the results for takeoff, delivery, and landing. Scatter plots for these measurements are shown in **Figure 9** through **Figure 17**.

Table 17. Takeoff, Delivery, and Landing Averaged A-Weighted SELs

Distance to PADDC (ft)	Max Weight		Empty Weight
	Takeoff	**Delivery**	**Landing**
Undertrack			
20	90.5	91.7	91.8
75	81.6	83.7	82.8
195	76.5	78.8	76.5
372	72.4	74.5	70.4
772	-	69.5	-
Behind			
19	89.8	92.0	91.2
79	80.0	83.2	81.6
176	73.5	77.3	75.3
375	67.3	71.3	70.5
Lateral			
25	88.8	92.1	89.9
76	82.1	85.8	83.2
175	75.5	79.0	76.3
375	68.2	71.1	-

Source: Prime Air, 2024; ESA, 2025.

Figure 9. Range of MK30 Averaged A-Weighted SELs from Takeoff at Max Weight – Undertrack

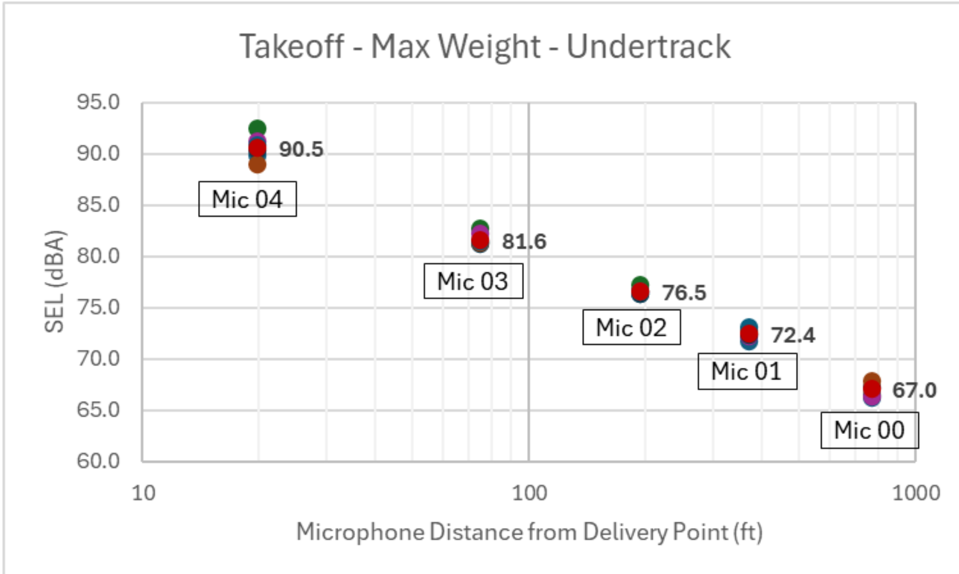


Figure 10. Range of MK30 Averaged A-Weighted SELs from Takeoff at Max Weight – Behind

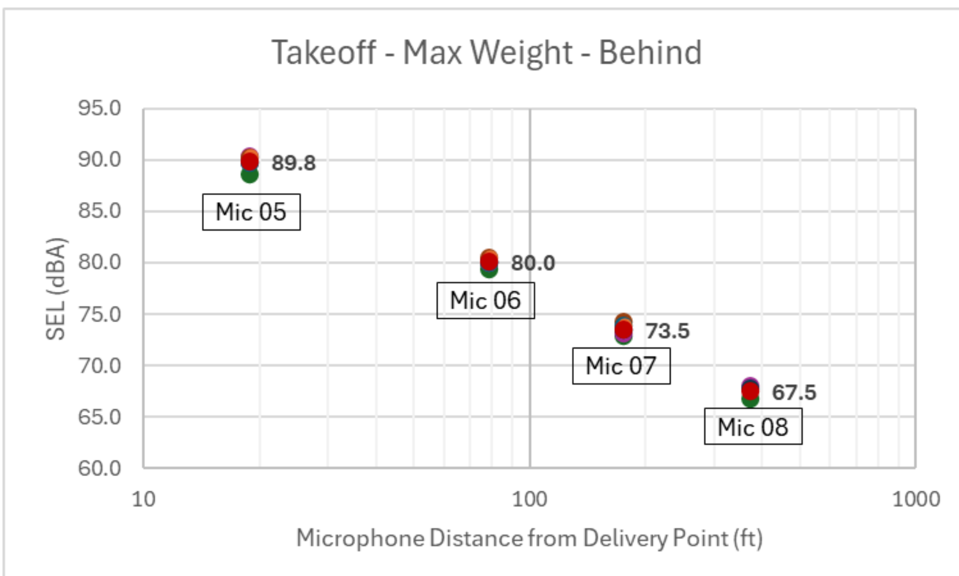


Figure 11. Range of MK30 Averaged A-Weighted SELs from Takeoff at Max Weight – Lateral

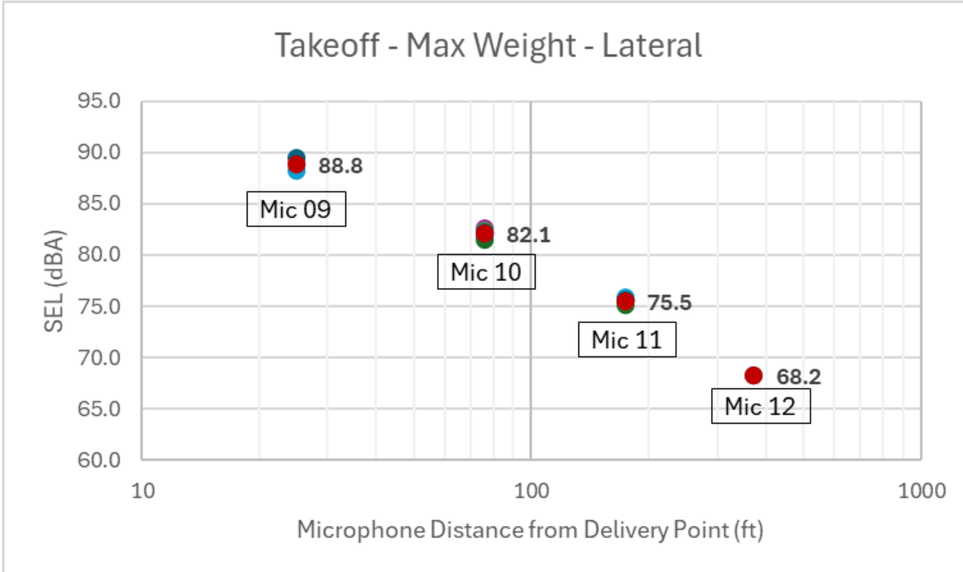


Figure 12. Range of MK30 Averaged A-Weighted SELs from Landing at Empty Weight – Undertrack

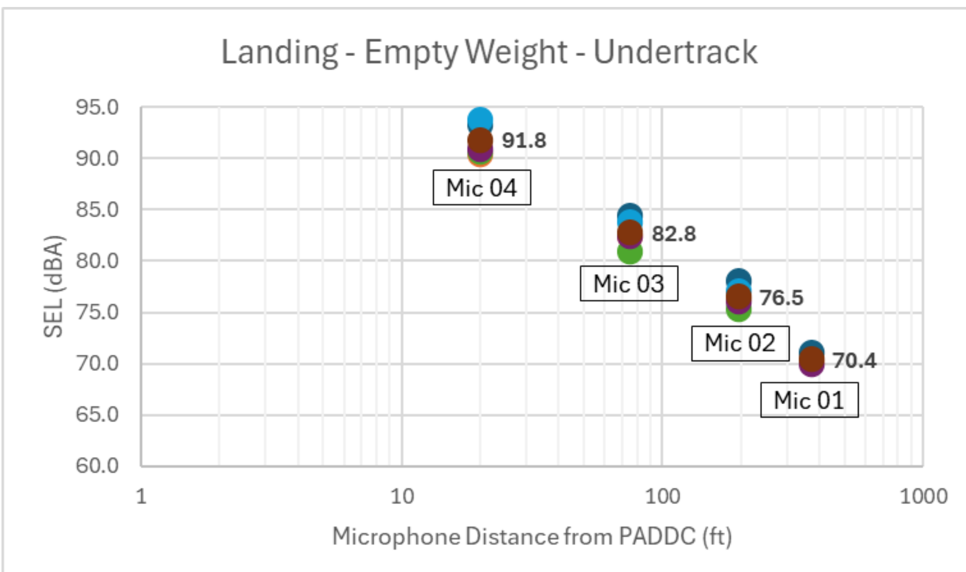


Figure 13. Range of MK30 Averaged A-Weighted SELs from Landing at Empty Weight – Behind

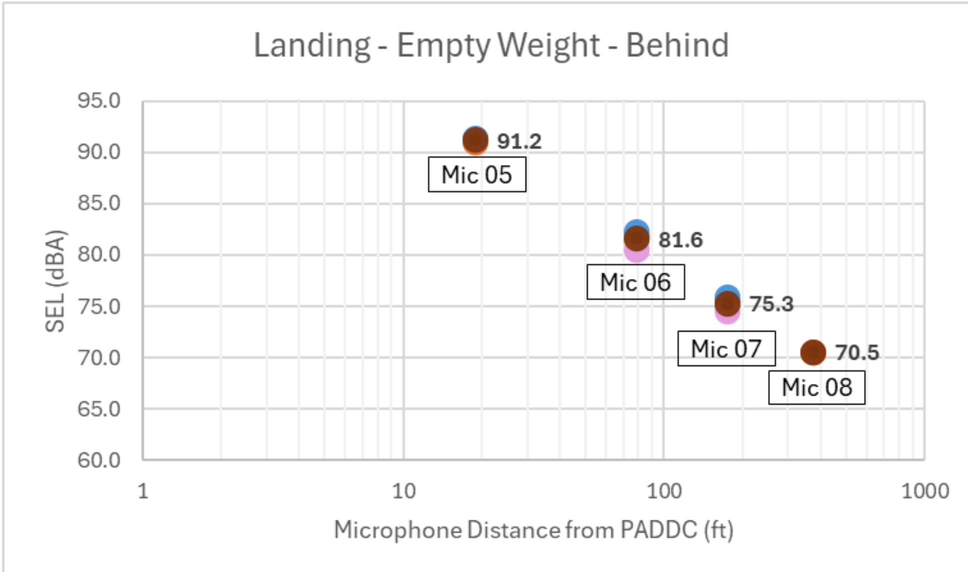


Figure 14. Range of MK30 Averaged A-Weighted SELs from Landing at Empty Weight – Lateral

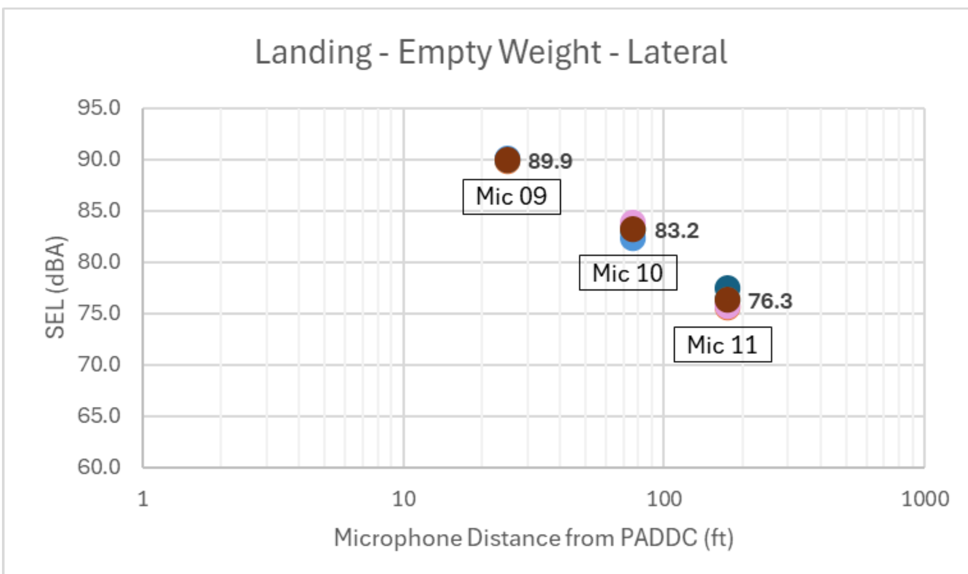


Figure 15. Range of MK30 Averaged A-Weighted SELs from Delivery at Max Weight – Undertrack

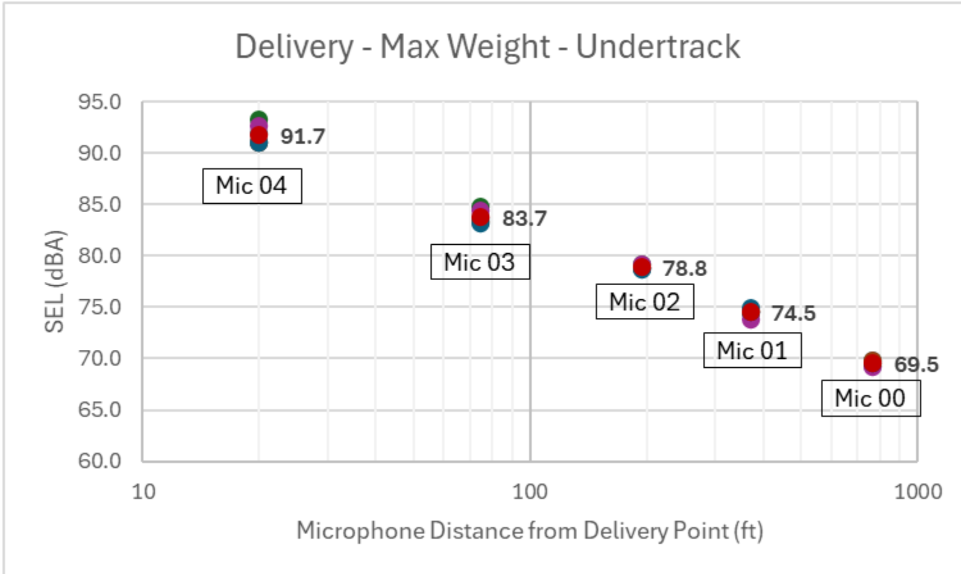


Figure 16. Range of MK30 Averaged A-Weighted SELs from Delivery at Max Weight – Behind

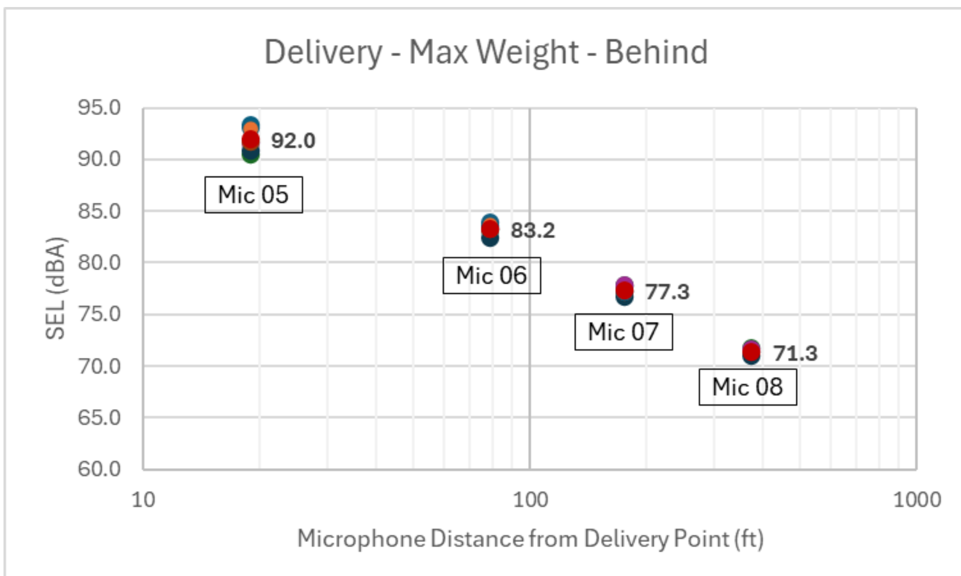
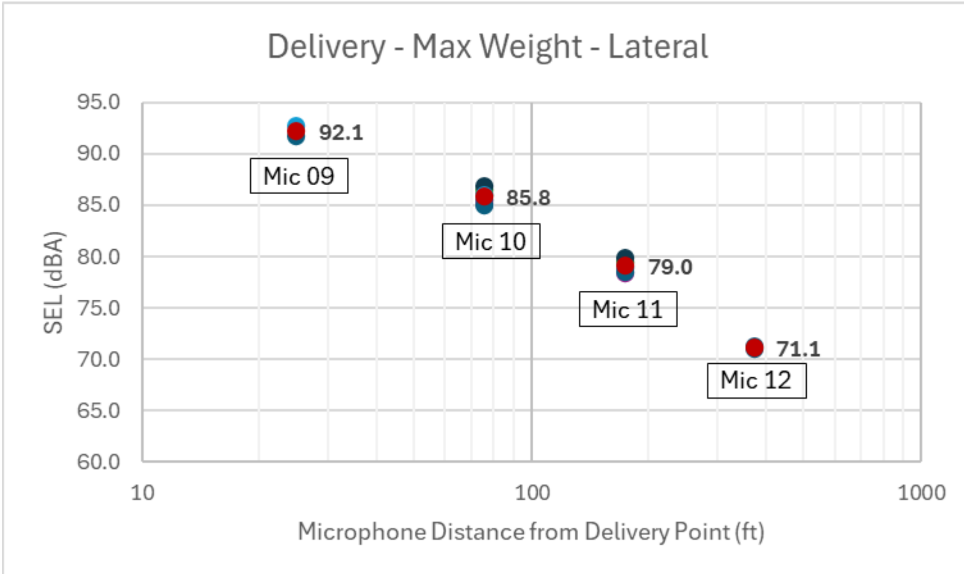


Figure 17. Range of MK30 Averaged A-Weighted SELs from Delivery at Max Weight – Lateral



The maximum SEL values from each test outline in **Table 17** were utilized to determine the composite, maximum A-weight SELs for takeoff, delivery, and landings, as shown in **Table 18** through **Table 20**. Additionally, speed- and altitude-corrected en route noise was factored in to calculate the interpolated distances to the PADDCs. **Figure 18** illustrates the noise levels and corresponding distances associated with takeoff, delivery, and landing.

Table 18. Maximum Takeoff A-Weighted SELs

Distance to PADDC (ft)	Max Weight Delivery
	SEL[1]
20	90.5
76	82.1
195	76.5
372	72.4
772	67.0
1,205[2]	63.7[2]

Source: Prime Air, 2024; ESA, 2025.

Notes:

[1] Maximum SEL derived from Table 17.

[2] Calculated distanced to the PADDC derived from the altitude and speed corrected max weight enroute measurement.

Table 19. Maximum A-Weighted SELs - Delivery

Distance to PADDC (ft)	Max Weight Delivery
	SEL[1]
25	92.1
76	85.8
175	79.0
372	74.5
772	69.5
1,820[2]	63.7[2]

Source: Prime Air, 2024; ESA, 2025.

Notes:

[1] Maximum SEL derived from Table 17.

[2] Calculated distanced to the PADDC derived from the altitude and speed corrected max weight enroute measurement.

Table 20. Maximum A-Weighted SELs - Landing

Distance to PADDC (ft)	Empty Weight Landing
	SEL[1]
20	91.8
76	83.2
195	76.5
375	70.5
1,074[2]	60.9[2]

Source: Prime Air, 2024; ESA, 2025.

Notes:

[1] Maximum SEL derived from Table 17.

[2] Calculated distanced to the PADDC derived from the speed and altitude corrected empty weight enroute measurement.

Figure 18. MK30 Maximum A-Weighted SELs

Using the maximum A-weight SELs from takeoff, delivery, and landing, parameters were determined to estimate SELs as a function of distance from the PADDC launch pad and delivery location. **Table 21** provides parameters to estimate SELs associated with takeoff as a function of distance from the PADDC launch pad to the receiver. **Table 22** provides parameters to estimate the SEL associated with delivery, as a function of distance from the delivery point to the receiver. **Table 23** provides parameters to estimate SELs associated with landing as a function of distance from the PADDC launch pad to the receiver. In these tables, constants "m" and "b" are components of the slope intercept linear equation y = mx +b. Constant "m" represents the slope of the line. Constant "b" represents the point at which the slope crosses the y-axis.

Table 21. Parameters for Estimating Sound Exposure Level for Takeoff versus Distance

Range for Distance (feet from launch pad)	m	b
20 to 76	-14.51	109.30
76 to 195	-13.51	107.46
195 to 372	-14.66	110.09
372 to 772	-17.08	116.32
772 to 1,205	-17.05	116.23
1,205 and greater	0.00	63.7

Source: Prime Air, 2024; ESA, 2025.

Notes: Distance is along ground from launch pad to receiver.

Table 22. Parameters for Estimating Sound Exposure Level for Delivery versus Distance

Range for Distance (feet from delivery point)	m	b
25 to 76	-13.18	110.56
76 to 175	-18.65	120.84
175 to 372	-13.86	110.11
372 to 772	-15.63	114.67
772 to 1,820	-15.63	114.65
1,820 and greater	0.00	63.7

Source: Prime Air, 2024; ESA, 2025.

Notes: Distance is along ground from delivery point to receiver.

Table 23. Parameters for Estimating Sound Exposure Level for Landing versus Distance

Range for Distance (feet from launch pad)	m	b
20 to 76	-14.95	111.28
76 to 195	-16.17	113.58
195 to 375	-21.10	124.86
375 to 1,074	-21.10	124.87
1,074 and greater	0.00	60.9

Source: Prime Air, 2024; ESA, 2025.

Notes: Distance is along ground from launch pad to receiver.

Appendix A: Flight Profile Measurements

Phase of Flight	Minimum Altitude (ft AGL)	Maximum Altitude (ft AGL)	Average Altitude (ft AGL)	Minimum Duration (seconds)	Maximum Duration (seconds)	Average Duration (seconds)	Minimum True Airspeed (knots)	Maximum True Airspeed (knots)	Average True Airspeed (knots)
Takeoff and Vertical Ascent	3.2	137.4	64.9	19	24	20	0.7	9.4	5.5
Transition and Outbound Climb	132.1	201.2	160.7	58	63	60	0.8	62.4	42.9
Fixed Wing Outbound Cruise	194.7	205.9	200.5	Variable	Variable	Variable	57.6	62.6	59.7
Delivery Descent and Transition	130.6	202.8	158.1	30	36	34	0.6	60.2	36.9
Backyard Descent	17.7	135.8	77.6	18	22	19	1.5	7.7	5.4
Delivery	14.4	23.0	18.5	2	2	2	2.8	7.2	4.5
Backyard Ascent	16.4	138.6	105.8	24	30	29	1.1	8.9	7.1
Transition and Inbound Climb	133.0	203.3	160.9	57	62	60	1.4	62.5	43.0
Fixed-wing Inbound Cruise	194.8	207.8	201.2	Variable	Variable	Variable	66.0	71.0	68.7
Landing Descent and Transition	133.7	201.9	160.3	32	39	36	1.5	70.5	42.7
Vertical Descent and Landing	1.1	134.6	78.3	33	34	34	0.2	6.7	5.1

Source: Prime Air, 2024; ESA, 2025.

Appendix B:
Noise Event Tables

Table B-1. Max Weight Takeoff Measurements

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
Mic 00 (Undertrack)															
772	1-1	45.2	50.6	60.1	68.1	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
772	2-1	42.3	48.6	57.2	66.2	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
772	3-1	42.4	48.4	57.8	66.4	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
772	4-1	42.4	48.4	57.7	66.3	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
772	5-1	47.3	49.7	59.1	67.2	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
772	6-1	44.5	50.4	59.6	67.8	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
772	7-1	46.0	51.6	60.8	69.7	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	No
Mic 00 Average		**44.3**	**49.7**	**58.9**	**67.4**	**200.5**	**59.7**								
Mic 01 (Undertrack)															
372	1-1	45.5	55.3	64.2	72.8	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
372	2-1	43.5	54.0	62.8	71.6	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
372	3-1	43.7	54.4	62.5	72.4	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
372	4-1	43.6	54.3	63.1	72.1	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
372	5-1	48.3	54.8	64.1	72.3	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
372	6-1	45.7	55.3	64.1	72.7	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
372	7-1	45.9	54.9	64.4	73.0	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
Mic 01 Average		**45.2**	**54.7**	**63.6**	**72.4**	**200.5**	**59.7**								
Mic 02 (Undertrack)															
195	1-1	44.2	59.0	65.2	76.5	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
195	2-1	42.0	58.7	65.0	76.3	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
195	3-1	42.0	59.2	65.6	77.2	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
195	4-1	42.3	58.5	63.9	76.4	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
195	5-1	47.8	58.8	64.1	76.3	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
195	6-1	45.4	59.1	64.4	76.5	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
195	7-1	44.4	58.4	65.0	76.5	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
Mic 02 Average		**44.0**	**58.8**	**64.7**	**76.5**	**200.5**	**59.7**								
Mic 03 (Undertrack)															
75	1-1	43.9	63.7	71.1	81.2	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
75	2-1	42.3	63.6	69.1	81.2	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
75	3-1	41.7	64.6	70.3	82.6	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
75	4-1	43.1	64.3	70.5	82.1	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
75	5-1	48.2	63.6	71.6	81.1	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
75	6-1	45.3	63.9	71.0	81.3	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
75	7-1	44.3	63.3	70.6	81.3	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
Mic 03 Average		**44.1**	**63.8**	**70.6**	**81.6**	**200.5**	**59.7**								
Mic 04 (Undertrack)															
20	1-1	48.0	72.6	82.1	90.0	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
20	2-1	47.0	72.1	81.0	89.8	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
20	3-1	45.9	74.4	81.9	92.4	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
20	4-1	47.4	73.3	81.8	91.2	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
20	5-1	51.3	72.8	82.0	90.3	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
20	6-1	49.0	71.4	81.9	88.8	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
20	7-1	47.4	72.7	81.7	90.8	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
Mic 04 Average		**48.0**	**72.8**	**81.8**	**90.5**	**200.5**	**59.7**								
Mic 05 (Behind)															
19	1-1	48.1	72.2	81.6	89.7	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
19	2-1	47.0	70.9	79.6	88.5	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
19	3-1	46.1	72.3	80.1	90.3	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
19	4-1	50.8	72.0	79.9	89.9	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	No
19	5-1	50.5	72.7	81.3	90.2	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
19	6-1	49.2	72.3	81.3	89.7	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
19	7-1	47.4	72.3	80.8	90.3	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
Mic 05 Average		**48.1**	**72.1**	**80.8**	**89.8**	**200.2**	**59.7**								
Mic 06 (Behind)															
79	1-1	44.7	62.5	70.7	80.0	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
79	2-1	43.4	61.7	68.8	79.3	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
79	3-1	42.7	61.9	69.1	79.9	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
79	4-1	43.3	62.2	69.4	80.0	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
79	5-1	48.6	62.9	70.5	80.4	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
79	6-1	46.0	62.6	70.2	80.0	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
79	7-1	45.0	62.4	70.4	80.4	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
Mic 06 Average		**44.8**	**62.3**	**69.9**	**80.0**	**200.5**	**59.7**								
Mic 07 (Behind)															
176	1-1	43.5	55.9	61.4	73.4	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
176	2-1	41.7	55.2	61.1	72.8	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
176	3-1	41.2	55.0	60.3	73.0	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
176	4-1	45.0	55.6	60.6	73.4	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
176	5-1	48.1	56.7	62.5	74.1	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
176	6-1	44.5	56.5	61.4	73.9	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
176	7-1	43.9	55.8	62.5	73.9	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
	Mic 07 Average	**44.0**	**55.8**	**61.4**	**73.5**	**200.5**	**59.7**								
Mic 08 (Behind)															
375	1-1	45.0	49.7	53.5	67.1	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	No
375	2-1	43.7	49.1	53.5	66.7	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
375	3-1	45.0	49.9	54.3	67.9	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
375	4-1	44.6	49.9	54.1	67.8	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
375	5-1	51.3	51.5	55.5	69.0	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	No
375	6-1	47.6	51.5	55.6	68.9	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	No
375	7-1	50.8	54.3	58.1	72.4	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	No
	Mic 08 (Average)	**44.4**	**49.6**	**54.0**	**67.5**	**200.8**	**59.7**								
Mic 09 (Lateral)															
25	1-1	51.4	70.8	80.1	88.3	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	No
25	2-1	50.6	70.6	78.8	88.3	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	No
25	3-1	49.8	71.3	79.6	89.3	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	No
25	4-1	51.4	70.4	79.0	88.2	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	No
25	5-1	53.5	71.0	79.9	88.5	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	No
25	6-1	52.8	70.7	79.9	88.1	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
25	7-1	50.4	71.4	80.1	89.4	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
	Mic 09 (Average)	**51.6**	**71.0**	**80.0**	**88.8**	**200.2**	**59.7**								
Mic 10 (Lateral)															
76	1-1	46.1	64.4	70.3	81.9	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
76	2-1	44.5	63.8	71.0	81.4	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
76	3-1	43.7	64.5	71.0	82.5	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
76	4-1	44.4	64.4	70.2	82.2	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
76	5-1	49.6	64.6	70.0	82.1	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
76	6-1	47.5	64.6	70.7	82.0	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
76	7-1	45.6	64.2	70.9	82.2	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
	Mic 10 (Average)	**45.9**	**64.4**	**70.6**	**82.1**	**200.5**	**59.7**								
Mic 11 (Lateral)															
175	1-1	44.9	58.1	63.4	75.5	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes
175	2-1	43.5	57.4	61.9	75.0	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	Yes
175	3-1	43.2	57.4	62.6	75.4	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	Yes
175	4-1	43.5	57.5	62.2	75.4	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	Yes
175	5-1	48.7	58.0	63.1	75.5	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	Yes
175	6-1	46.6	58.5	64.4	75.9	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	Yes
175	7-1	45.2	57.5	62.5	75.5	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	Yes
	Mic 11 (Average)	**45.1**	**57.8**	**62.9**	**75.5**	**200.5**	**59.7**								
Mic 12 (Lateral)															
375	1-1	45.1	50.7	55.6	68.2	200.3	59.7	242	-0.7	4.3	112	6.2	49.3	56.5	Yes

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
375	2-1	44.8	50.8	54.5	68.4	201.5	59.7	335	-1.4	2.0	173	3.5	55.5	43.9	No
375	3-1	50.0	52.2	55.5	70.2	198.7	59.7	332	-1.9	4.1	274	7.4	59.7	36.4	No
375	4-1	45.3	50.6	53.8	68.5	202.1	59.8	339	-2.8	3.5	233	7.0	60.1	35.6	No
375	5-1	48.7	51.2	55.9	68.6	200.4	59.7	251	0.8	3.4	101	4.3	50.0	52.7	No
375	6-1	47.3	51.7	56.1	69.1	202.0	59.7	247	0.2	4.0	90	4.9	45.8	62.5	No
375	7-1	45.7	50.7	54.4	68.7	198.4	59.7	246	-0.9	4.0	121	6.2	47.8	60.2	No
Mic 12 (Average)		**45.1**	**50.7**	**55.6**	**68.2**	**200.3**	**59.7**								

Source: Prime Air, 2024; ESA, 2025.

Notes: Greyed out cells we determined to not be valid measurements and were not included in SEL calculations.

Table B-2. Max Weight Delivery Measurements

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
Mic 00 (Undertrack)															
772	1-1	45.2	49.6	59.3	70.0	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
772	2-1	42.3	48.9	59.4	69.7	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
772	3-1	42.4	49.1	57.4	69.2	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
772	4-1	42.4	48.9	57.5	69.1	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
772	5-1	47.3	49.3	59.0	69.5	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
772	6-1	44.5	49.8	60.2	69.8	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
772	7-1	46.0	50.2	60.5	70.4	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	No
Mic 00 Average		**44.0**	**49.3**	**58.8**	**69.5**	**94.6**	**6.0**								
Mic 01 (Undertrack)															
372	1-1	45.5	54.3	64.0	74.7	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
372	2-1	43.5	53.5	62.2	74.3	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
372	3-1	43.7	54.4	62.8	74.5	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
372	4-1	43.6	53.6	62.3	73.8	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
372	5-1	48.3	54.4	63.7	74.5	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
372	6-1	45.7	54.7	64.2	74.7	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
372	7-1	45.9	54.8	64.9	74.9	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
Mic 01 Average		**45.2**	**54.2**	**63.4**	**74.5**	**94.6**	**6.1**								
Mic 02 (Undertrack)															
195	1-1	44.2	58.4	64.9	78.7	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
195	2-1	42.0	57.9	64.9	78.7	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
195	3-1	42.0	58.9	64.6	79.1	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
195	4-1	42.3	58.9	64.6	79.1	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
195	5-1	47.8	58.7	65.0	78.8	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
195	6-1	45.4	58.8	65.0	78.8	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
195	7-1	44.4	58.5	64.7	78.6	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
Mic 02 Average		**44.0**	**58.6**	**64.8**	**78.8**	**94.6**	**6.1**								
Mic 03 (Undertrack)															
75	1-1	43.9	63.2	69.1	83.5	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
75	2-1	42.3	62.5	67.9	83.3	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
75	3-1	41.7	64.6	71.5	84.8	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
75	4-1	43.1	64.2	69.5	84.4	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
75	5-1	48.2	63.5	68.6	83.6	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
75	6-1	45.3	63.2	68.5	83.2	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
75	7-1	44.3	62.9	68.8	83.0	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
Mic 03 Average		**44.1**	**63.4**	**69.1**	**83.7**	**94.6**	**6.1**								
Mic 04 (Undertrack)															

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
20	1-1	48.0	71.1	82.9	91.4	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
20	2-1	47.0	71.0	80.8	91.8	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
20	3-1	45.9	73.1	83.7	93.3	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
20	4-1	47.4	72.4	83.8	92.6	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
20	5-1	51.3	70.8	81.8	90.9	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
20	6-1	49.0	71.0	82.0	91.0	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
20	7-1	47.4	70.8	81.9	90.9	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
	Mic 04 Average	**48.0**	**71.5**	**82.4**	**91.7**	**94.6**	**6.1**								
Mic 05 (Behind)															
19	1-1	48.1	72.7	84.1	93.0	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
19	2-1	47.0	69.6	80.7	90.4	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
19	3-1	46.1	71.5	81.7	91.6	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
19	4-1	50.8	70.6	81.5	90.8	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
19	5-1	50.5	71.6	81.4	91.7	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
19	6-1	49.2	73.3	84.2	93.3	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
19	7-1	47.4	72.7	84.0	92.9	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
	Mic 05 Average	**48.5**	**71.7**	**82.5**	**92.0**	**94.6**	**6.1**								
Mic 06 (Behind)															
79	1-1	44.7	63.6	70.4	83.9	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
79	2-1	43.4	62.2	68.8	83.0	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
79	3-1	42.7	63.1	68.9	83.2	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
79	4-1	43.3	62.1	67.8	82.3	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
79	5-1	48.6	63.0	68.4	83.2	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
79	6-1	46.0	63.4	69.1	83.4	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
79	7-1	45.0	63.5	69.8	83.6	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
	Mic 06 Average	**44.8**	**63.0**	**69.0**	**83.2**	**94.6**	**6.1**								
Mic 07 (Behind)															
176	1-1	43.5	57.3	62.5	77.7	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
176	2-1	41.7	56.9	61.1	77.7	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
176	3-1	41.2	57.6	62.0	77.7	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
176	4-1	45.0	56.5	62.2	76.7	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
176	5-1	48.1	57.0	61.1	77.1	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
176	6-1	44.5	57.1	62.0	77.1	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
176	7-1	43.9	57.1	62.8	77.3	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
	Mic 07 Average	**44.0**	**57.1**	**61.9**	**77.3**	**94.6**	**6.1**								
Mic 08 (Behind)															
375	1-1	45.0	50.9	56.9	71.2	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
375	2-1	43.7	50.8	55.3	71.6	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
375	3-1	45.0	51.4	54.4	71.5	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
375	4-1	44.6	50.7	55.0	70.9	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
375	5-1	51.3	51.1	56.1	71.3	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	No
375	6-1	47.6	51.6	56.0	71.6	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	No
375	7-1	50.8	51.7	55.1	71.8	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	No
Mic 08 Average		**44.6**	**51.0**	**55.4**	**71.3**	**97.0**	**6.0**								
Mic 09 (Lateral)															
25	1-1	51.4	71.5	83.1	91.8	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	No
25	2-1	50.6	71.1	82.4	91.9	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	No
25	3-1	49.8	70.8	82.3	90.9	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	No
25	4-1	51.4	72.7	83.9	92.9	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	No
25	5-1	53.5	73.5	84.4	93.6	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	No
25	6-1	52.8	72.7	83.2	92.7	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
25	7-1	50.4	71.4	82.4	91.6	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
Mic 09 Average		**51.6**	**72.1**	**82.8**	**92.1**	**92.0**	**6.7**								
Mic 10 (Lateral)															
76	1-1	46.1	65.1	71.0	85.4	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
76	2-1	44.5	65.1	71.1	86.0	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
76	3-1	43.7	64.9	71.2	85.0	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
76	4-1	44.4	66.3	71.7	86.4	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
76	5-1	49.6	66.6	72.6	86.7	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
76	6-1	47.5	65.9	70.9	85.9	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
76	7-1	45.6	64.8	70.4	85.0	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
Mic 10 Average		**45.9**	**65.5**	**71.3**	**85.8**	**94.6**	**6.1**								
Mic 11 (Lateral)															
175	1-1	44.9	58.5	63.9	78.8	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
175	2-1	43.5	58.4	64.1	79.2	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	Yes
175	3-1	43.2	58.2	63.2	78.4	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	Yes
175	4-1	43.5	59.3	63.4	79.5	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	Yes
175	5-1	48.7	59.7	65.2	79.8	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	Yes
175	6-1	46.6	59.0	63.2	79.0	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	Yes
175	7-1	45.2	58.2	62.8	78.4	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
Mic 11 Average		**45.1**	**58.8**	**63.7**	**79.0**	**94.6**	**6.1**								
Mic 12 (Lateral)															
375	1-1	45.1	50.9	55.7	71.2	96.6	6.0	127	-0.5	4.1	123	6.0	49.1	56.6	Yes
375	2-1	44.8	53.3	58.9	74.1	95.5	5.0	84	0.0	1.2	260	3.7	55.6	43.5	No
375	3-1	50.0	53.6	57.6	73.7	96.7	5.6	31	-3.0	5.0	283	7.4	59.8	36.3	No
375	4-1	45.3	52.0	57.1	72.2	99.4	7.5	271	-2.6	4.6	222	6.2	60.3	35.2	No
375	5-1	48.7	51.6	57.3	71.7	90.3	5.5	115	-0.6	2.9	92	4.3	50.6	52.3	No
375	6-1	47.3	52.1	56.0	72.1	89.3	6.1	115	-1.4	4.5	93	4.9	45.8	62.8	No

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
375	7-1	45.7	50.8	55.5	70.9	94.7	7.3	117	-0.2	4.2	112	6.2	47.9	59.7	Yes
	Mic 12 Average	**45.4**	**50.8**	**55.6**	**71.1**	**95.6**	**6.6**								

Source: Prime Air, 2024; ESA, 2025.

Notes: Greyed out cells we determined to not be valid measurements and were not included in SEL calculations.

Table B-3. Empty Weight Landing Measurements

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
Mic 00 (Undertrack)															
772	1-1	42.4	48.3	55.7	66.2	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	No
772	2-1	42.3	46.4	51.9	64.2	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	No
772	3-1	42.3	47.6	55.8	65.8	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
772	4-1	44.3	49.0	55.7	67.2	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	No
772	5-1	47.6	48.3	53.8	66.2	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	No
772	6-1	43.3	48.1	55.9	66.0	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	No
Mic 00 Average		-	-	-	-	-	-								
Mic 01 (Undertrack)															
372	1-1	45.0	53.2	60.4	71.1	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
372	2-1	43.6	52.5	59.3	70.3	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
372	3-1	43.5	52.4	59.8	70.6	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
372	4-1	44.9	52.9	59.5	71.1	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	No
372	5-1	47.9	52.3	58.4	70.2	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	No
372	6-1	44.4	52.0	60.0	69.9	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
Mic 01 Average		**44.3**	**52.6**	**59.9**	**70.4**	**200.7**	**68.7**								
Mic 02 (Undertrack)															
195	1-1	42.0	60.1	63.1	78.0	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
195	2-1	42.1	58.5	62.2	76.3	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
195	3-1	42.0	58.9	62.4	77.1	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
195	4-1	43.5	58.8	62.9	77.0	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes
195	5-1	47.0	57.5	62.2	75.3	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
195	6-1	43.5	58.1	63.0	76.0	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
Mic 02 Average		**43.6**	**58.6**	**62.7**	**76.5**	**201.0**	**68.7**								
Mic 03 (Undertrack)															
75	1-1	41.9	66.5	70.7	84.4	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
75	2-1	42.0	64.6	68.7	82.4	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
75	3-1	43.0	65.7	71.2	83.9	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
75	4-1	43.5	65.7	70.4	83.9	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes
75	5-1	46.0	63.1	67.9	81.0	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
75	6-1	43.4	64.5	69.7	82.4	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
Mic 03 Average		**43.4**	**64.9**	**69.5**	**82.8**	**201.0**	**68.7**								
Mic 04 (Undertrack)															
20	1-1	46.1	75.4	83.1	93.3	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
20	2-1	46.1	72.7	80.6	90.5	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
20	3-1	45.7	75.0	83.5	93.2	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
20	4-1	46.5	75.6	84.1	93.8	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
20	5-1	49.0	72.8	81.0	90.7	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
20	6-1	46.7	73.0	80.3	90.9	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
Mic 04 Average		**46.9**	**73.9**	**81.8**	**91.8**	**201.0**	**68.7**								
Mic 05 (Behind)															
19	1-1	52.0	72.6	80.1	90.6	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	No
19	2-1	46.5	73.2	81.3	91.0	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
19	3-1	45.8	72.3	79.9	90.5	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
19	4-1	51.9	77.4	91.2	95.6	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	No
19	5-1	49.3	73.5	81.5	91.4	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
19	6-1	59.4	72.4	81.7	90.3	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	No
Mic 05 Average		**47.9**	**73.4**	**81.4**	**91.2**	**201.0**	**68.7**								
Mic 06 (Behind)															
79	1-1	42.8	63.8	67.8	81.7	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
79	2-1	43.0	64.2	68.0	82.0	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
79	3-1	42.7	63.7	69.2	81.9	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
79	4-1	43.7	63.3	68.2	81.5	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes
79	5-1	47.2	64.4	68.8	82.3	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
79	6-1	44.0	62.5	66.8	80.5	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
Mic 06 Average		**44.1**	**63.6**	**67.9**	**81.6**	**201.0**	**68.7**								
Mic 07 (Behind)															
176	1-1	41.2	57.5	61.6	75.5	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
176	2-1	43.4	57.6	61.4	75.4	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
176	3-1	41.4	57.4	62.0	75.6	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
176	4-1	43.8	56.9	60.1	75.1	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes
176	5-1	46.8	58.0	62.4	75.8	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
176	6-1	43.2	56.6	60.9	74.5	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
Mic 07 Average		**43.7**	**57.3**	**61.3**	**75.3**	**201.0**	**68.7**								
Mic 08 (Behind)															
375	1-1	43.6	50.4	53.6	68.3	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	No
375	2-1	44.7	52.8	57.4	70.5	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
375	3-1	46.7	55.7	57.4	73.9	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
375	4-1	46.7	65.6	80.6	83.8	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	No
375	5-1	52.1	51.2	53.9	69.0	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	No
375	6-1	48.6	69.8	84.7	87.7	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	No
Mic 08 Average		**44.7**	**52.8**	**57.4**	**70.5**	**200.6**	**68.7**								
Mic 09 (Lateral)															
25	1-1	48.3	72.2	80.6	90.2	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	No
25	2-1	50.1	72.0	79.7	89.8	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
25	3-1	49.7	72.4	80.8	90.6	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No

Distance to PADDC (ft)	Test#	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
25	4-1	50.1	71.7	81.1	89.9	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes
25	5-1	49.8	72.2	80.2	90.1	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
25	6-1	49.7	73.4	81.5	91.4	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	No
	Mic 09 Average	**50.0**	**72.0**	**80.4**	**89.9**	**201.2**	**68.7**								
Mic 10 (Lateral)															
76	1-1	43.6	65.3	70.0	83.2	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
76	2-1	44.8	65.1	69.1	82.9	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	No
76	3-1	43.8	65.4	69.7	83.6	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
76	4-1	44.8	65.1	69.2	83.3	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes
76	5-1	47.5	64.5	70.0	82.4	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	Yes
76	6-1	44.7	65.9	70.8	83.8	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
	Mic 10 Average	**45.2**	**65.2**	**70.0**	**83.2**	**201.1**	**68.7**								
Mic 11 (Lateral)															
175	1-1	43.2	59.5	63.3	77.4	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	Yes
175	2-1	43.4	57.8	62.5	75.6	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	Yes
175	3-1	43.2	58.3	61.2	76.4	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
175	4-1	44.8	58.2	61.1	76.4	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	Yes
175	5-1	47.5	57.2	60.4	75.1	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	No
175	6-1	44.2	57.8	61.5	75.8	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	Yes
	Mic 11 Average	**43.9**	**58.3**	**62.1**	**76.3**	**200.9**	**68.7**								
Mic 12 (Lateral)															
375	1-1	44.2	51.1	55.1	69.1	202.5	68.7	24	-3.1	3.4	309	6.8	51.5	61.3	No
375	2-1	47.9	51.9	55.3	69.7	200.6	68.7	166	0.3	1.2	298	6.0	62.4	33.0	No
375	3-1	58.2	54.2	56.9	72.4	201.7	68.8	23	-4.1	5.2	321	7.8	61.4	34.7	No
375	4-1	45.5	50.9	55.1	69.1	201.4	68.7	38	-2.4	3.4	271	5.2	59.9	44.6	No
375	5-1	51.3	58.8	72.3	76.6	201.5	68.7	152	-1.2	4.8	118	5.6	42.6	83.0	No
375	6-1	44.6	50.1	52.8	68.0	198.9	68.7	225	-0.3	1.0	108	2.1	56.8	51.1	No
	Mic 12 Average	**-**	**-**	**-**	**-**	**-**	**-**								

Source: Prime Air, 2024; ESA, 2025.

Notes: Greyed out cells we determined to not be valid measurements and were not included in SEL calculations.

Table B-4. Max Weight En Route Measurements

Distance to PADDC (ft)	Test#	Undertrack Distance (ft)	POCA Slant (ft)	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Median Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
Mic 09 (Lateral)																	
25	1-1	17.5	117.1	46.7	56.1	60.3	65.7	122.2	60.2	77	0.6	1.6	96.6	4.4	53.4	53.8	Yes
25	1-2	6.1	117.7	46.7	55.9	60.1	65.4	122.9	60.1	255	-0.4	2.9	82.3	4.1	53.2	53.6	Yes
25	2-1	9.5	117.6	45.8	55.7	59.7	65.3	122.4	61.6	77	0.0	3.3	77.3	5.8	48.4	62.8	Yes
25	2-2	33.8	120.4	45.8	56.1	60.1	65.1	121.0	60.9	252	-2.8	3.6	123.5	5.8	49.3	60.9	Yes
25	3-1	43.8	122.8	46.3	55.7	59.7	65.3	121.8	60.1	76	1.3	1.7	132.1	3.5	54.5	52.2	Yes
25	3-2	5.5	115.3	46.3	55.9	60.0	65.4	121.3	60.8	255	1.7	2.2	306.5	3.5	54.9	51.3	Yes
25	4-1	24.8	119.7	47.8	56.0	60.4	66.0	122.3	61.3	74	2.1	2.1	170.8	3.9	56.7	48.7	Yes
25	4-2	13.4	117.6	47.8	55.2	59.5	65.2	125.5	61.7	258	-1.3	1.9	214.0	4.1	56.1	49.2	Yes
25	5-1	17.1	118.2	46.9	55.5	59.7	65.5	123.0	60.8	78	2.0	3.3	116.9	4.7	50.9	59.1	Yes
25	5-2	7.9	116.4	46.9	55.9	60.1	65.4	122.3	60.6	254	-2.2	2.7	131.5	4.7	51.1	58.6	Yes
25	6-1	16.9	117.3	50.9	57.7	61.8	66.8	123.6	61.4	74	1.5	1.6	191.3	4.1	65.5	53.5	Yes
25	6-2	43.2	120.2	50.9	57.5	61.7	67.5	121.5	59.9	256	-0.6	3.7	245.7	7.0	65.3	56.7	Yes
Mic 09 Average		20.0	118.4	47.4	56.1	60.3	65.7	122.5	60.8								
Mic 10 (Lateral)																	
76	1-1	54.2	127.8	50.0	57.0	61.3	66.5	122.2	60.2	77	0.6	1.6	96.6	4.4	53.4	53.8	Yes
76	1-2	50.9	128.1	50.0	56.1	60.2	65.7	122.9	60.1	255	-0.4	2.9	82.3	4.1	53.2	53.6	Yes
76	2-1	52.6	128.5	49.0	56.2	60.1	65.7	122.4	61.6	77	0.0	3.3	77.3	5.8	48.4	62.8	Yes
76	2-2	60.6	130.5	49.0	56.8	60.7	65.8	121.0	60.9	252	-2.8	3.6	123.5	5.8	49.3	60.9	Yes
76	3-1	69.3	134.0	50.2	56.4	60.5	65.9	121.8	60.1	76	1.3	1.7	132.1	3.5	54.5	52.2	Yes
76	3-2	49.6	125.4	50.2	56.2	60.2	65.8	121.3	60.8	255	1.7	2.2	306.5	3.5	54.9	51.3	Yes
76	4-1	57.5	130.5	50.5	56.4	61.2	66.4	122.3	61.3	74	2.1	2.1	170.8	3.9	56.7	48.7	Yes
76	4-2	52.3	128.1	50.5	55.6	59.7	65.6	125.5	61.7	258	-1.3	1.9	214.0	4.1	56.1	49.2	Yes
76	5-1	54.1	128.9	49.9	56.1	60.5	66.1	123.0	60.8	78	2.0	3.3	116.9	4.7	50.9	59.1	Yes
76	5-2	52.7	127.5	49.9	56.7	61.0	66.2	122.3	60.6	254	-2.2	2.7	131.5	4.7	51.1	58.6	Yes
76	6-1	51.1	126.8	47.5	57.4	61.6	66.5	123.6	61.4	74	1.5	1.6	191.3	4.1	65.5	53.5	Yes
76	6-2	66.8	130.5	47.5	57.1	61.2	67.1	121.5	59.9	256	-0.6	3.7	245.7	7.0	65.3	56.7	Yes
Mic 10 Average		56.0	128.9	49.5	56.5	60.7	66.1	122.5	60.8								
Mic 11 (Lateral)																	
175	1-1	152.4	191.4	44.9	53.3	57.1	62.9	122.2	60.2	77	0.6	1.6	96.6	4.4	53.4	53.8	Yes
175	1-2	150.4	190.9	44.9	53.5	57.3	63.0	122.9	60.1	255	-0.4	2.9	82.3	4.1	53.2	53.6	Yes
175	2-1	151.7	191.7	43.7	53.3	57.4	62.8	122.4	61.6	77	0.0	3.3	77.3	5.8	48.4	62.8	Yes
175	2-2	154.5	192.9	43.7	53.8	57.4	62.8	121.0	60.9	252	-2.8	3.6	123.5	5.8	49.3	60.9	Yes
175	3-1	158.9	196.0	43.4	52.8	56.5	62.4	121.8	60.1	76	1.3	1.7	132.1	3.5	54.5	52.2	Yes
175	3-2	149.1	188.4	43.4	53.4	57.2	62.9	121.3	60.8	255	1.7	2.2	306.5	3.5	54.9	51.3	Yes
175	4-1	154.2	193.6	43.3	53.2	57.6	63.2	122.3	61.3	74	2.1	2.1	170.8	3.9	56.7	48.7	Yes

Distance to PADDC (ft)	Test#	Undertrack Distance (ft)	POCA Slant (ft)	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Median Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
175	4-2	151.2	191.1	43.3	51.9	55.7	61.9	125.5	61.7	258	-1.3	1.9	214.0	4.1	56.1	49.2	Yes
175	5-1	151.8	191.6	44.3	53.1	57.0	63.1	123.0	60.8	78	2.0	3.3	116.9	4.7	50.9	59.1	Yes
175	5-2	152.0	191.2	44.3	53.0	56.9	62.6	122.3	60.6	254	-2.2	2.7	131.5	4.7	51.1	58.6	Yes
175	6-1	148.7	188.6	46.5	54.5	58.3	63.6	123.6	61.4	74	1.5	1.6	191.3	4.1	65.5	53.5	Yes
175	6-2	157.5	193.4	46.5	54.2	57.8	64.2	121.5	59.9	256	-0.6	3.7	245.7	7.0	65.3	56.7	Yes
Mic 11 Average		152.7	191.7	44.4	53.3	57.2	62.9	122.5	60.8								
Mic 12 (Lateral)																	
375	1-1	351.5	370.1	45.2	48.6	50.0	58.1	122.2	60.2	77	0.6	1.6	96.6	4.4	53.4	53.8	No
375	1-2	349.8	369.0	45.2	48.8	50.3	58.3	122.9	60.1	255	-0.4	2.9	82.3	4.1	53.2	53.6	No
375	2-1	351.0	370.1	44.2	48.2	49.3	57.7	122.4	61.6	77	0.0	3.3	77.3	5.8	48.4	62.8	No
375	2-2	352.2	370.6	44.2	49.2	50.5	58.2	121.0	60.9	252	-2.8	3.6	123.5	5.8	49.3	60.9	No
375	3-1	354.8	372.9	44.4	48.2	49.8	57.7	121.8	60.1	76	1.3	1.7	132.1	3.5	54.5	52.2	No
375	3-2	348.6	367.1	44.4	48.7	49.9	58.3	121.3	60.8	255	1.7	2.2	306.5	3.5	54.9	51.3	No
375	4-1	352.7	371.6	44.3	48.5	50.1	58.5	122.3	61.3	74	2.1	2.1	170.8	3.9	56.7	48.7	No
375	4-2	350.5	369.5	44.3	47.8	48.5	57.8	125.5	61.7	258	-1.3	1.9	214.0	4.1	56.1	49.2	No
375	5-1	350.7	369.7	45.2	50.4	51.5	60.4	123.0	60.8	78	2.0	3.3	116.9	4.7	50.9	59.1	No
375	5-2	351.4	370.0	45.2	52.0	52.9	61.5	122.3	60.6	254	-2.2	2.7	131.5	4.7	51.1	58.6	No
375	6-1	347.6	366.4	49.6	50.2	51.4	59.3	123.6	61.4	74	1.5	1.6	191.3	4.1	65.5	53.5	No
375	6-2	354.0	371.3	49.6	50.5	51.6	60.5	121.5	59.9	256	-0.6	3.7	245.7	7.0	65.3	56.7	No
Mic 12 Average		351.2	369.9	-	-	-	-	-	-								

Source: Prime Air, 2024; ESA, 2025.

Notes: Greyed out cells we determined to not be valid measurements and were not included in SEL calculations.

Table B-5. Empty Weight En Route Measurements

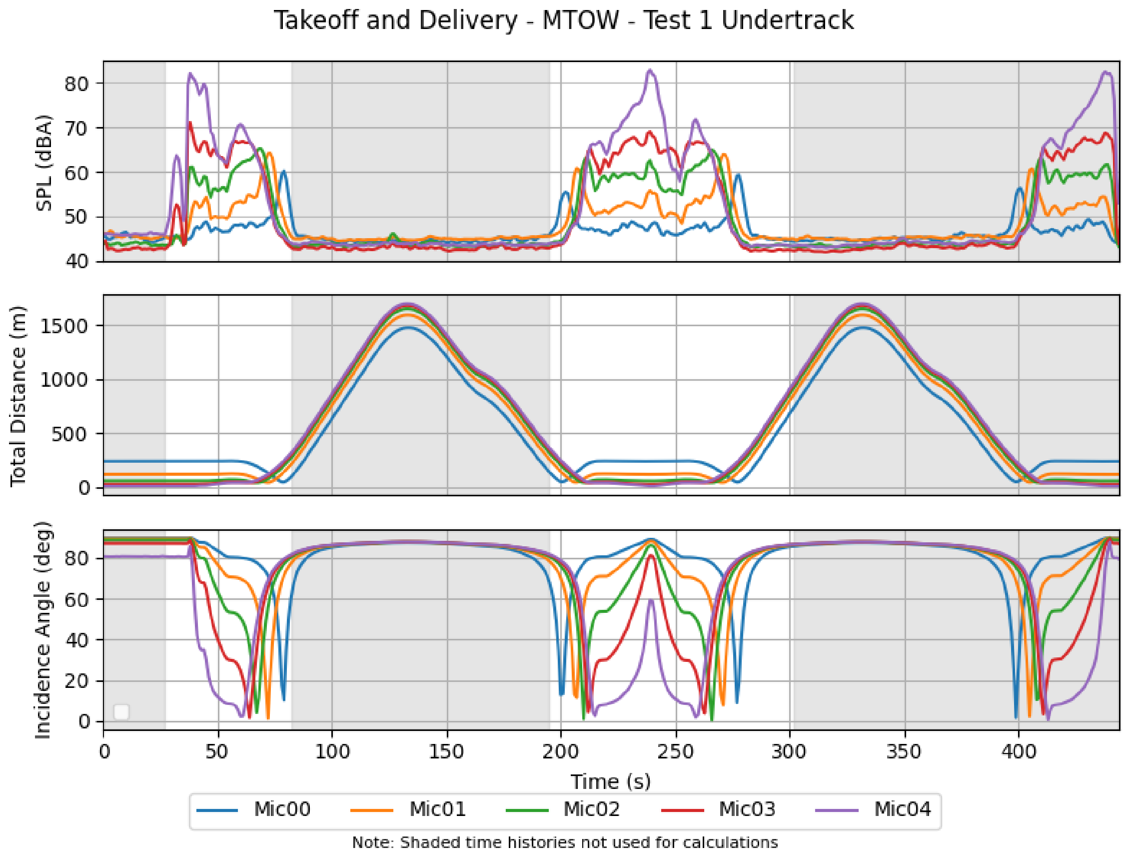
Distance to PADDC (ft)	Test#	Undertrack Distance (ft)	POCA Slant (ft)	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Median Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
Mic 09 (Lateral)																	
25	1-1	0.4	101.8	50.8	57.5	62.1	67.1	107.2	59.8	76	1.8	4.0	102.4	4.5	45.3	62.8	Yes
25	1-2	17.6	103.4	50.8	57.0	61.6	66.6	107.6	59.7	254	-1.2	3.8	93.1	4.5	45.5	62.2	Yes
25	2-1	44.8	94.2	50.1	59.3	63.6	68.4	90.4	61.9	76	2.4	2.4	177.4	4.1	65.1	38.7	Yes
25	2-2	5.7	81.4	50.1	58.6	63.3	68.1	90.1	60.4	255	-2.0	3.0	212.8	4.1	65.1	38.4	Yes
25	3-1	36.0	107.7	46.8	56.9	61.2	66.5	110.3	61.5	68	-5.7	5.9	326.2	10.9	62.2	34.6	No
25	3-2	20.1	103.3	46.8	56.1	60.8	66.1	109.7	61.1	261	6.0	7.5	312.6	10.9	62.8	35.6	No
25	4-1	43.9	110.3	62.9	62.9	64.3	73.3	107.0	62.4	68	-3.1	4.3	300.5	11.1	63.3	34.1	No
25	4-2	52.4	112.5	62.9	64.8	65.9	74.3	105.2	60.3	264	6.4	6.4	353.4	10.7	63.9	33.9	No
25	5-1	3.6	96.7	47.0	57.5	61.7	66.5	104.3	60.6	69	-2.0	2.2	319.7	9.9	61.3	37.8	Yes
25	5-2	8.5	94.9	47.0	57.7	62.7	67.7	102.3	60.8	257	3.0	3.0	341.0	9.9	61.7	37.4	Yes
25	6-1	48.9	110.8	47.6	55.6	60.5	66.8	106.5	60.7	71	-2.5	4.4	34.0	9.1	61.3	37.3	Yes
25	6-2	9.2	100.6	47.6	55.2	60.1	65.6	107.7	63.2	258	2.2	2.6	21.8	7.4	61.0	37.0	Yes
25	7-1	22.4	104.3	50.7	57.1	61.5	67.1	107.2	59.6	78	1.7	4.2	102.3	4.7	45.5	61.5	Yes
25	7-2	23.1	105.2	50.7	56.9	61.3	66.4	107.9	59.9	252	-2.1	3.9	104.6	4.7	45.7	61.3	Yes
Mic 09 Average		18.4	99.3	49.2	57.2	61.8	67.0	103.1	60.7								
Mic 10 (Lateral)																	
76	1-1	50.7	113.7	44.9	56.6	61.1	66.1	107.2	59.8	76	1.8	4.0	102.4	4.5	45.3	62.8	Yes
76	1-2	54.7	115.6	44.9	56.1	60.8	65.6	107.6	59.7	254	-1.2	3.8	93.1	4.5	45.5	62.2	Yes
76	2-1	69.0	107.9	44.5	58.3	62.6	67.3	90.4	61.9	76	2.4	2.4	177.4	4.1	65.1	38.7	Yes
76	2-2	51.4	96.1	44.5	57.6	62.4	67.2	90.1	60.4	255	-2.0	3.0	212.8	4.1	65.1	38.4	Yes
76	3-1	63.0	119.5	51.1	58.0	62.3	67.6	110.3	61.5	68	-5.7	5.9	326.2	10.9	62.2	34.6	No
76	3-2	56.0	115.8	51.1	56.9	61.2	66.9	109.7	61.1	261	6.0	7.5	312.6	10.9	62.8	35.6	No
76	4-1	66.9	121.3	49.1	56.4	60.9	66.8	107.0	62.4	68	-3.1	4.3	300.5	11.1	63.3	34.1	Yes
76	4-2	72.9	123.5	49.1	58.0	62.4	67.5	105.2	60.3	264	6.4	6.4	353.4	10.7	63.9	33.9	No
76	5-1	50.5	109.1	50.6	58.6	62.5	67.6	104.3	60.6	69	-2.0	2.2	319.7	9.9	61.3	37.8	Yes
76	5-2	52.4	108.1	50.6	58.6	63.5	68.6	102.3	60.8	257	3.0	3.0	341.0	9.9	61.7	37.4	Yes
76	6-1	70.0	122.6	51.7	56.9	61.6	68.1	106.5	60.7	71	-2.5	4.4	34.0	9.1	61.3	37.3	Yes
76	6-2	53.1	113.4	51.7	56.2	60.7	66.7	107.7	63.2	258	2.2	2.6	21.8	7.4	61.0	37.0	No
76	7-1	56.8	116.6	45.3	56.2	60.7	66.2	107.2	59.6	78	1.7	4.2	102.3	4.7	45.5	61.5	Yes
76	7-2	55.9	116.8	45.3	56.0	60.7	65.6	107.9	59.9	252	-2.1	3.9	104.6	4.7	45.7	61.3	Yes
Mic 10 Average		57.8	112.8	47.1	57.1	61.7	66.9	103.0	60.6								
Mic 11 (Lateral)																	
175	1-1	150.5	181.7	44.5	53.3	57.1	62.8	107.2	59.8	76	1.8	4.0	102.4	4.5	45.3	62.8	Yes
175	1-2	152.3	183.2	44.5	52.6	56.7	62.2	107.6	59.7	254	-1.2	3.8	93.1	4.5	45.5	62.2	Yes
175	2-1	158.0	178.4	43.8	54.4	57.9	63.5	90.4	61.9	76	2.4	2.4	177.4	4.1	65.1	38.7	Yes

Distance to PADDC (ft)	Test#	Undertrack Distance (ft)	POCA Slant (ft)	Ambient (dBA)	LAEQ (dBA)	LMAX (dBA)	SEL (dBA)	Average Altitude (ft)	Average True Air Speed (kts)	Median Drone Heading (deg.)	Cross Wind (kts)	Wind Speed (kts)	Wind Direction (deg.)	Wind Gust Speed (kts)	Temp (°f)	Relative Humidity (%)	Valid
175	2-2	150.9	171.3	43.8	53.6	57.3	63.2	90.1	60.4	255	-2.0	3.0	212.8	4.1	65.1	38.4	Yes
175	3-1	155.1	185.4	44.9	53.7	57.4	63.3	110.3	61.5	68	-5.7	5.9	326.2	10.9	62.2	34.6	No
175	3-2	153.7	184.1	44.9	53.0	56.8	63.0	109.7	61.1	261	6.0	7.5	312.6	10.9	62.8	35.6	No
175	4-1	155.6	185.7	43.0	52.5	56.6	62.9	107.0	62.4	68	-3.1	4.3	300.5	11.1	63.3	34.1	Yes
175	4-2	159.4	188.0	43.0	53.8	57.9	63.3	105.2	60.3	264	6.4	6.4	353.4	10.7	63.9	33.9	No
175	5-1	150.3	178.7	45.7	54.0	57.7	63.1	104.3	60.6	69	-2.0	2.2	319.7	9.9	61.3	37.8	Yes
175	5-2	151.6	178.6	45.7	54.0	58.3	64.0	102.3	60.8	257	3.0	3.0	341.0	9.9	61.7	37.4	Yes
175	6-1	158.5	187.6	45.2	53.5	57.5	64.7	106.5	60.7	71	-2.5	4.4	34.0	9.1	61.3	37.3	No
175	6-2	152.5	182.5	45.2	51.8	55.7	62.2	107.7	63.2	258	2.2	2.6	21.8	7.4	61.0	37.0	Yes
175	7-1	153.2	184.0	44.7	53.0	56.7	63.0	107.2	59.6	78	1.7	4.2	102.3	4.7	45.5	61.5	Yes
175	7-2	152.9	184.1	44.7	52.6	56.6	62.2	107.9	59.9	252	-2.1	3.9	104.6	4.7	45.7	61.3	Yes
Mic 11 Average		152.8	180.8	44.6	53.2	57.1	62.9	103.2	60.8								
Mic 12 (Lateral)																	
375	1-1	350.1	364.5	45.5	48.7	49.9	58.2	107.2	59.8	76	1.8	4.0	102.4	4.5	45.3	62.8	No
375	1-2	351.1	365.6	45.5	48.4	49.4	57.9	107.6	59.7	254	-1.2	3.8	93.1	4.5	45.5	62.2	No
375	2-1	353.6	363.2	45.7	49.7	51.1	58.7	90.4	61.9	76	2.4	2.4	177.4	4.1	65.1	38.7	No
375	2-2	350.3	359.6	45.7	49.5	50.7	59.0	90.1	60.4	255	-2.0	3.0	212.8	4.1	65.1	38.4	No
375	3-1	352.0	366.4	46.7	49.1	50.2	58.7	110.3	61.5	68	-5.7	5.9	326.2	10.9	62.2	34.6	No
375	3-2	352.7	366.9	46.7	50.4	51.8	60.4	109.7	61.1	261	6.0	7.5	312.6	10.9	62.8	35.6	No
375	4-1	351.3	365.6	44.6	49.2	50.2	59.7	107.0	62.4	68	-3.1	4.3	300.5	11.1	63.3	34.1	No
375	4-2	354.0	367.8	44.6	49.6	51.1	59.2	105.2	60.3	264	6.4	6.4	353.4	10.7	63.9	33.9	No
375	5-1	349.8	362.9	49.7	49.2	50.4	58.2	104.3	60.6	69	-2.0	2.2	319.7	9.9	61.3	37.8	No
375	5-2	350.9	363.4	49.7	55.9	56.7	65.9	102.3	60.8	257	3.0	3.0	341.0	9.9	61.7	37.4	No
375	6-1	354.1	367.7	49.1	51.0	52.4	62.1	106.5	60.7	71	-2.5	4.4	34.0	9.1	61.3	37.3	No
375	6-2	352.0	366.0	49.1	48.7	49.5	59.2	107.7	63.2	258	2.2	2.6	21.8	7.4	61.0	37.0	No
375	7-1	351.7	366.1	45.2	49.5	50.5	59.5	107.2	59.6	78	1.7	4.2	102.3	4.7	45.5	61.5	No
375	7-2	351.6	366.2	45.2	48.3	49.5	57.9	107.9	59.9	252	-2.1	3.9	104.6	4.7	45.7	61.3	No
Mic 12 Average		-	-	-	-	-	-	-	-								

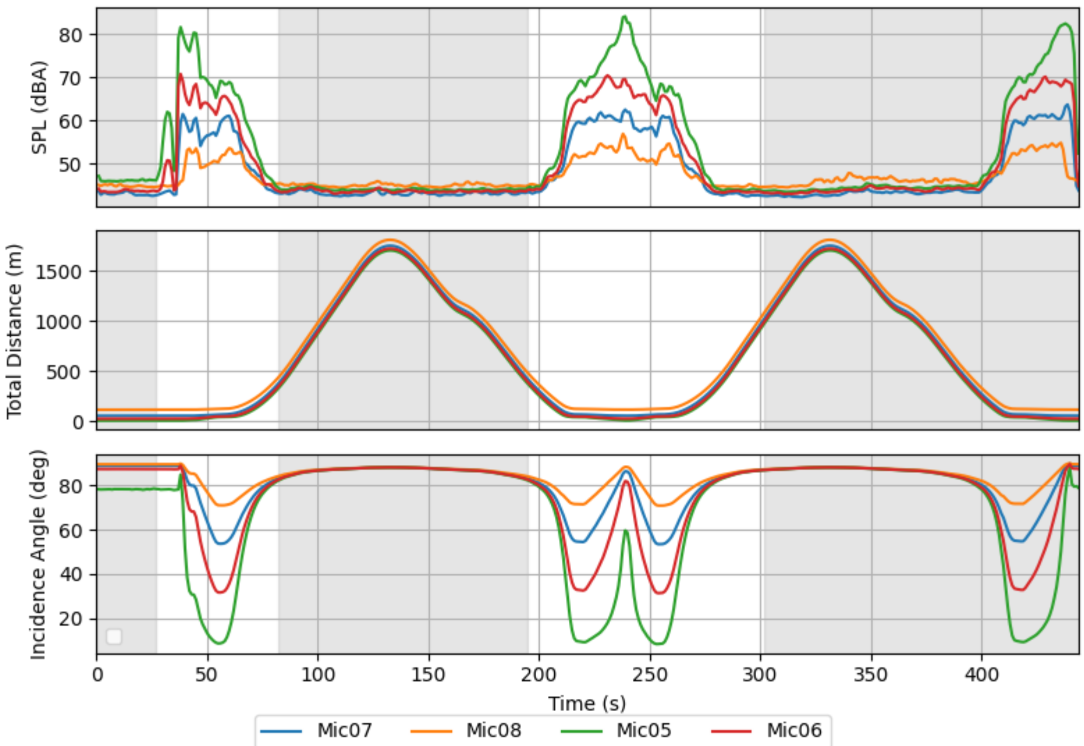
Source: Prime Air, 2024; ESA, 2025.

Notes: Greyed out cells we determined to not be valid measurements and were not included in SEL calculations.

Appendix C: Time History Graphs

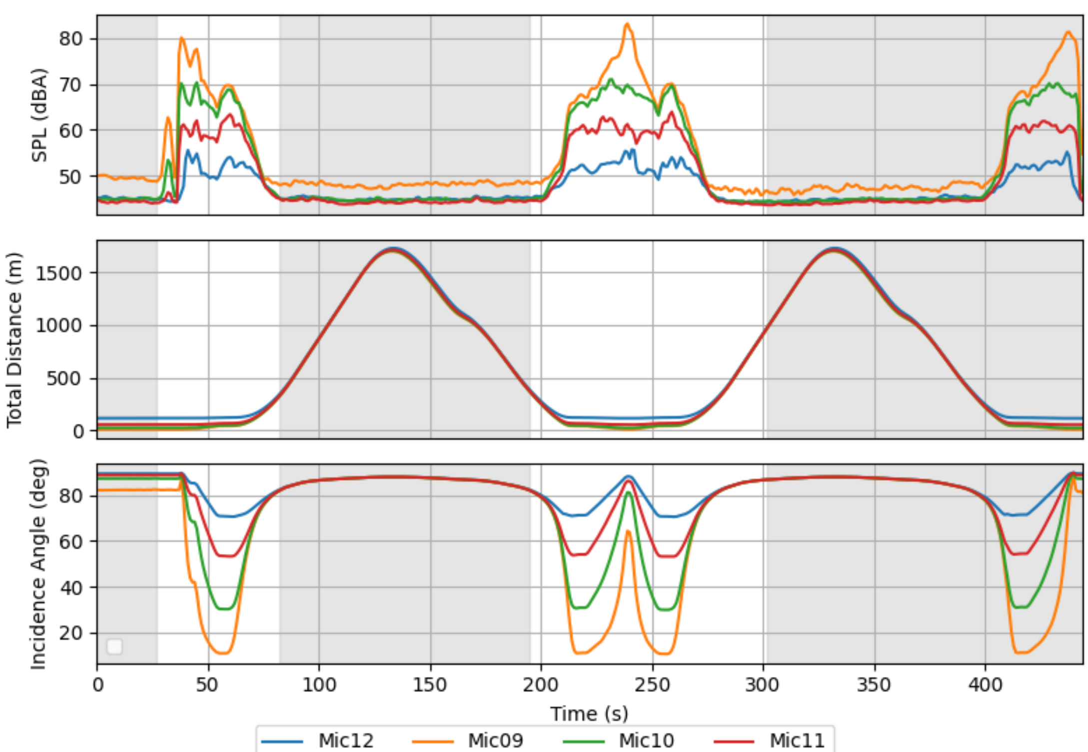


Takeoff and Delivery - MTOW - Test 1 Behind



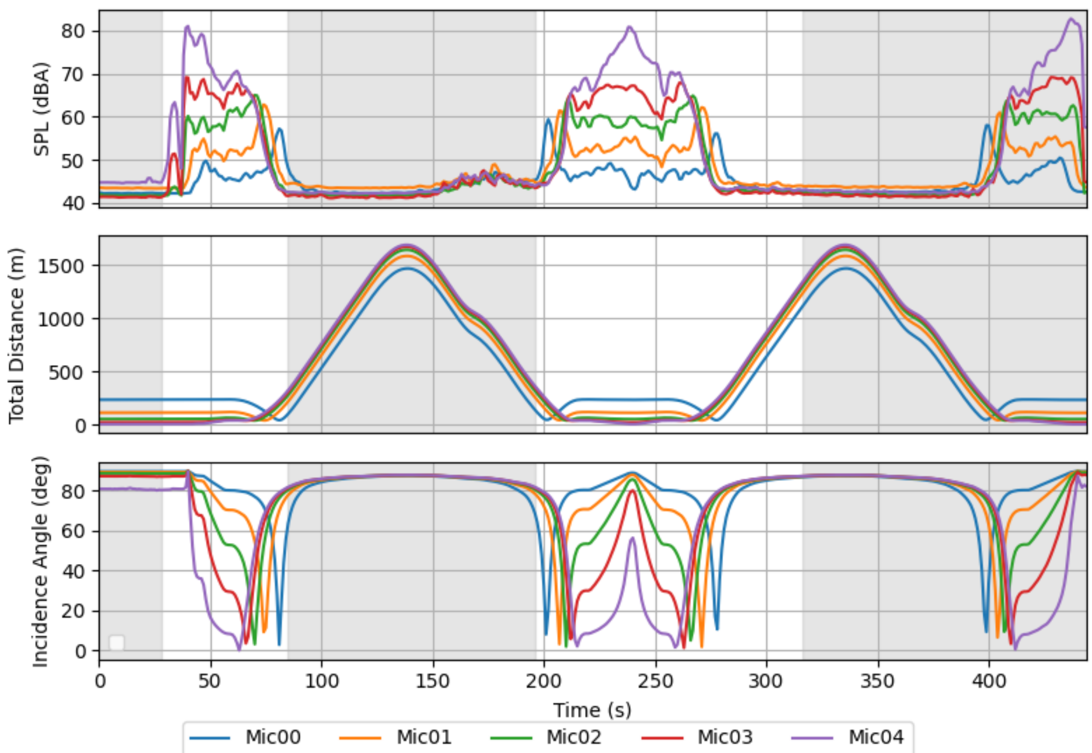
Note: Shaded time histories not used for calculations

Takeoff and Delivery - MTOW - Test 1 Lateral



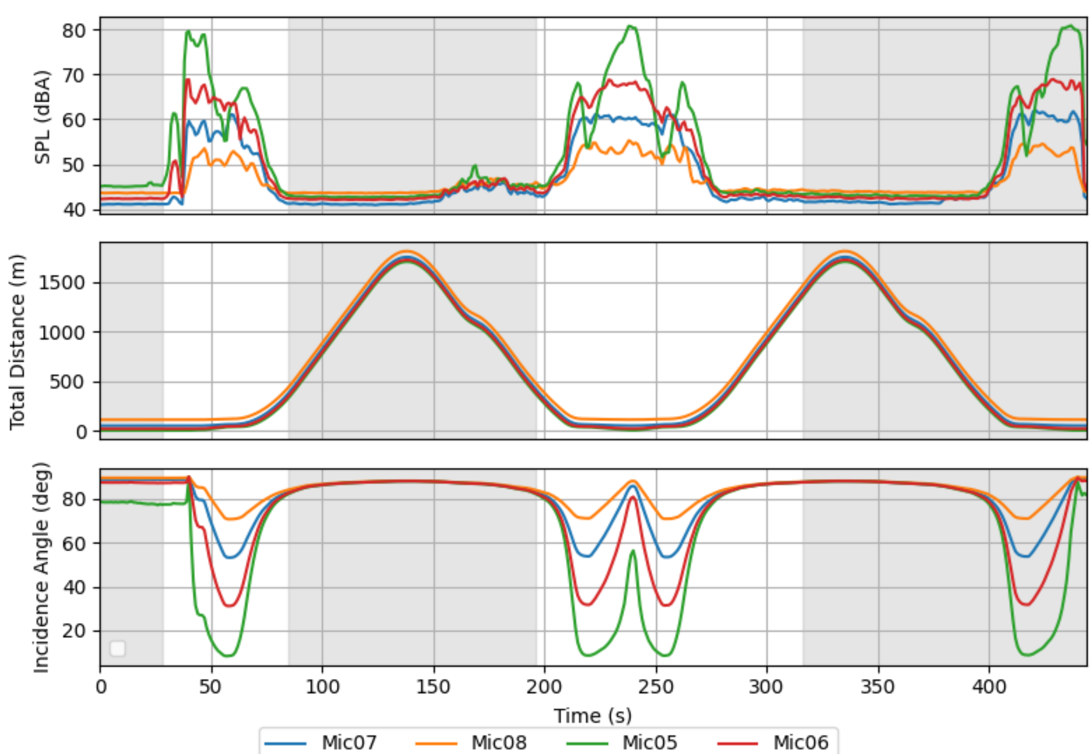
Note: Shaded time histories not used for calculations

Takeoff and Delivery - MTOW - Test 2 Undertrack



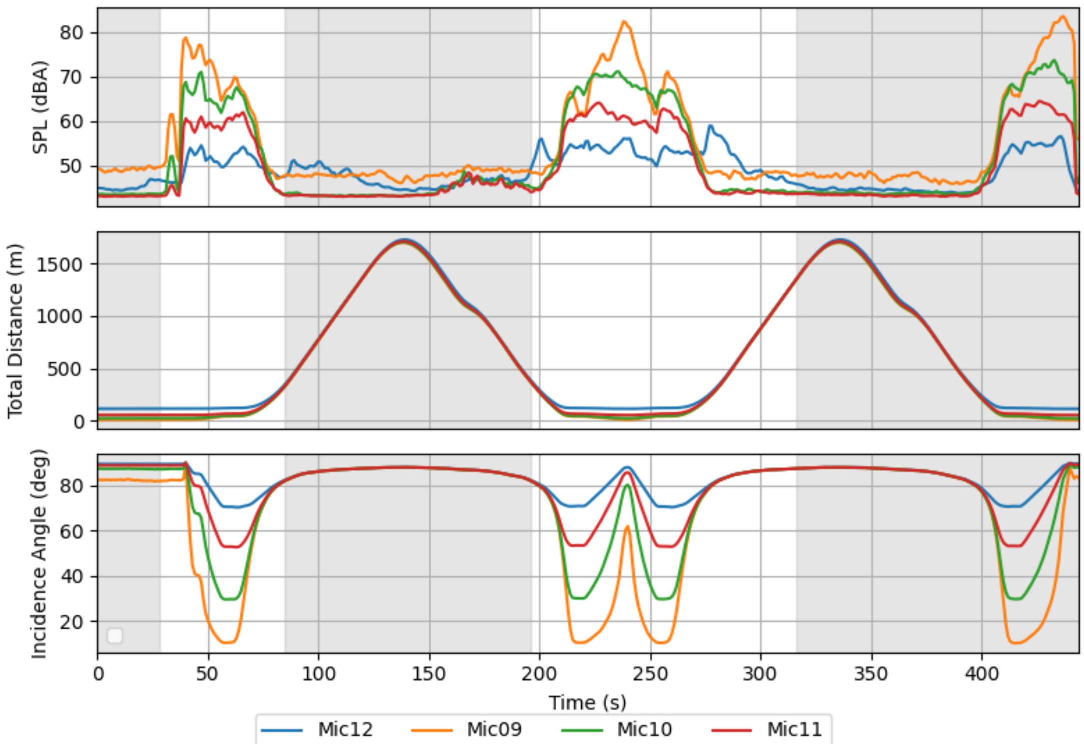
Note: Shaded time histories not used for calculations

Takeoff and Delivery - MTOW - Test 2 Behind



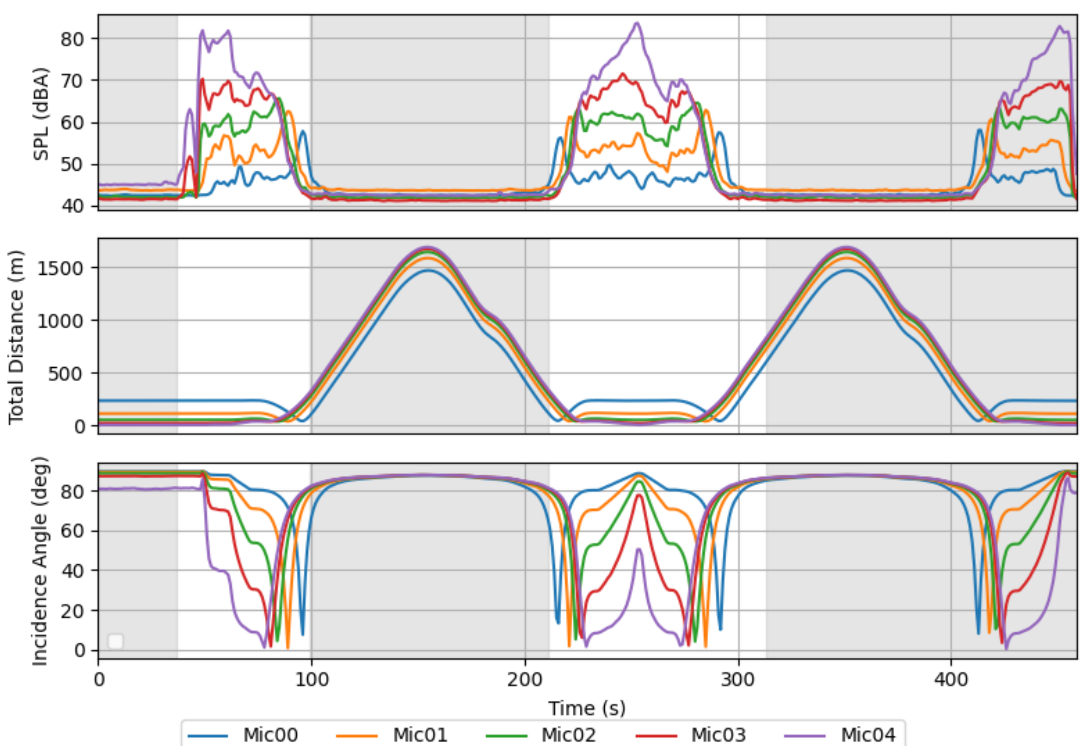
Note: Shaded time histories not used for calculations

Takeoff and Delivery - MTOW - Test 2 Lateral



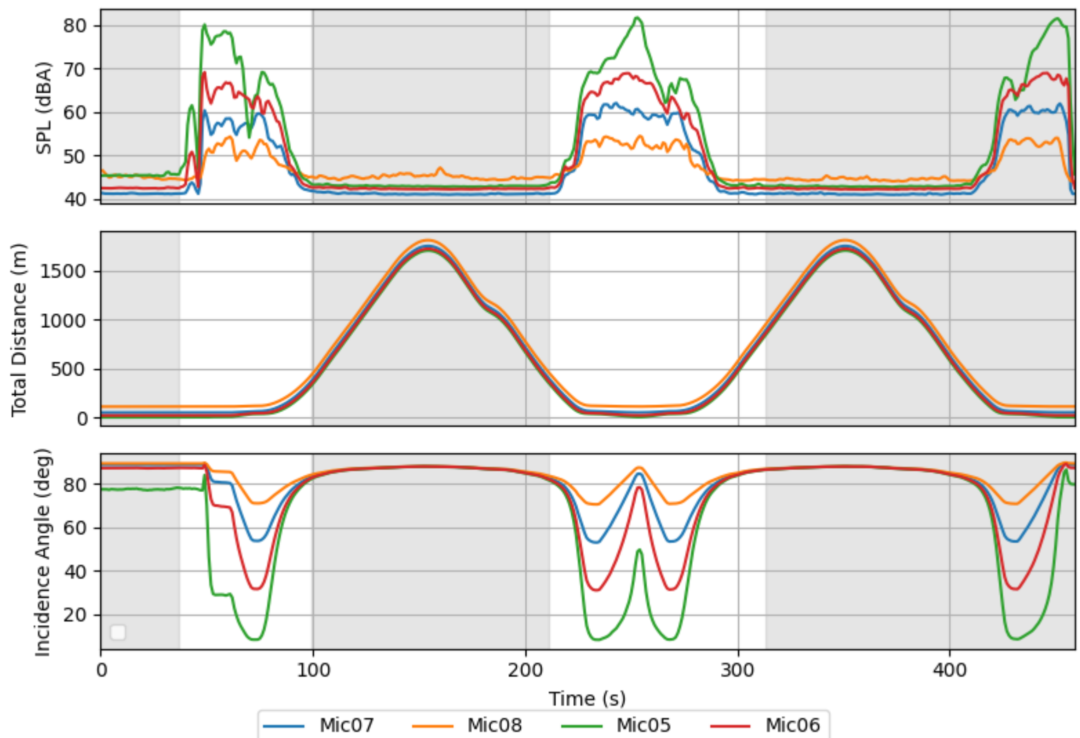
Note: Shaded time histories not used for calculations

Takeoff and Delivery - MTOW - Test 3 Undertrack



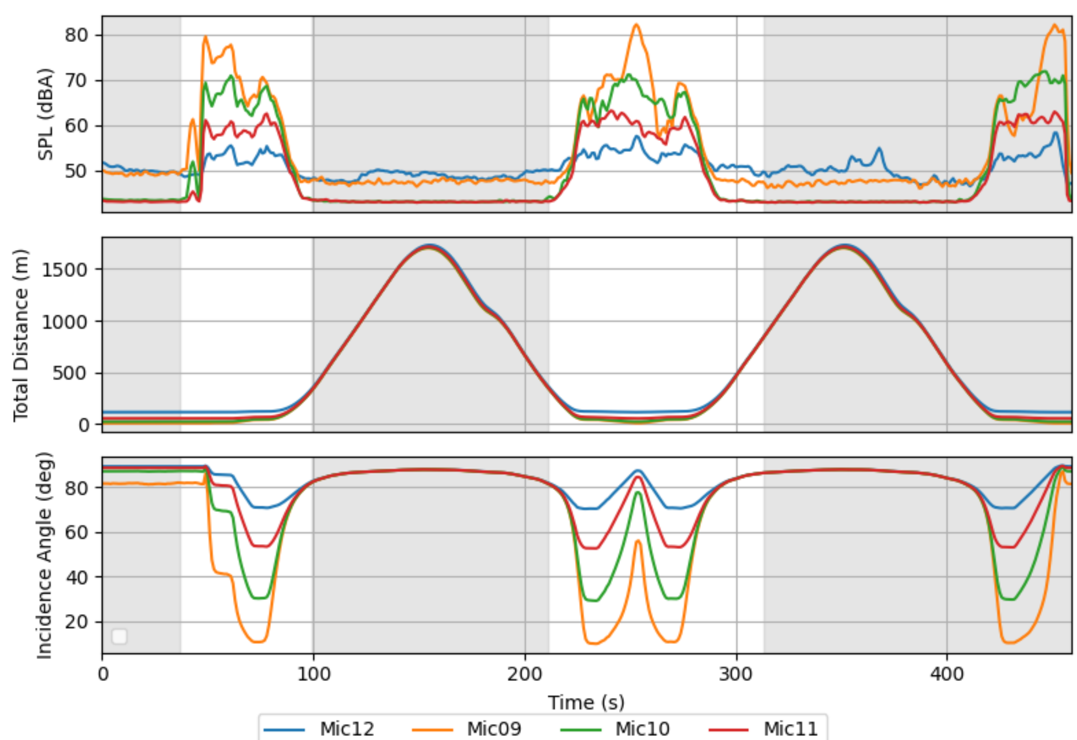
Note: Shaded time histories not used for calculations

Takeoff and Delivery - MTOW - Test 3 Behind

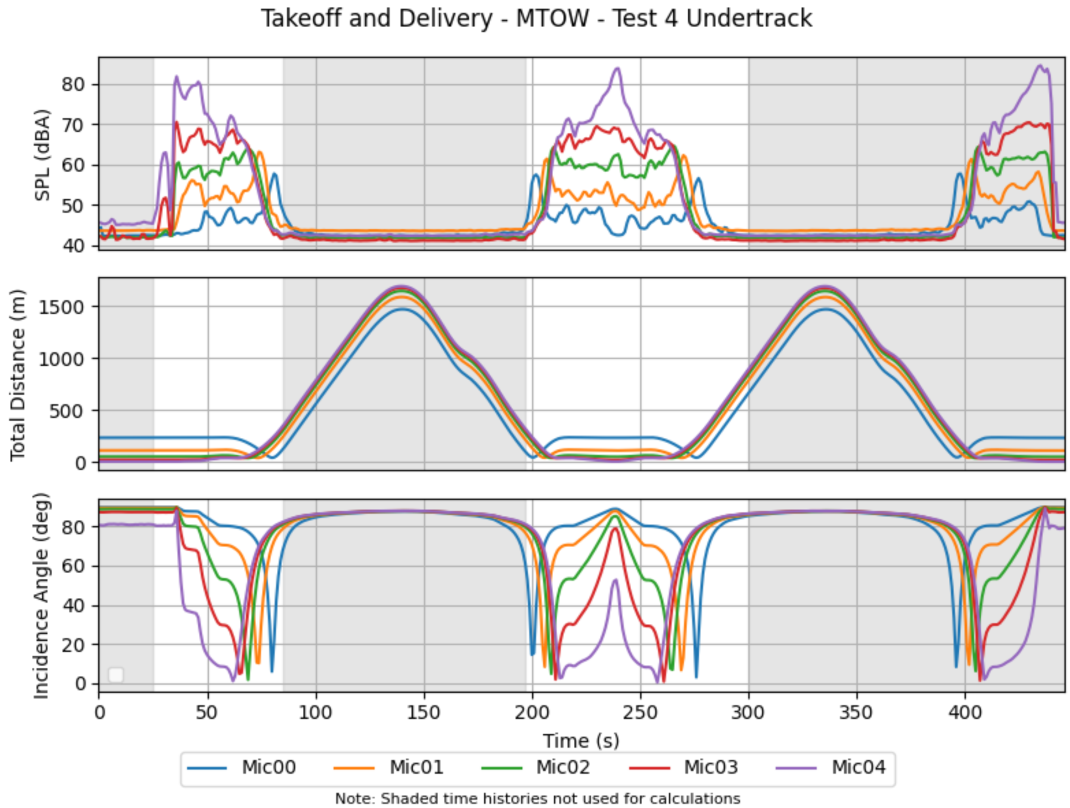


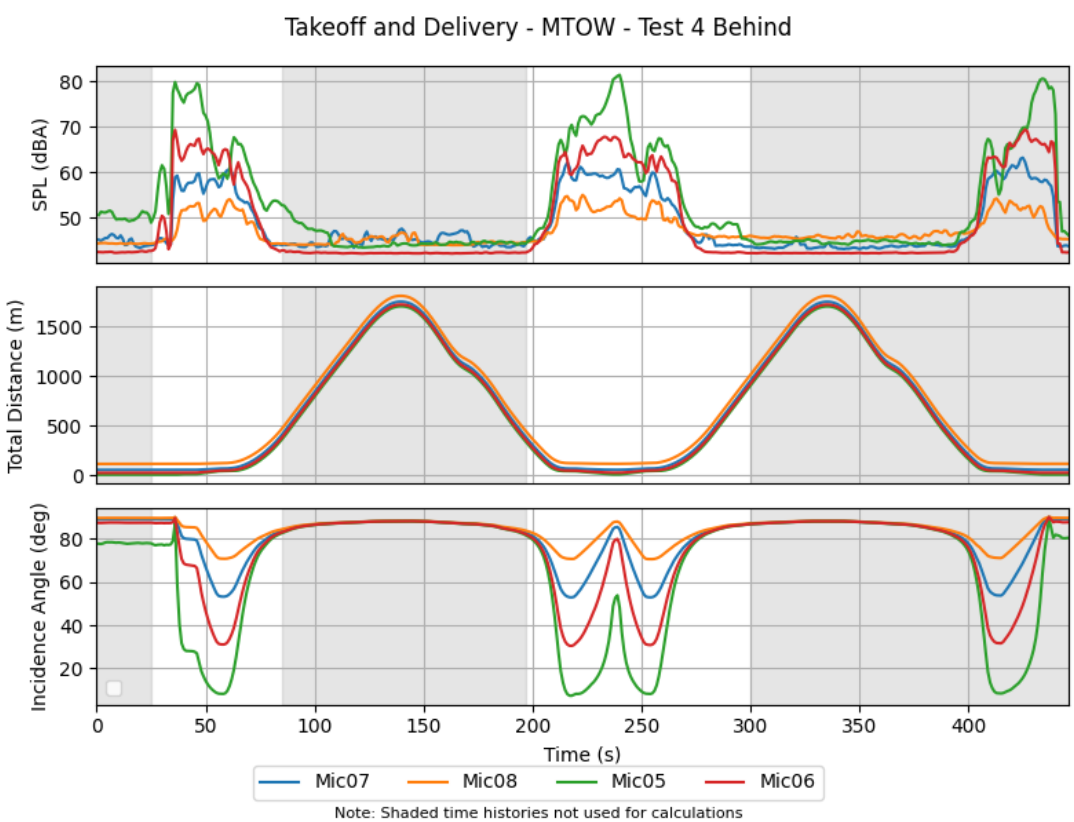
Note: Shaded time histories not used for calculations

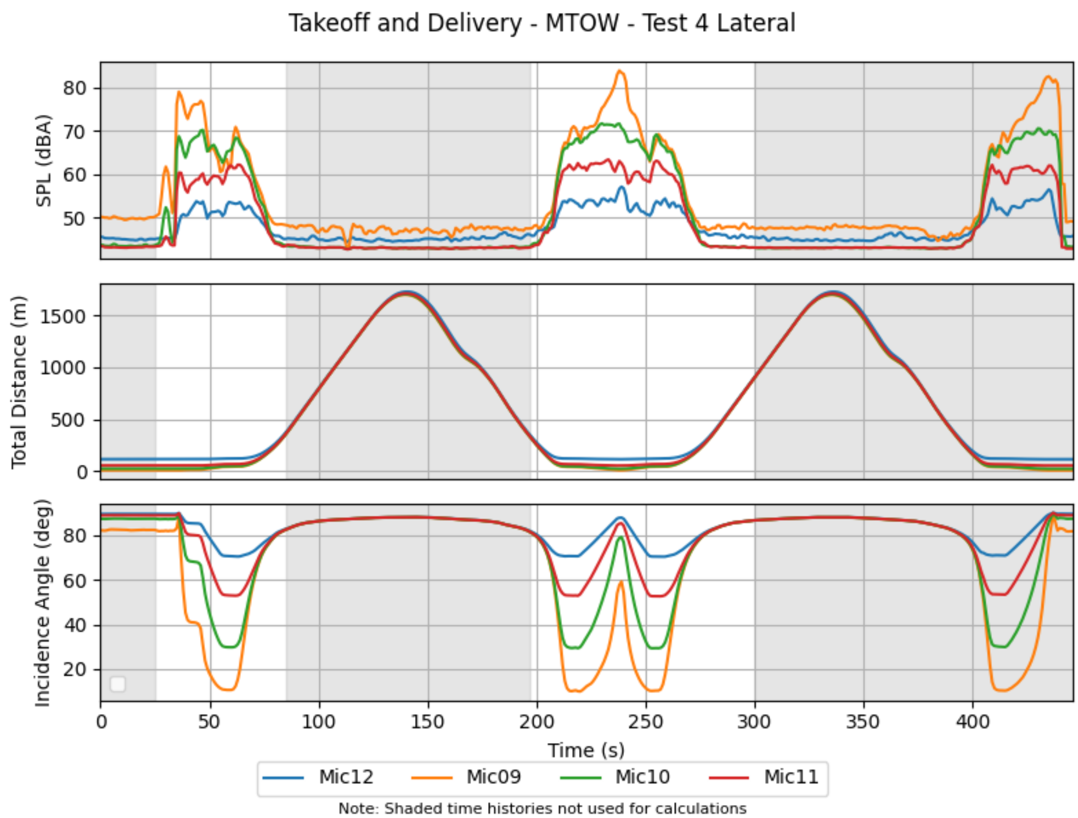
Takeoff and Delivery - MTOW - Test 3 Lateral

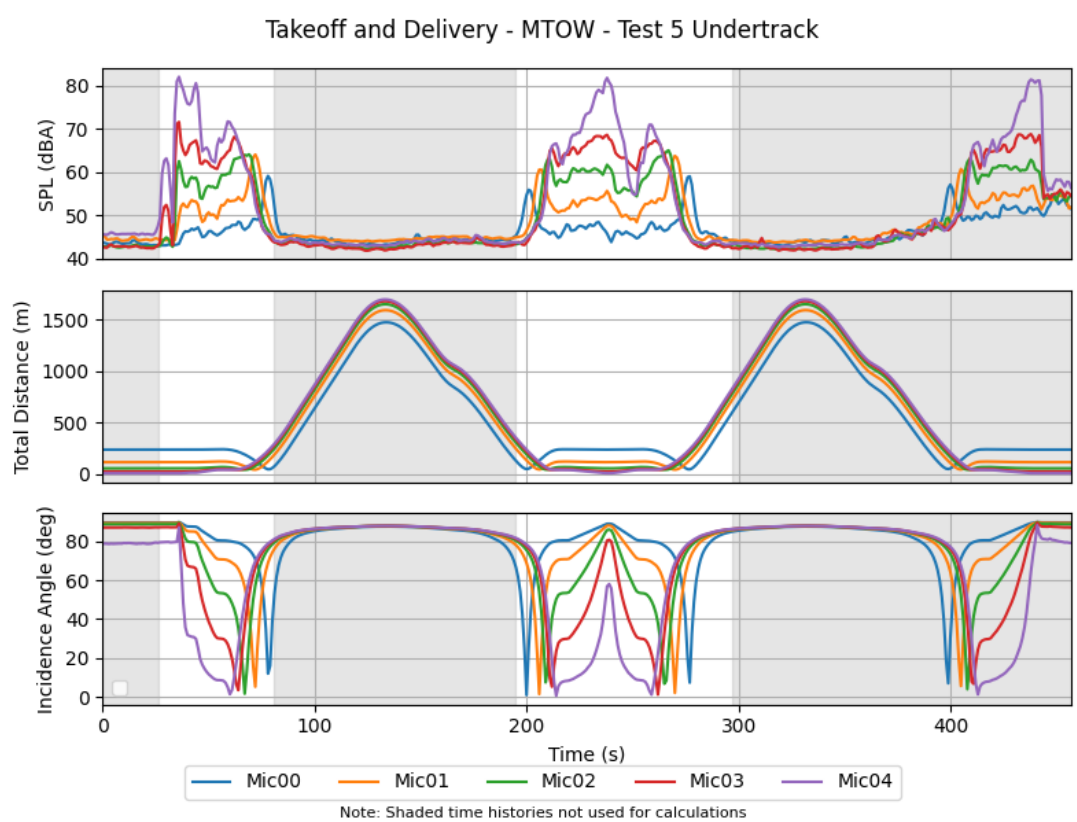


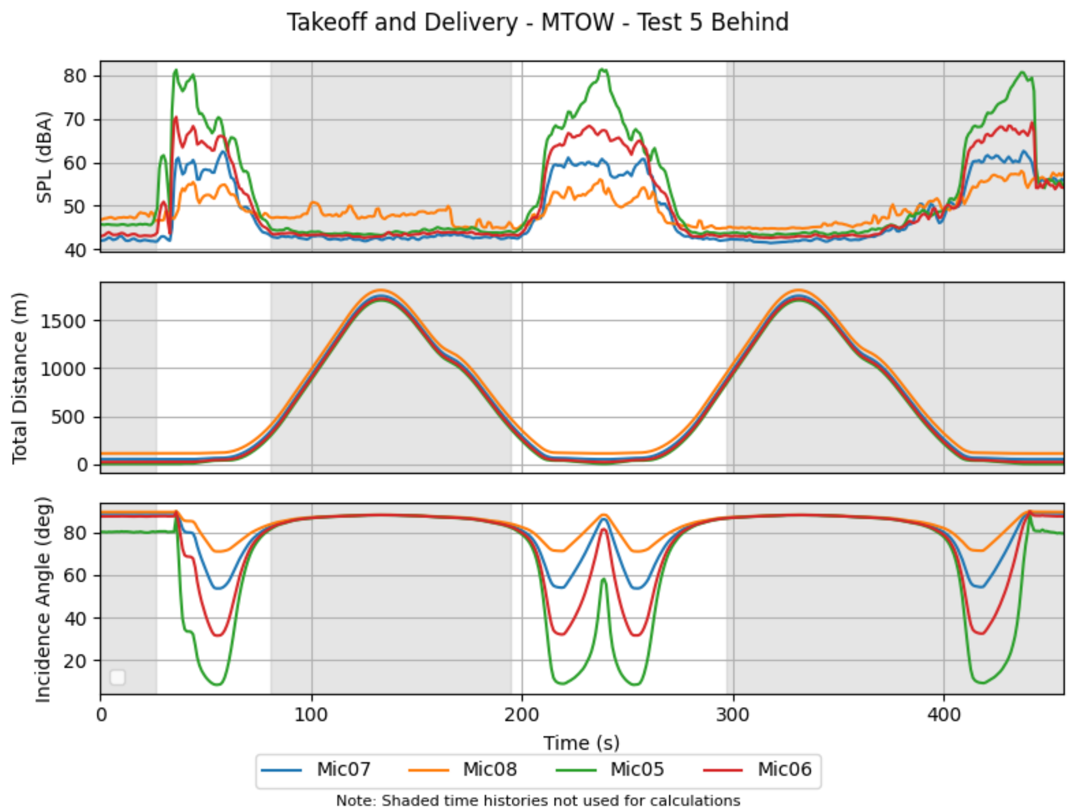
Note: Shaded time histories not used for calculations


Takeoff and Delivery - MTOW - Test 4 Undertrack
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic00
Mic01
Mic02
Mic03
Mic04
Note: Shaded time histories not used for calculations

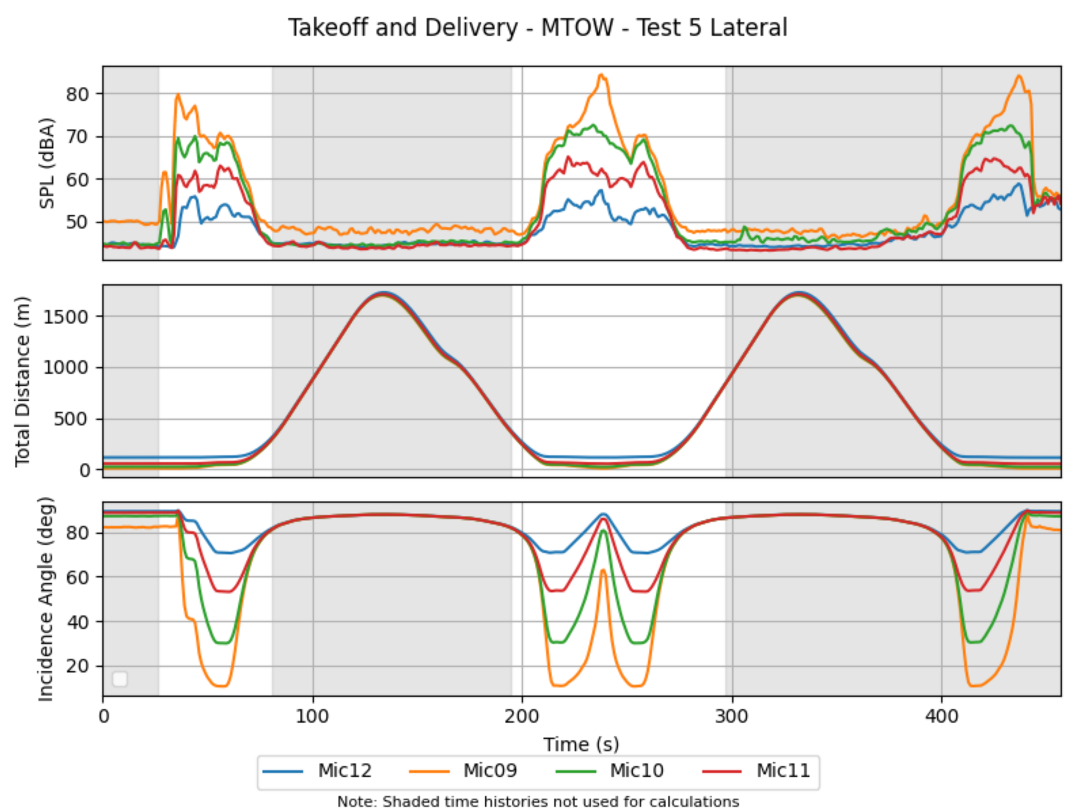

Takeoff and Delivery - MTOW - Test 4 Behind
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic07
Mic08
Mic05
Mic06
Note: Shaded time histories not used for calculations


Takeoff and Delivery - MTOW - Test 4 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations

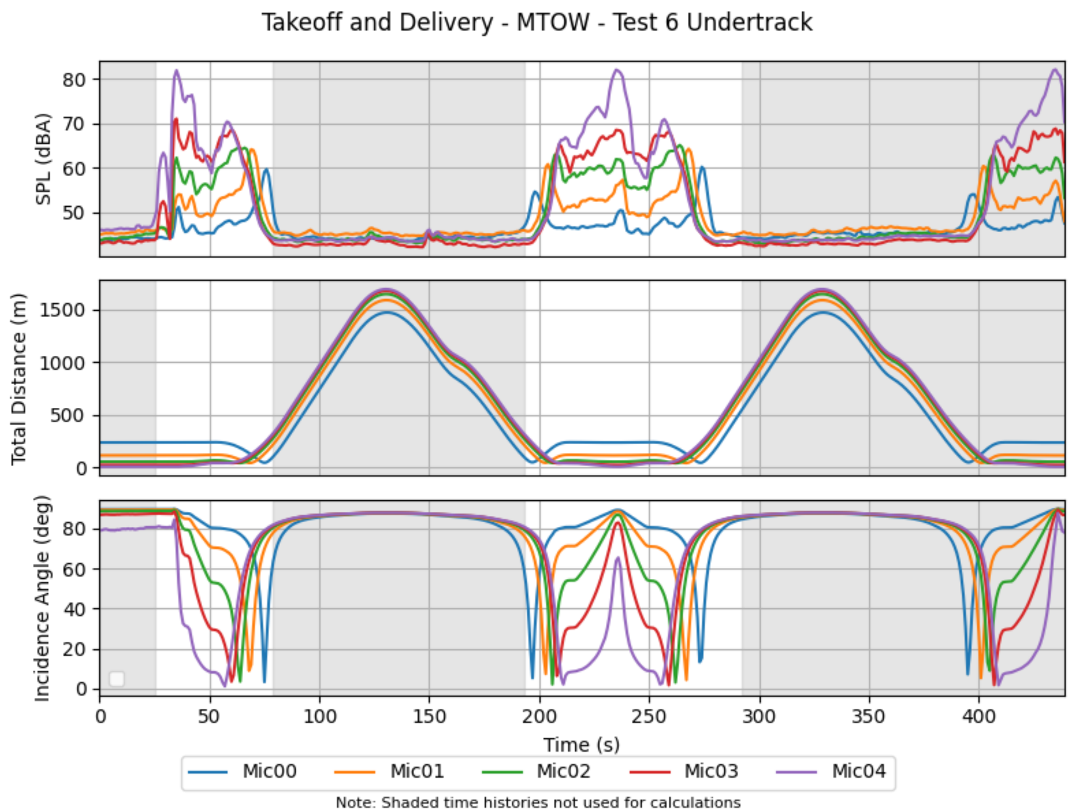

Takeoff and Delivery - MTOW - Test 5 Undertrack
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic00
Mic01
Mic02
Mic03
Mic04
Note: Shaded time histories not used for calculations

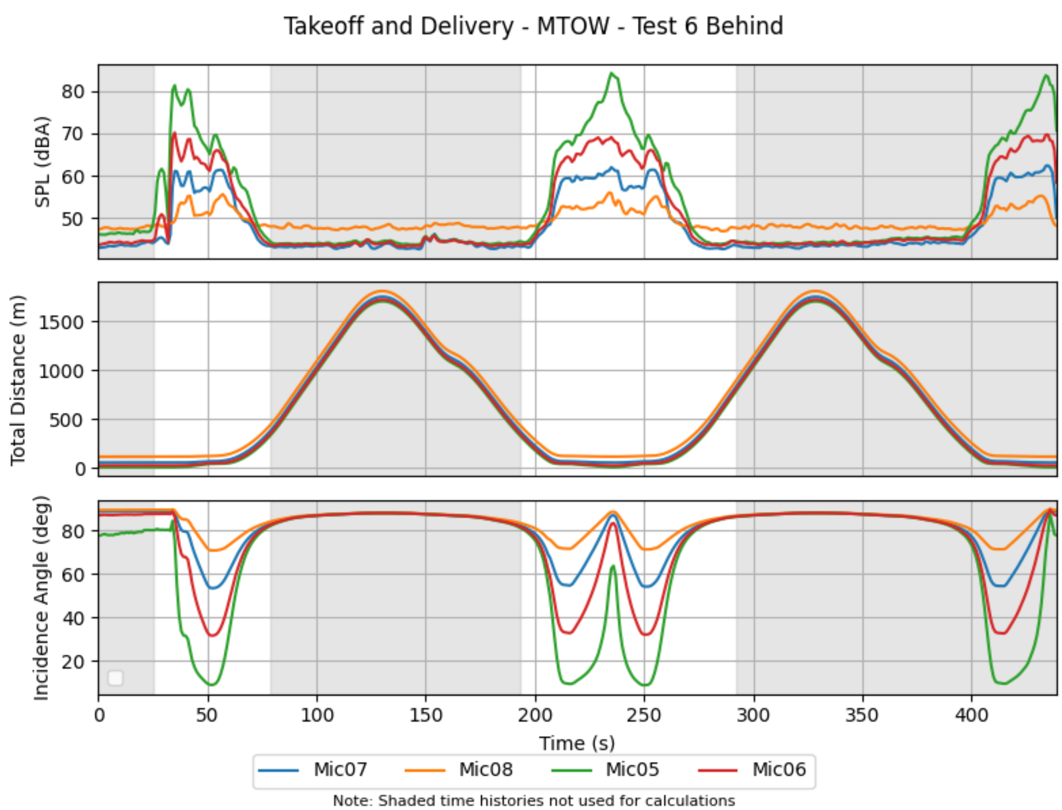


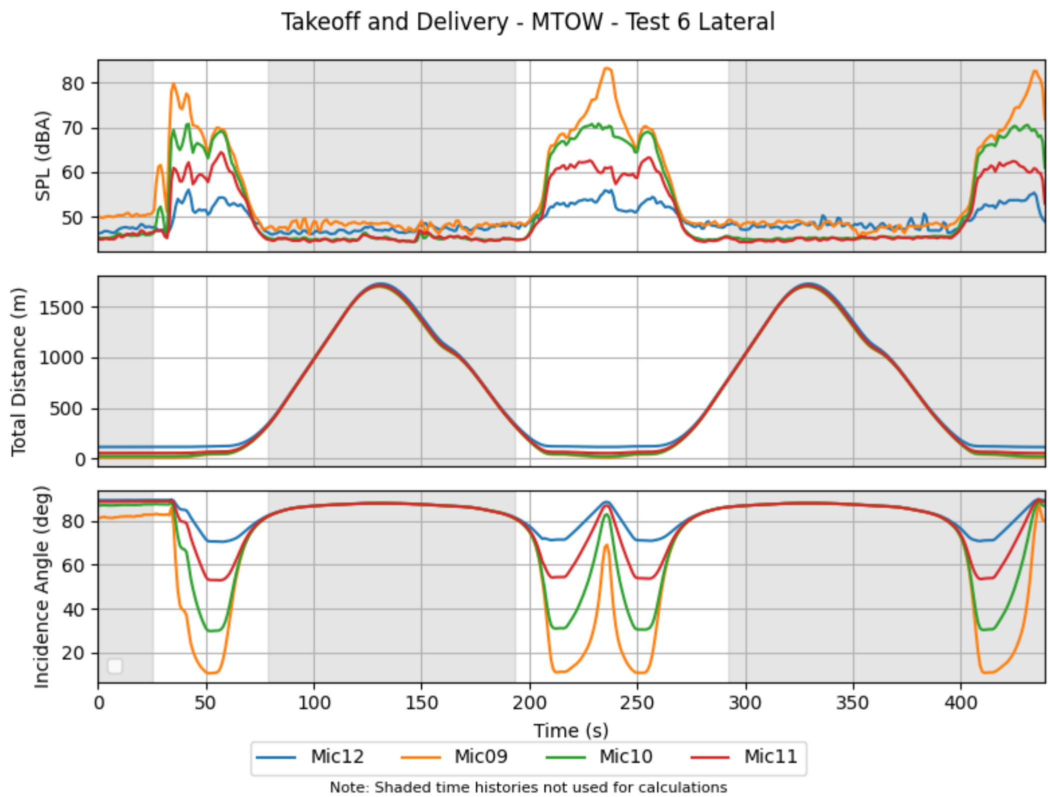
Takeoff and Delivery - MTOW - Test 5 Behind
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic07
Mic08
Mic05
Mic06
Note: Shaded time histories not used for calculations

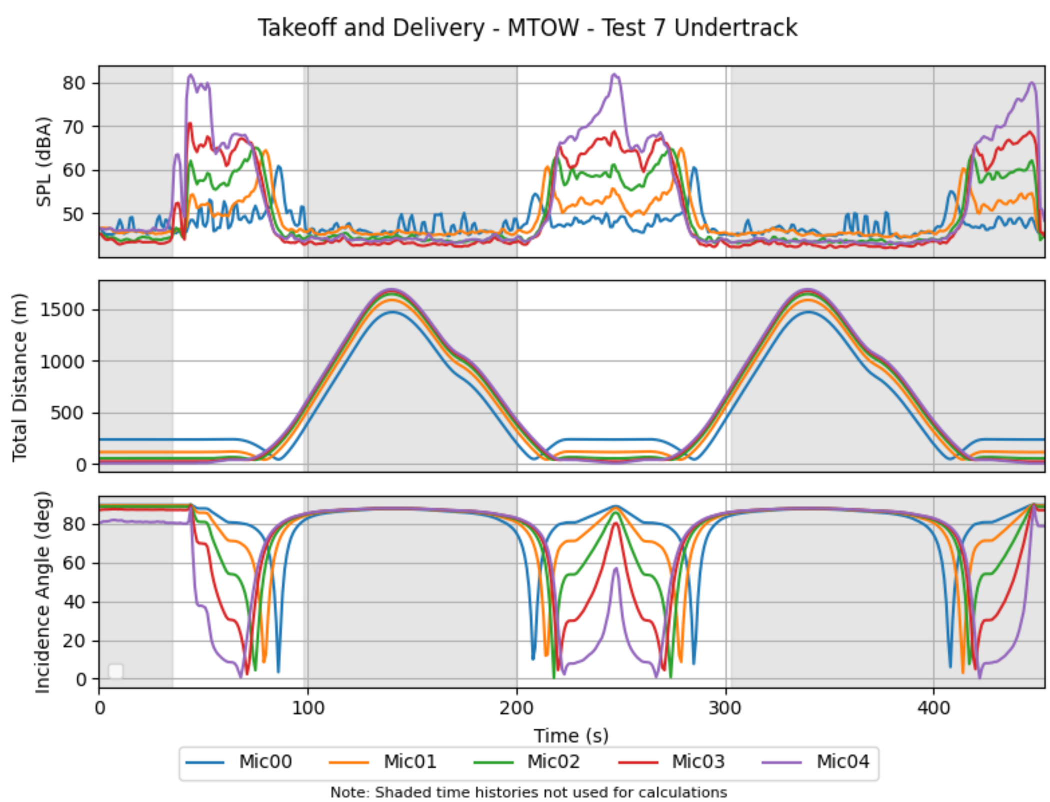


Takeoff and Delivery - MTOW - Test 5 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations

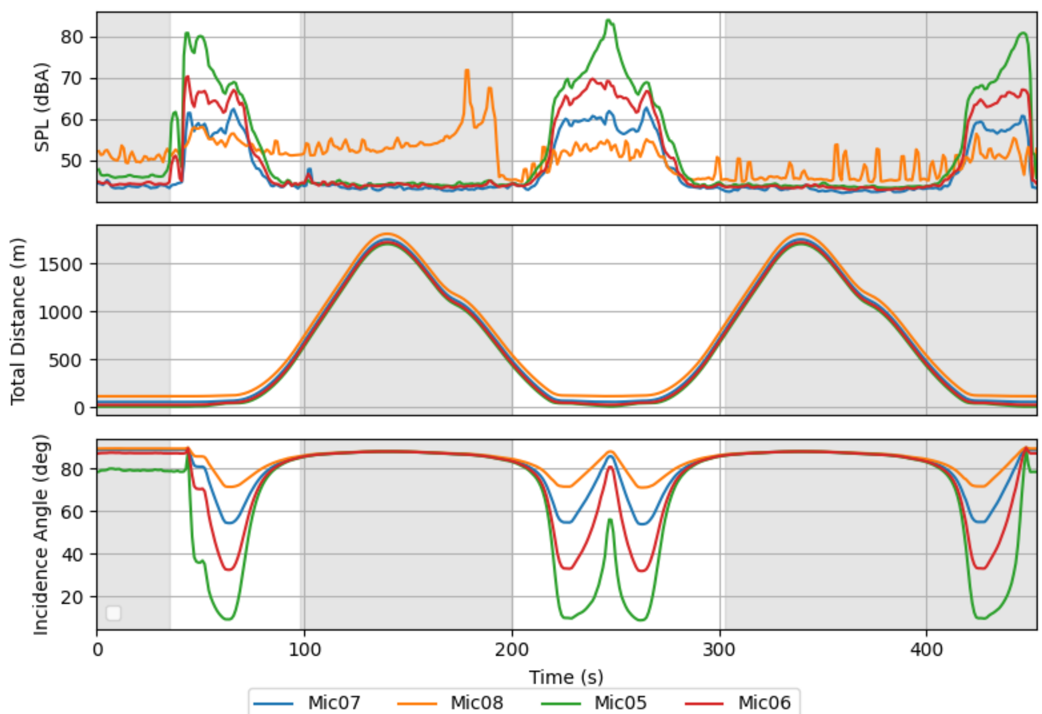

Takeoff and Delivery - MTOW - Test 6 Undertrack
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic00
Mic01
Mic02
Mic03
Mic04
Note: Shaded time histories not used for calculations


Takeoff and Delivery - MTOW - Test 6 Behind
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic07
Mic08
Mic05
Mic06
Note: Shaded time histories not used for calculations


Takeoff and Delivery - MTOW - Test 6 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations

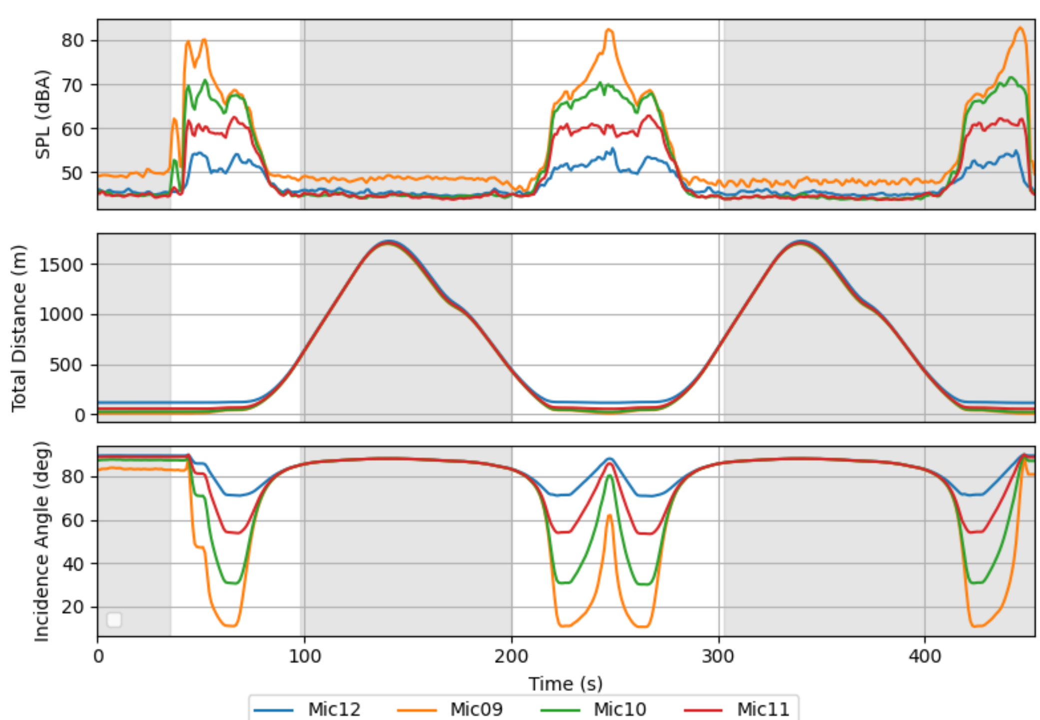

Takeoff and Delivery - MTOW - Test 7 Undertrack
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic00
Mic01
Mic02
Mic03
Mic04
Note: Shaded time histories not used for calculations

Takeoff and Delivery - MTOW - Test 7 Behind

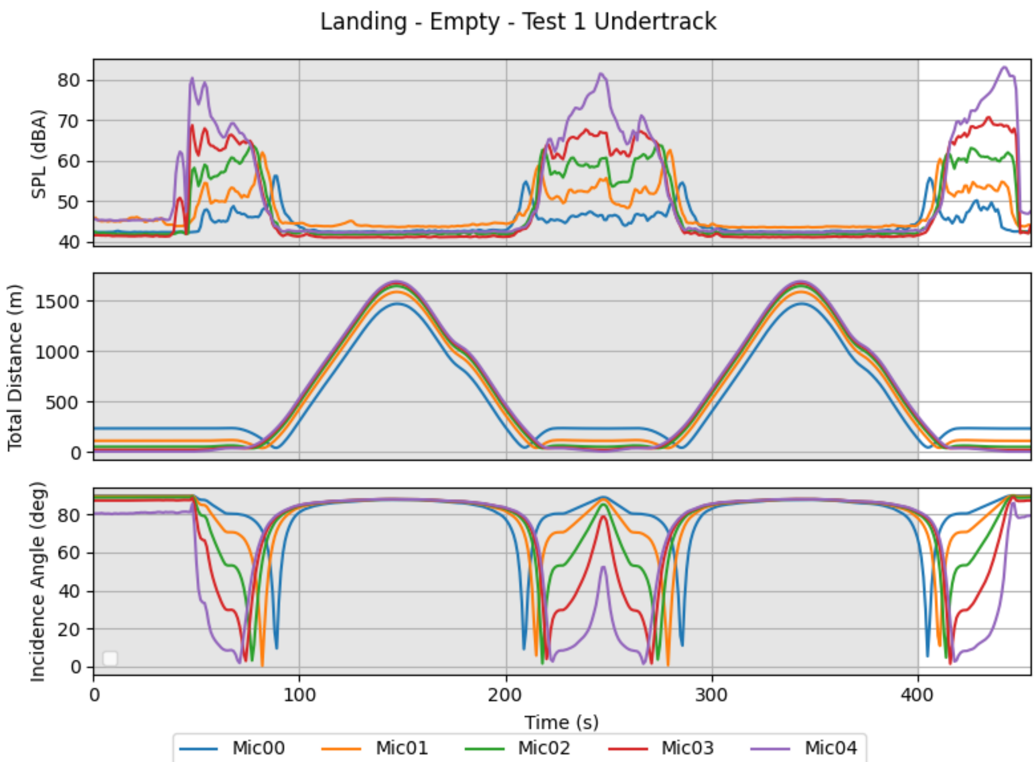


Note: Shaded time histories not used for calculations

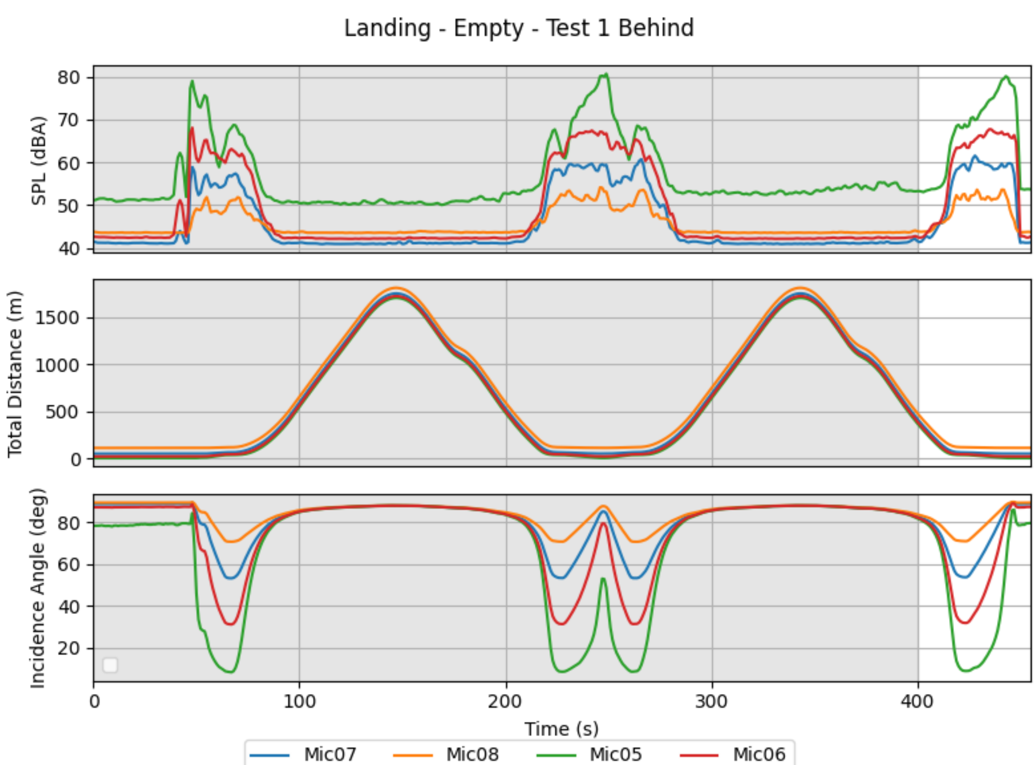
Takeoff and Delivery - MTOW - Test 7 Lateral



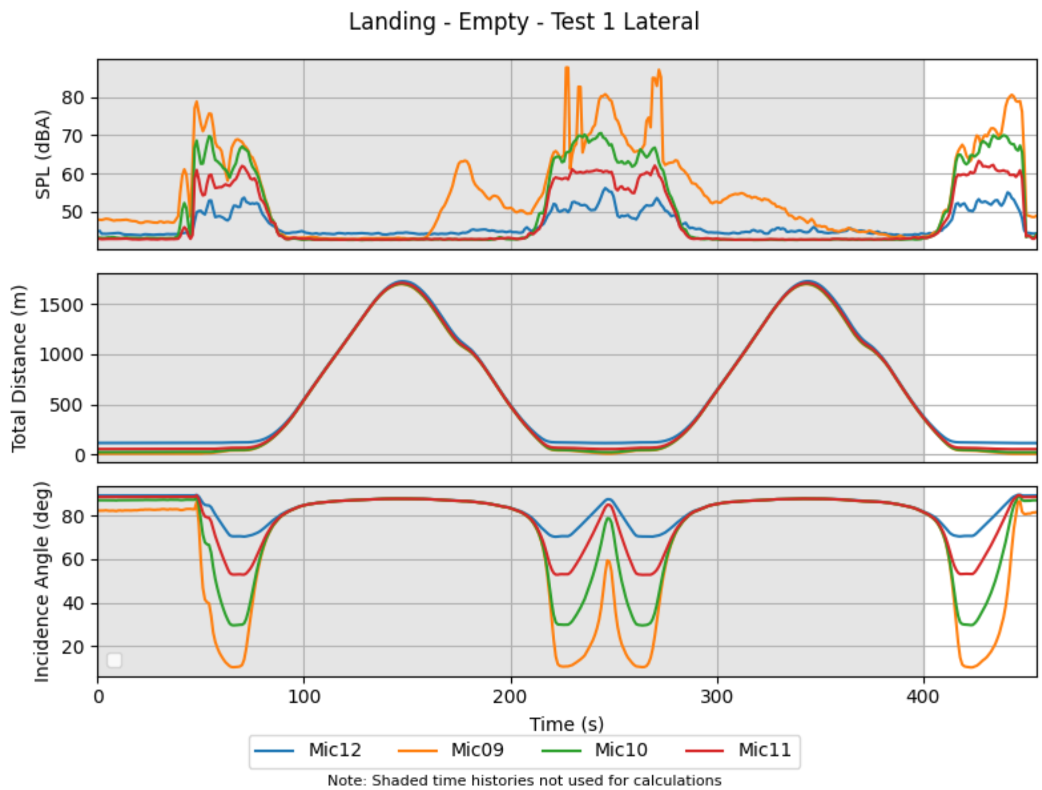
Note: Shaded time histories not used for calculations

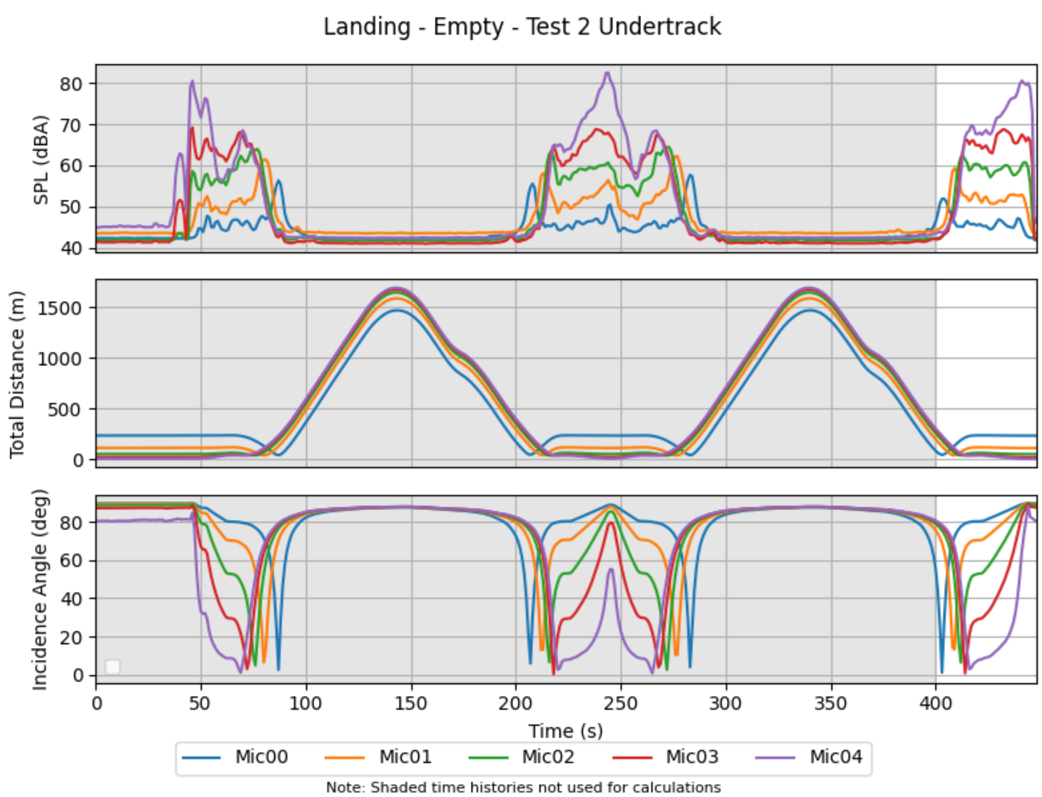


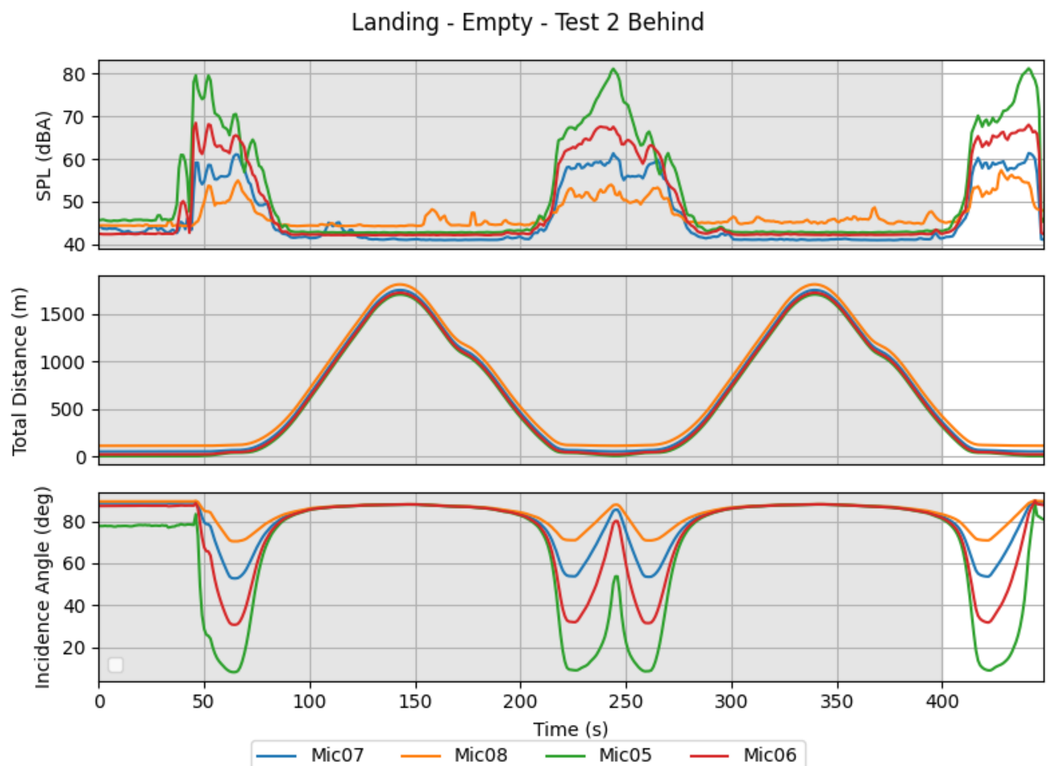
Note: Shaded time histories not used for calculations



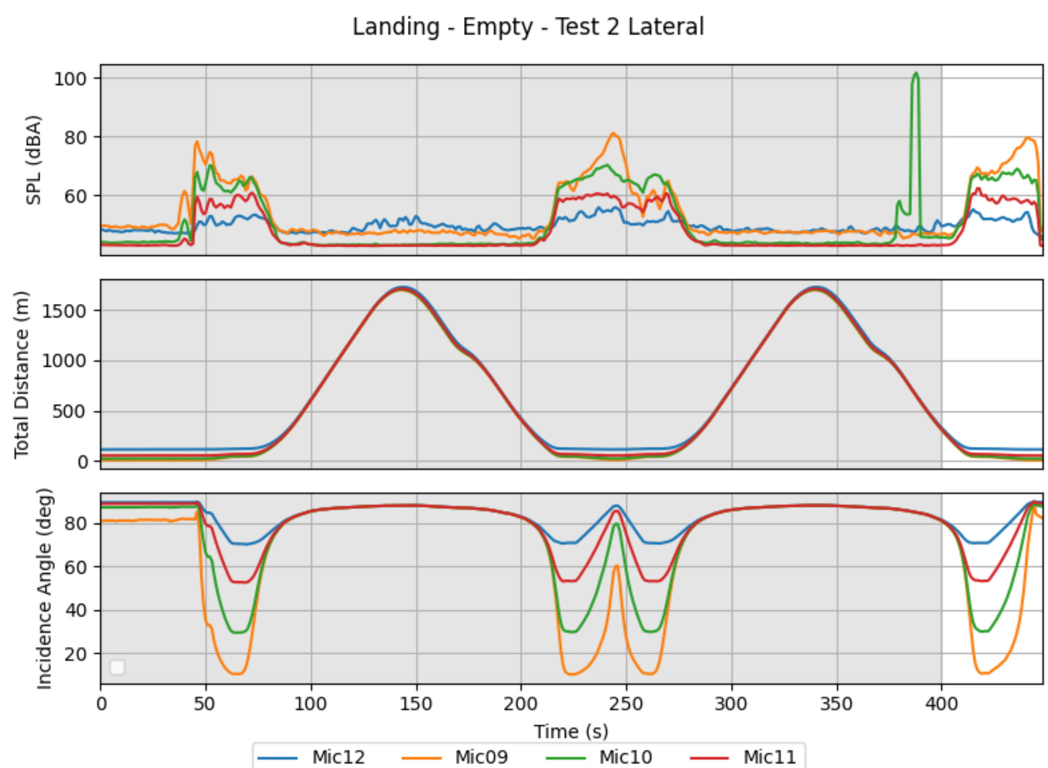
Note: Shaded time histories not used for calculations


Landing - Empty - Test 1 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations

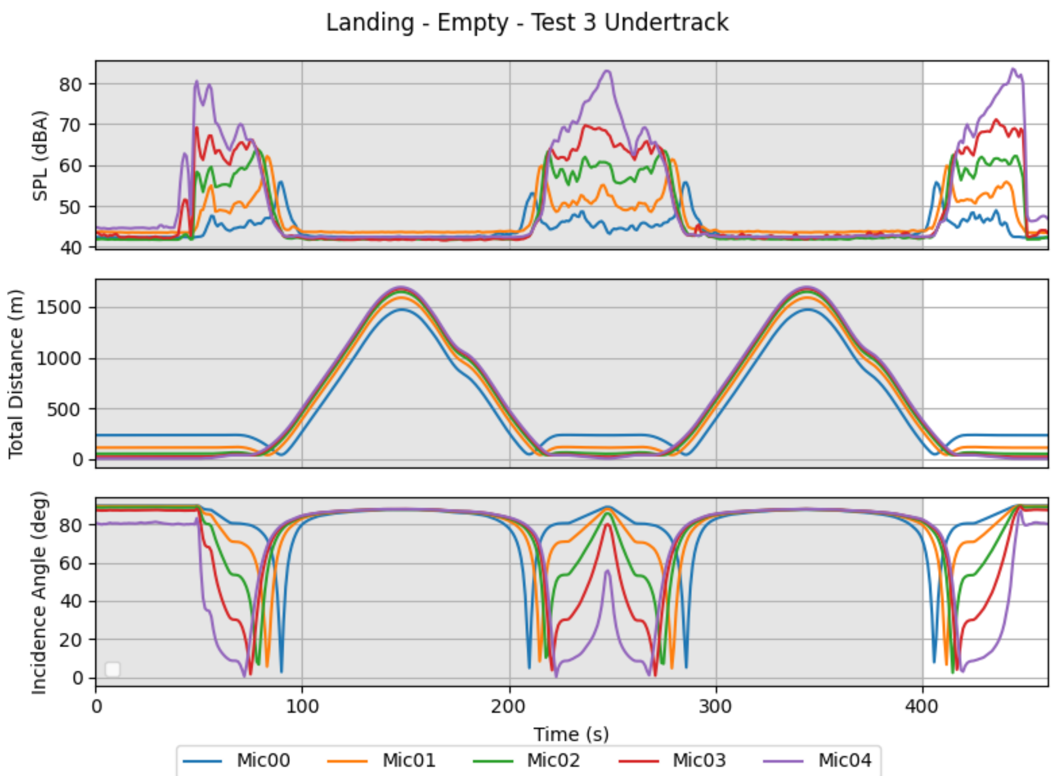

Landing - Empty - Test 2 Undertrack
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic00
Mic01
Mic02
Mic03
Mic04
Note: Shaded time histories not used for calculations



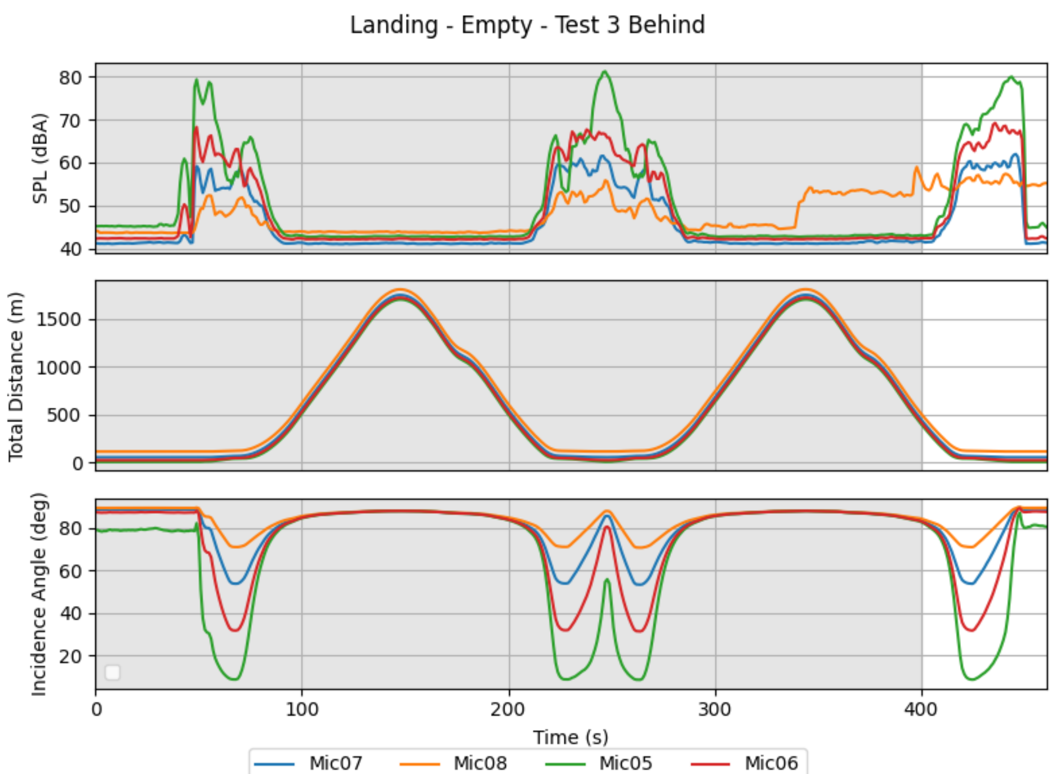
Note: Shaded time histories not used for calculations



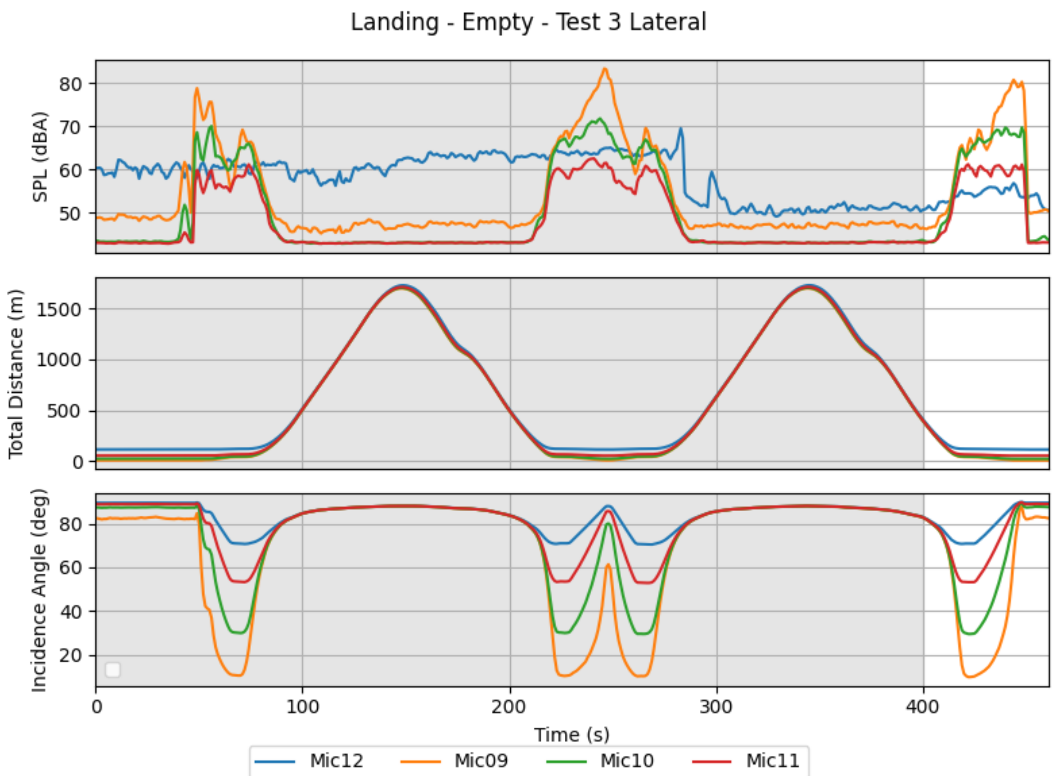
Note: Shaded time histories not used for calculations



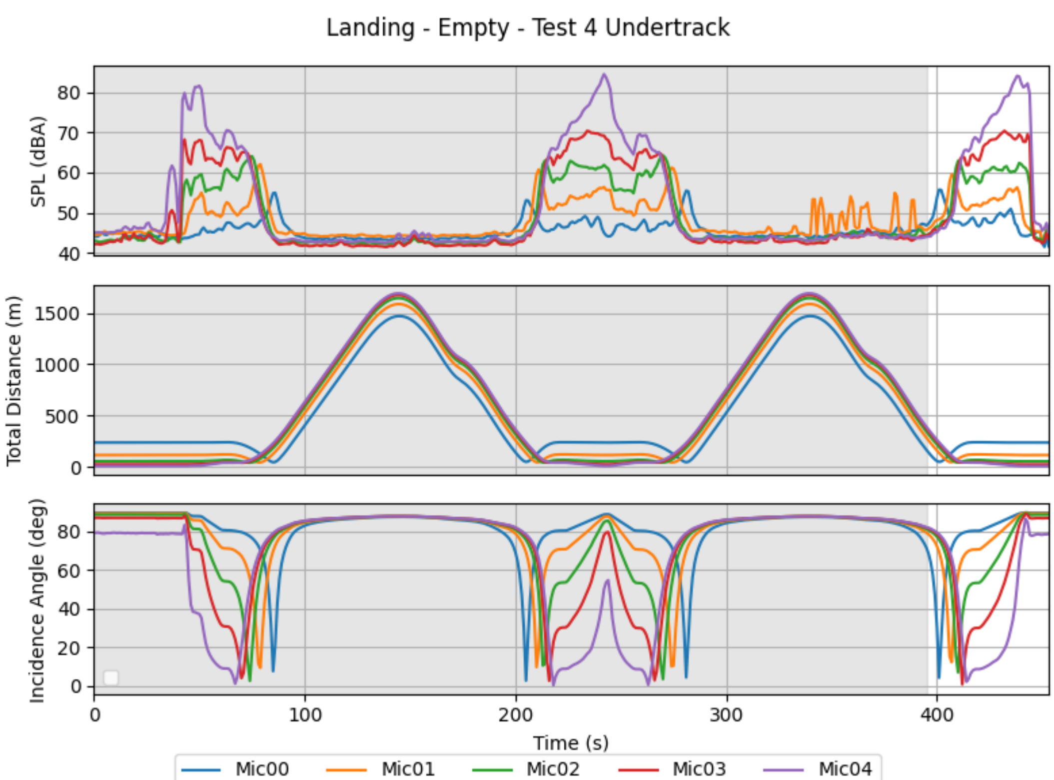
Note: Shaded time histories not used for calculations



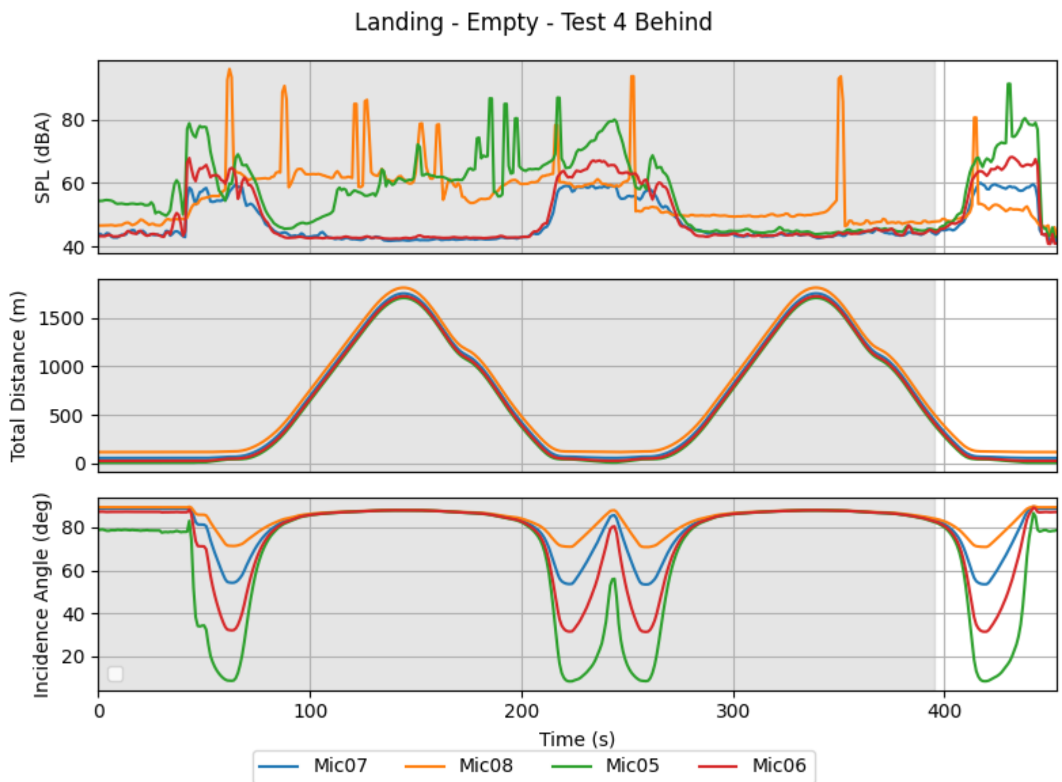
Note: Shaded time histories not used for calculations



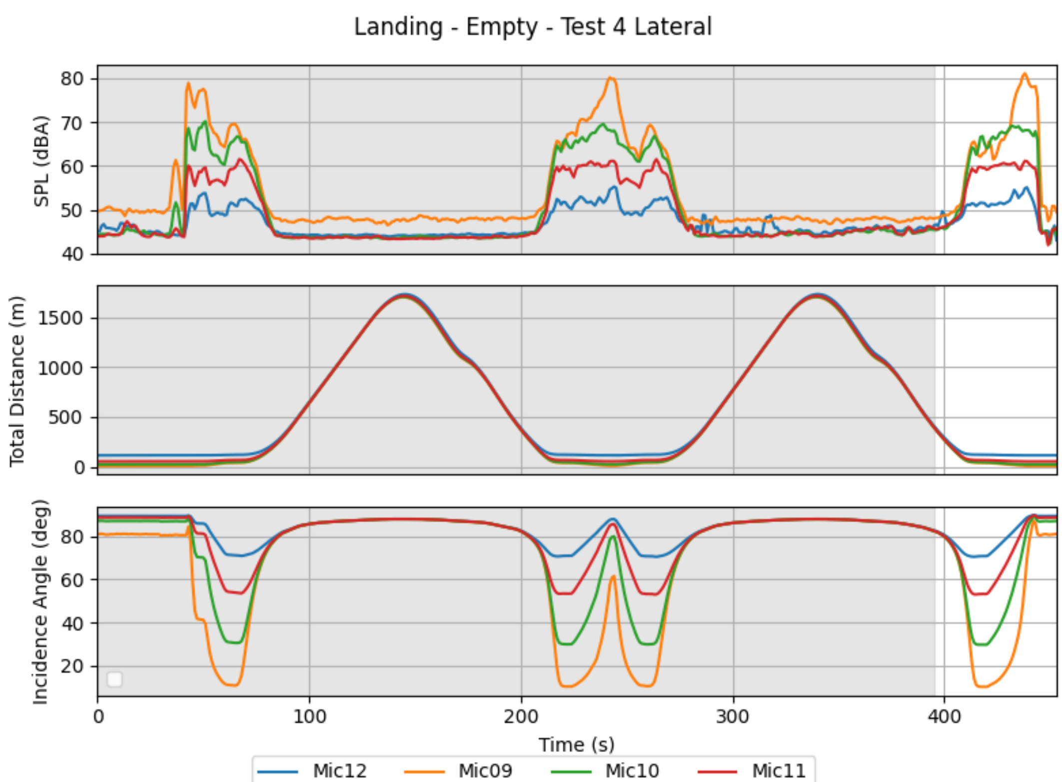
Note: Shaded time histories not used for calculations



Note: Shaded time histories not used for calculations

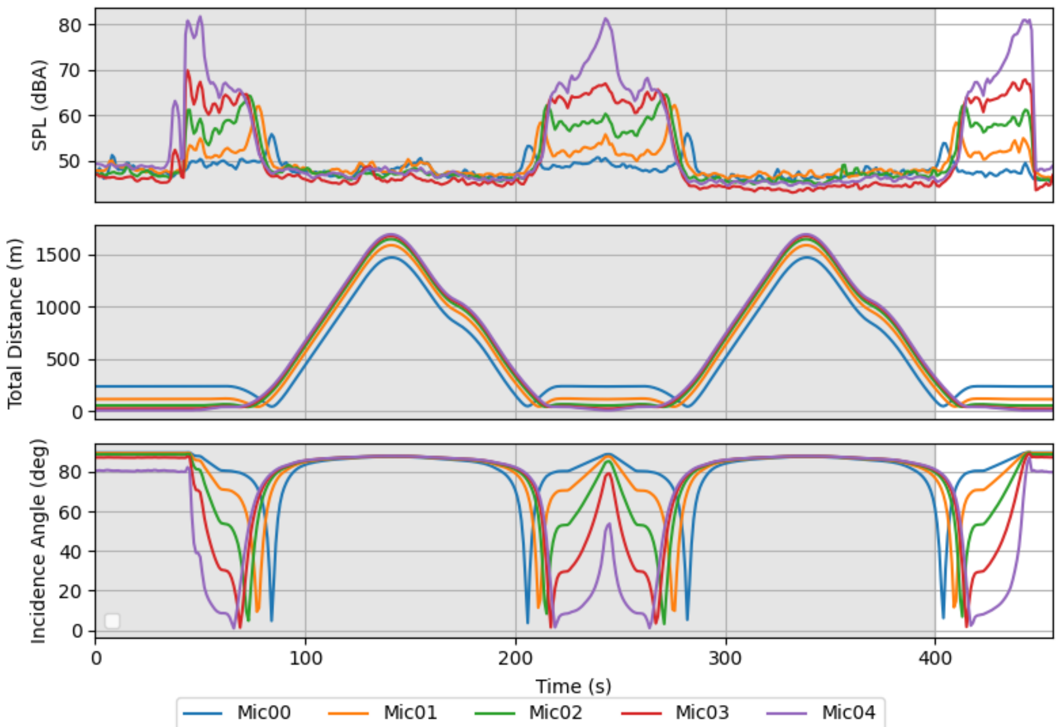


Note: Shaded time histories not used for calculations



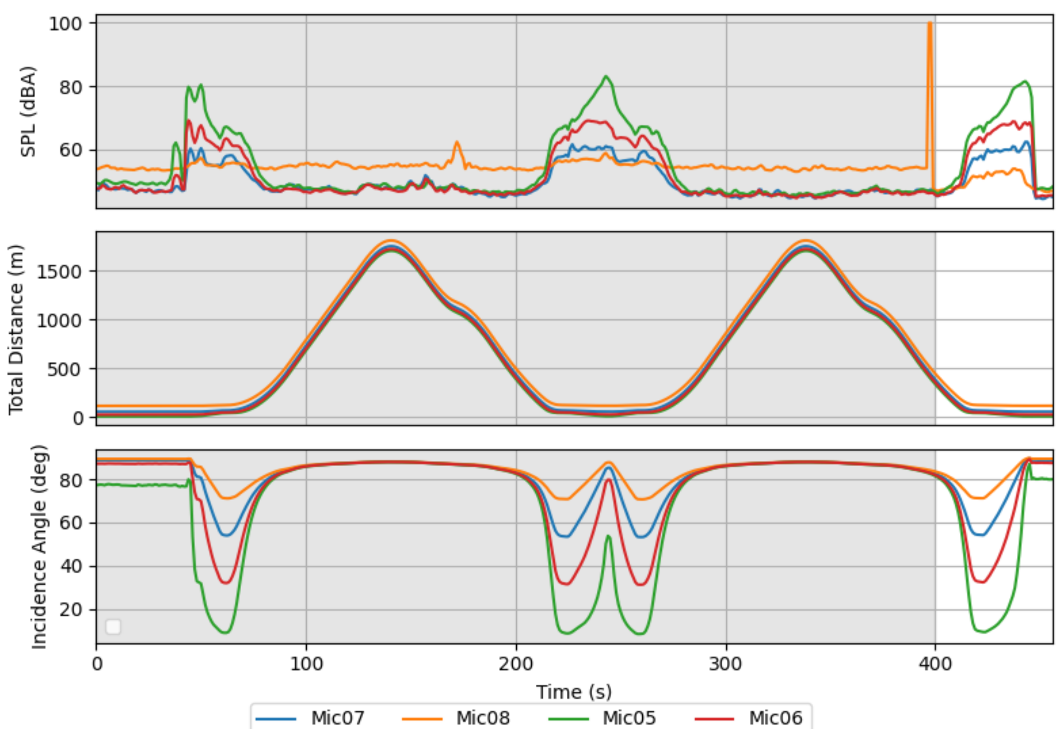
Note: Shaded time histories not used for calculations

Landing - Empty - Test 5 Undertrack

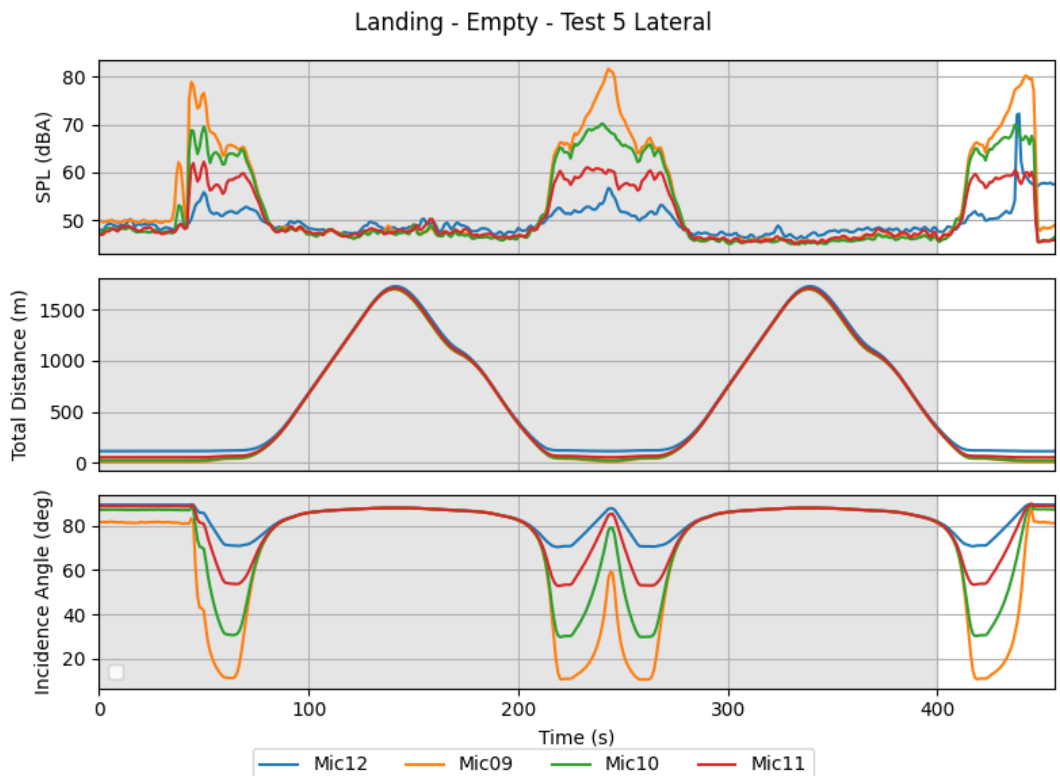


Note: Shaded time histories not used for calculations

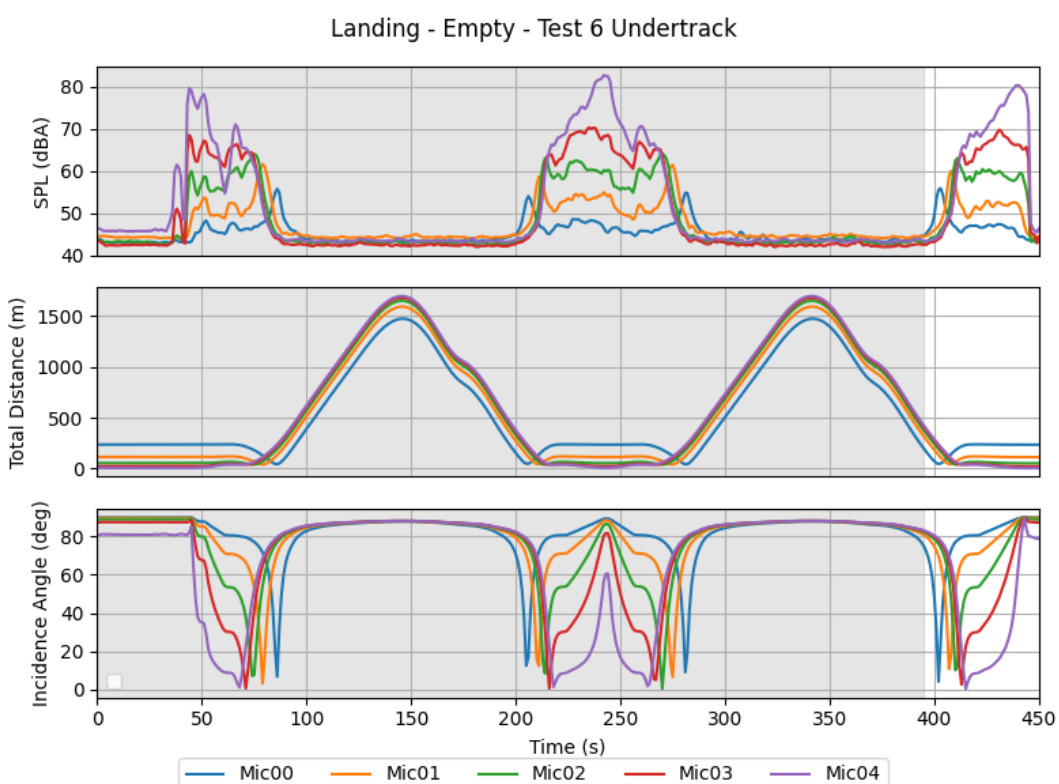
Landing - Empty - Test 5 Behind



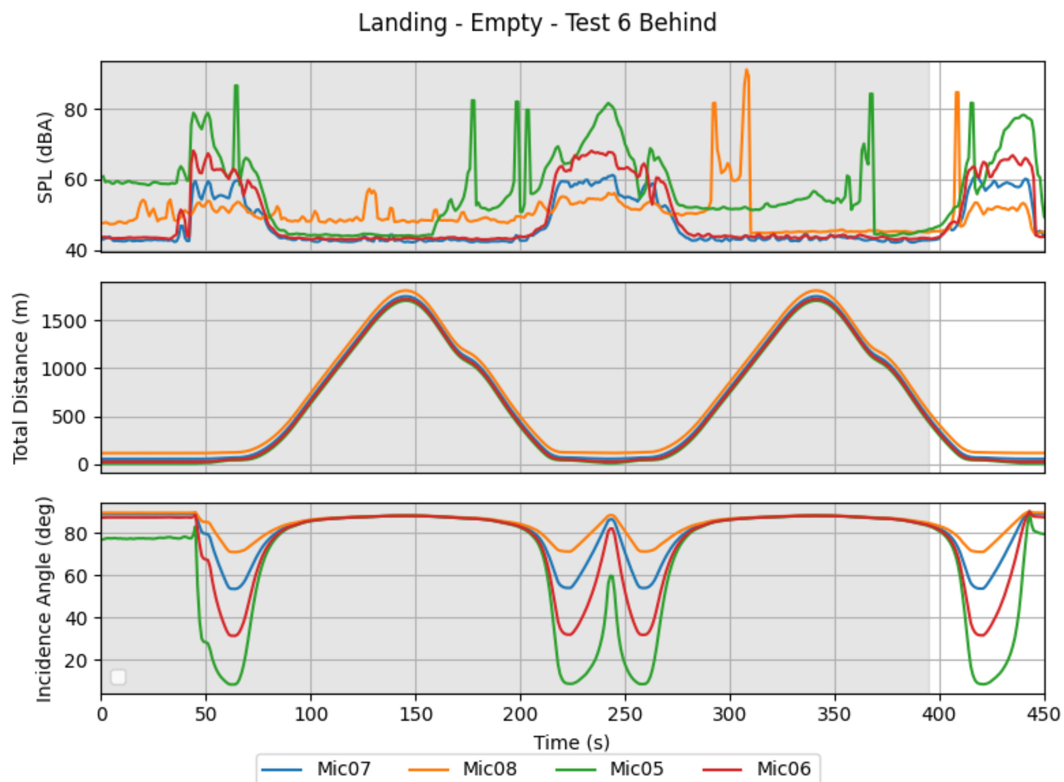
Note: Shaded time histories not used for calculations



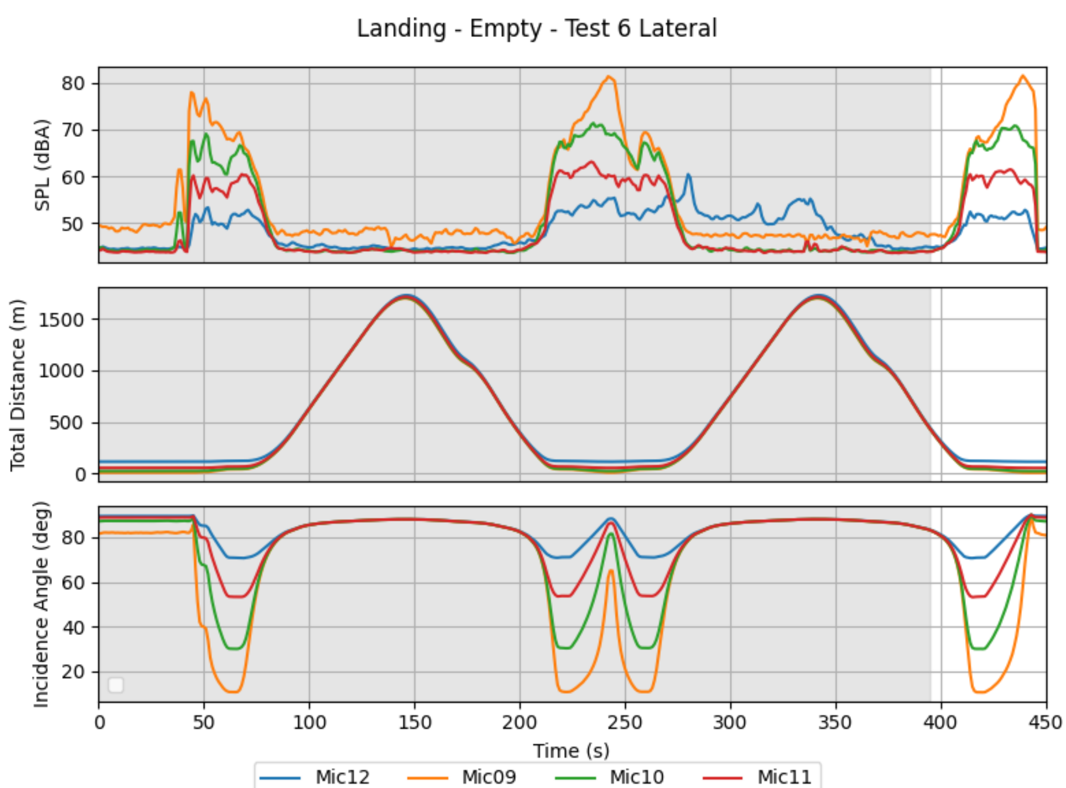
Note: Shaded time histories not used for calculations



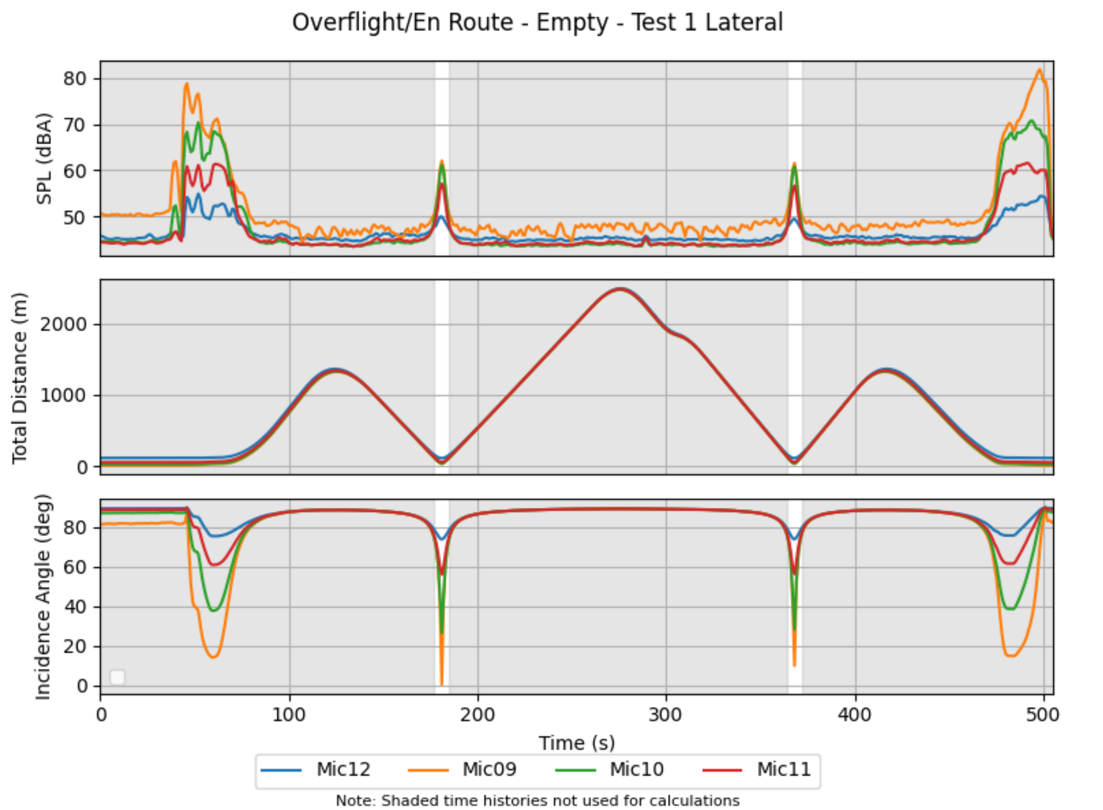
Note: Shaded time histories not used for calculations

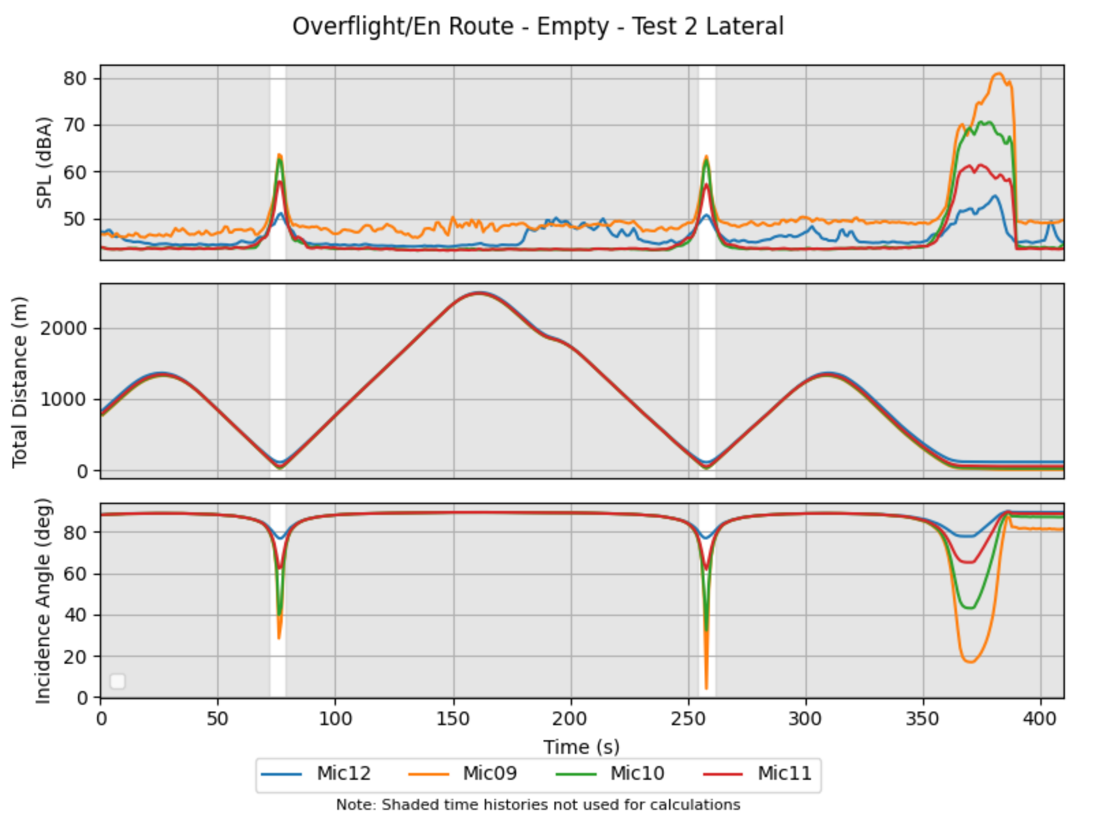


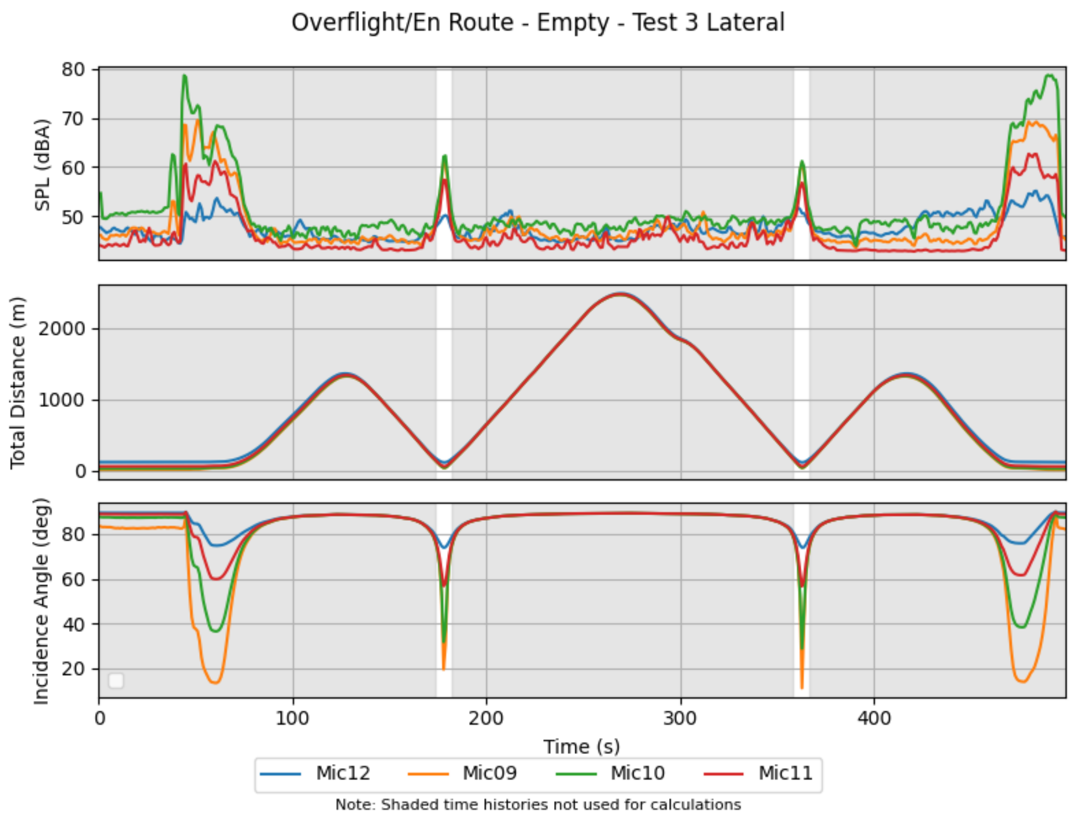
Note: Shaded time histories not used for calculations

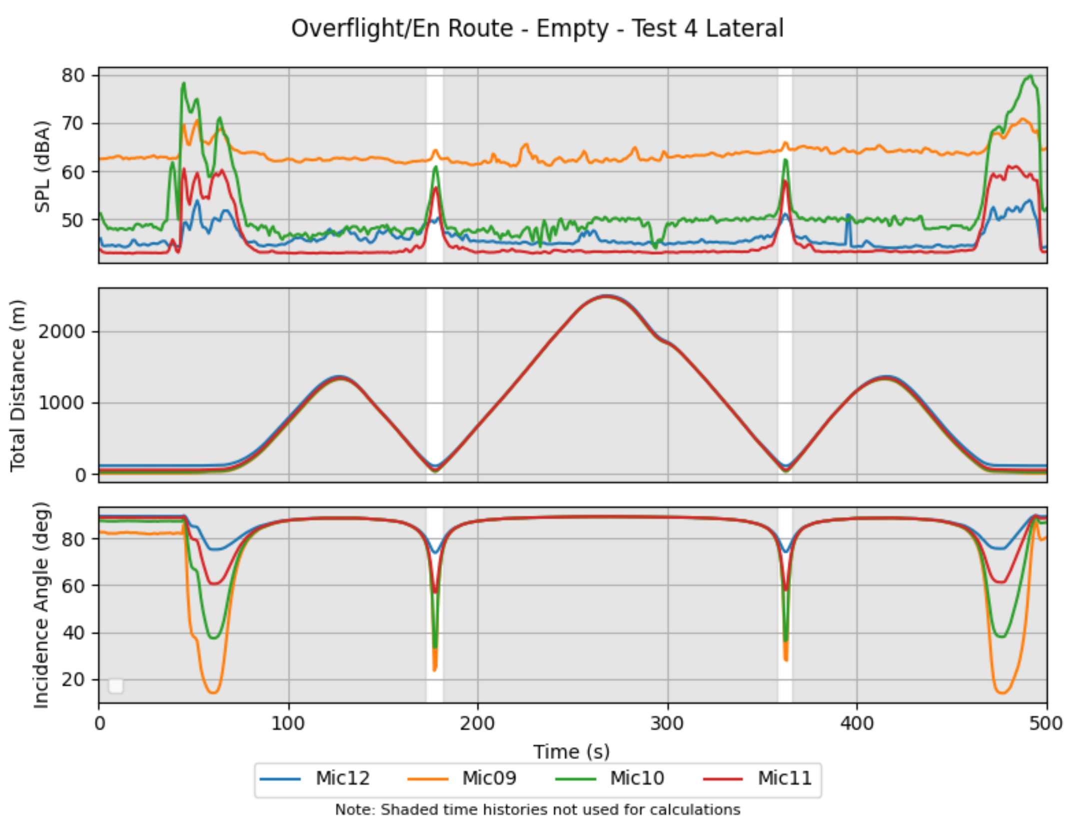


Note: Shaded time histories not used for calculations

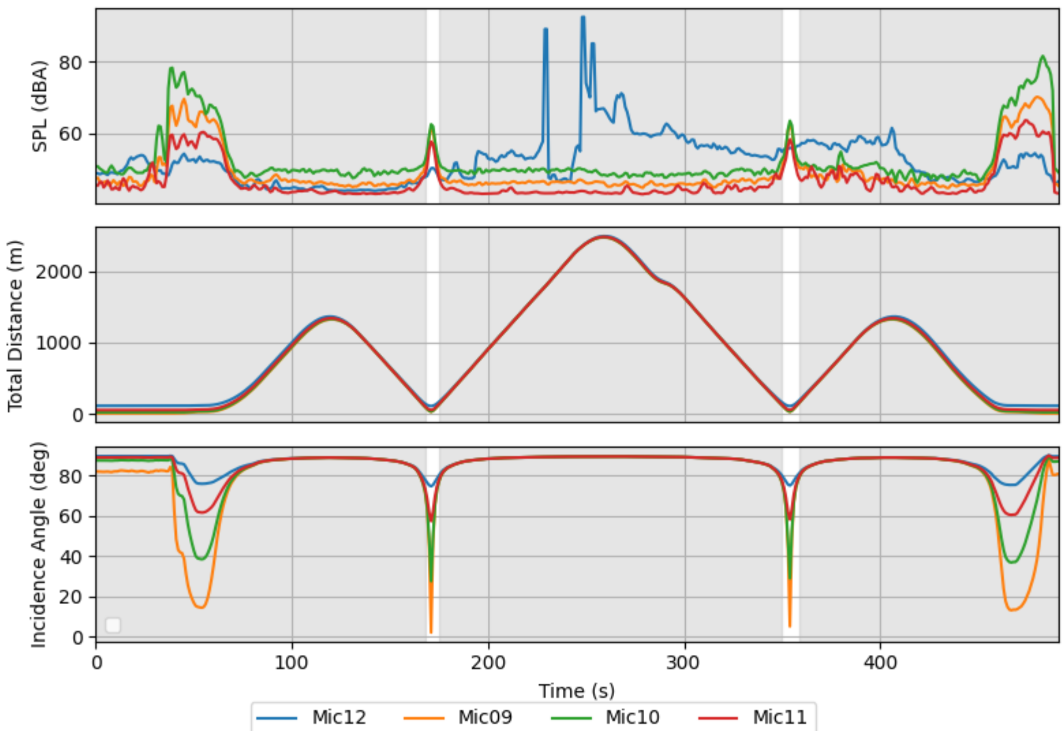

Overflight/En Route - Empty - Test 1 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations


Overflight/En Route - Empty - Test 2 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations


Overflight/En Route - Empty - Test 3 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations

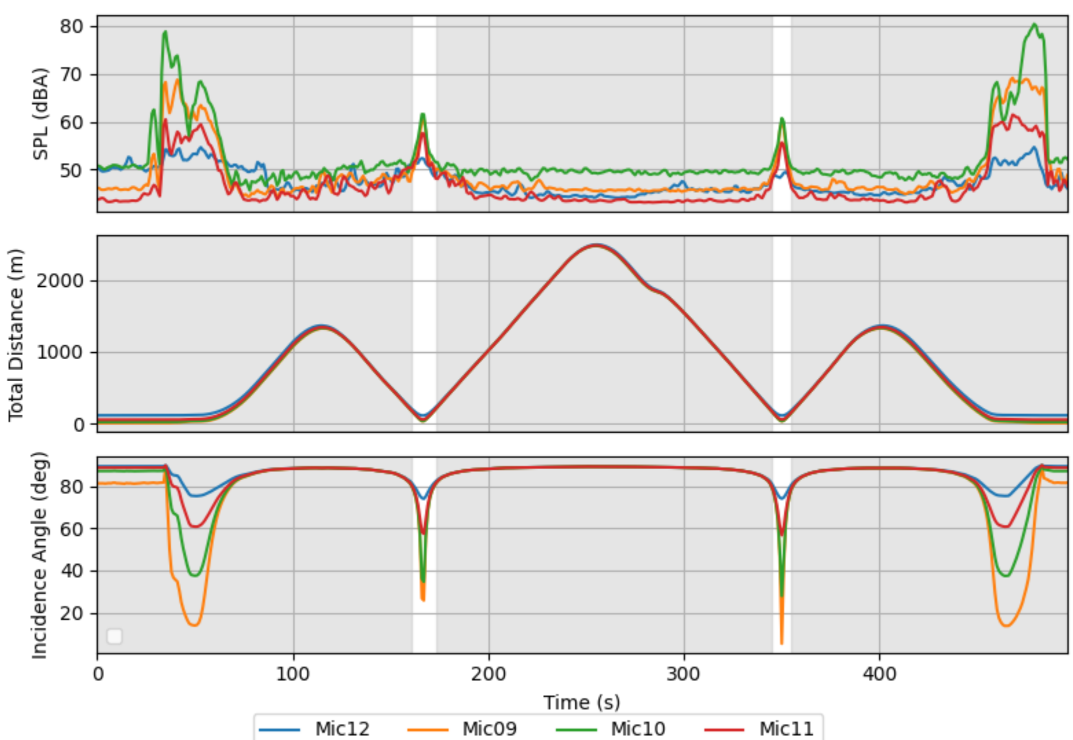

Overflight/En Route - Empty - Test 4 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations

Overflight/En Route - Empty - Test 5 Lateral



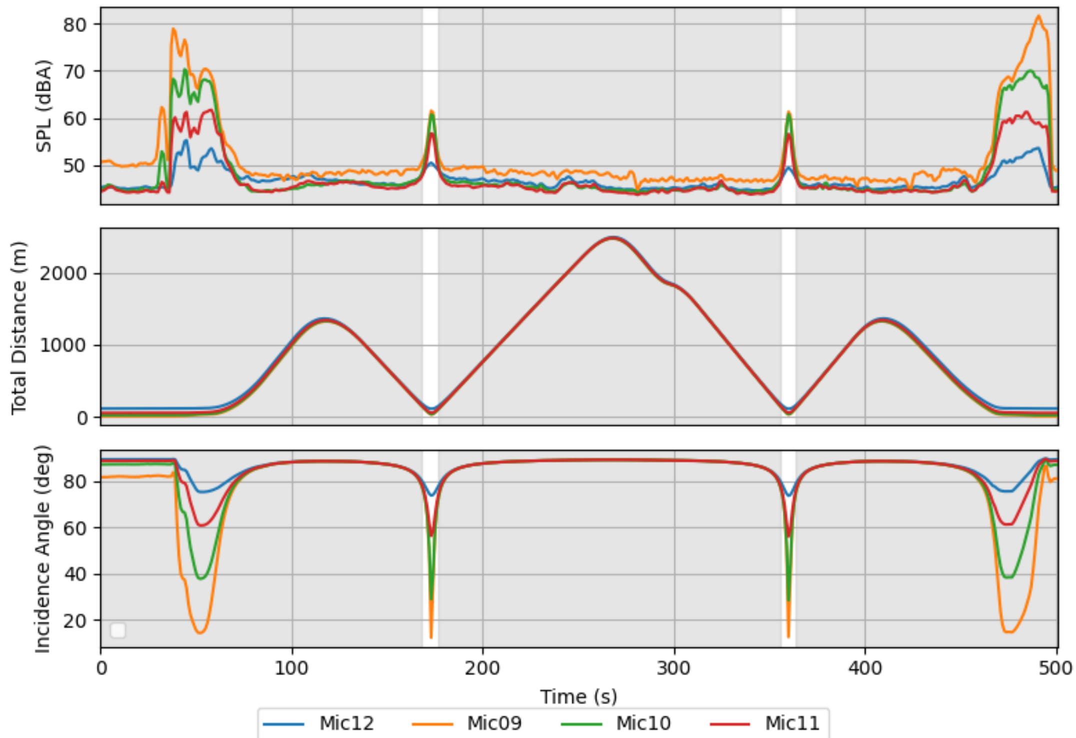
Note: Shaded time histories not used for calculations

Overflight/En Route - Empty - Test 6 Lateral



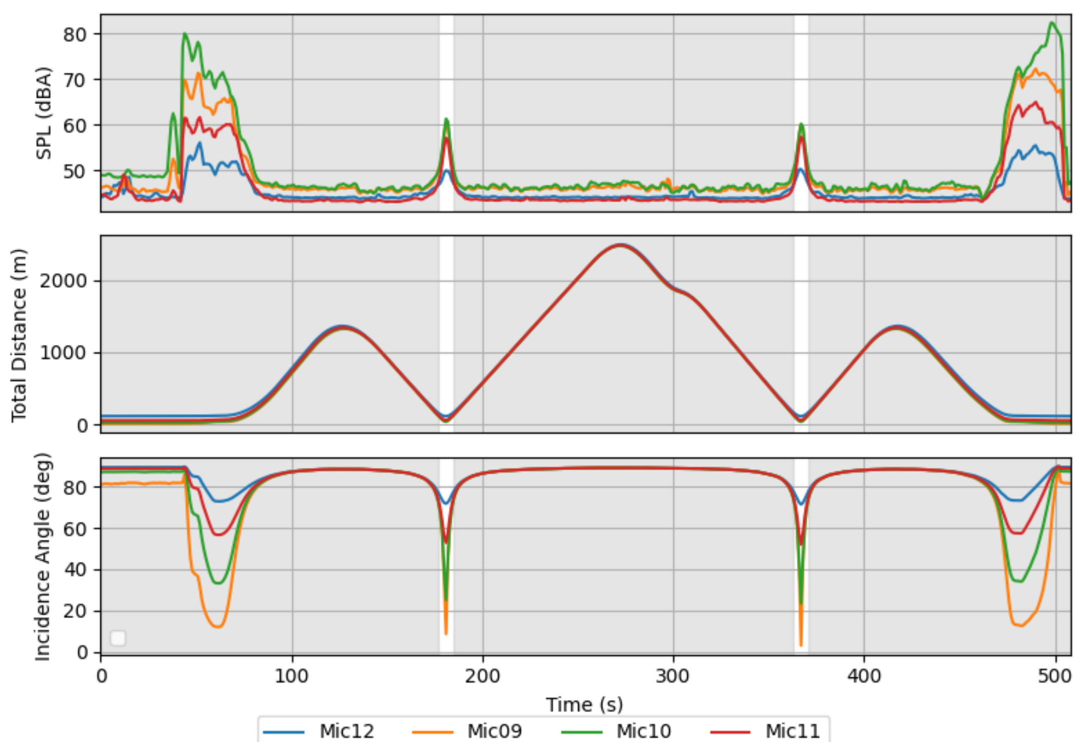
Note: Shaded time histories not used for calculations

Overflight/En Route - Empty - Test 7 Lateral

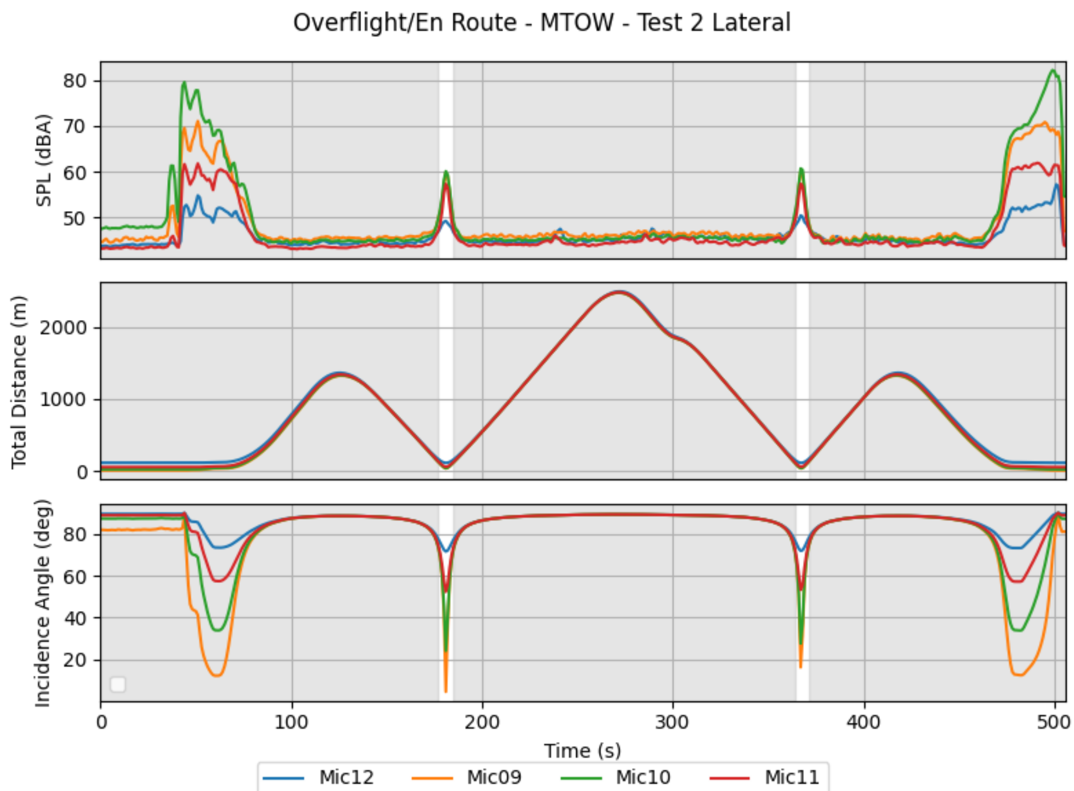


Note: Shaded time histories not used for calculations

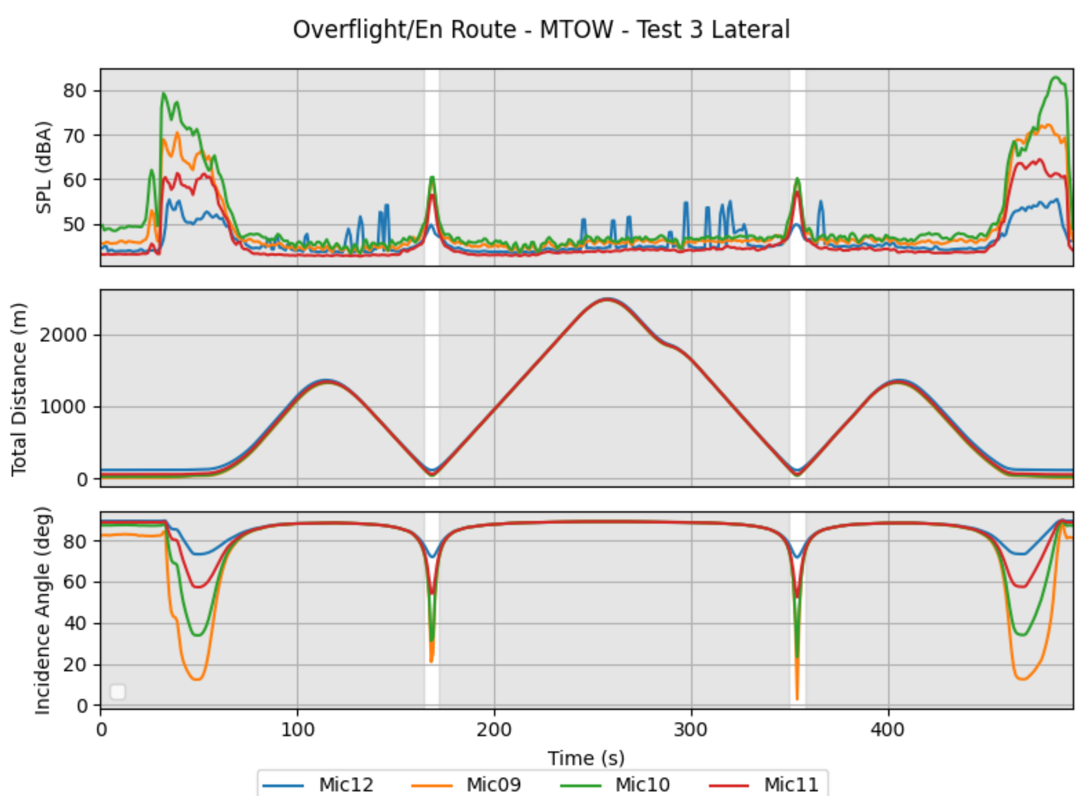
Overflight/En Route - MTOW - Test 1 Lateral



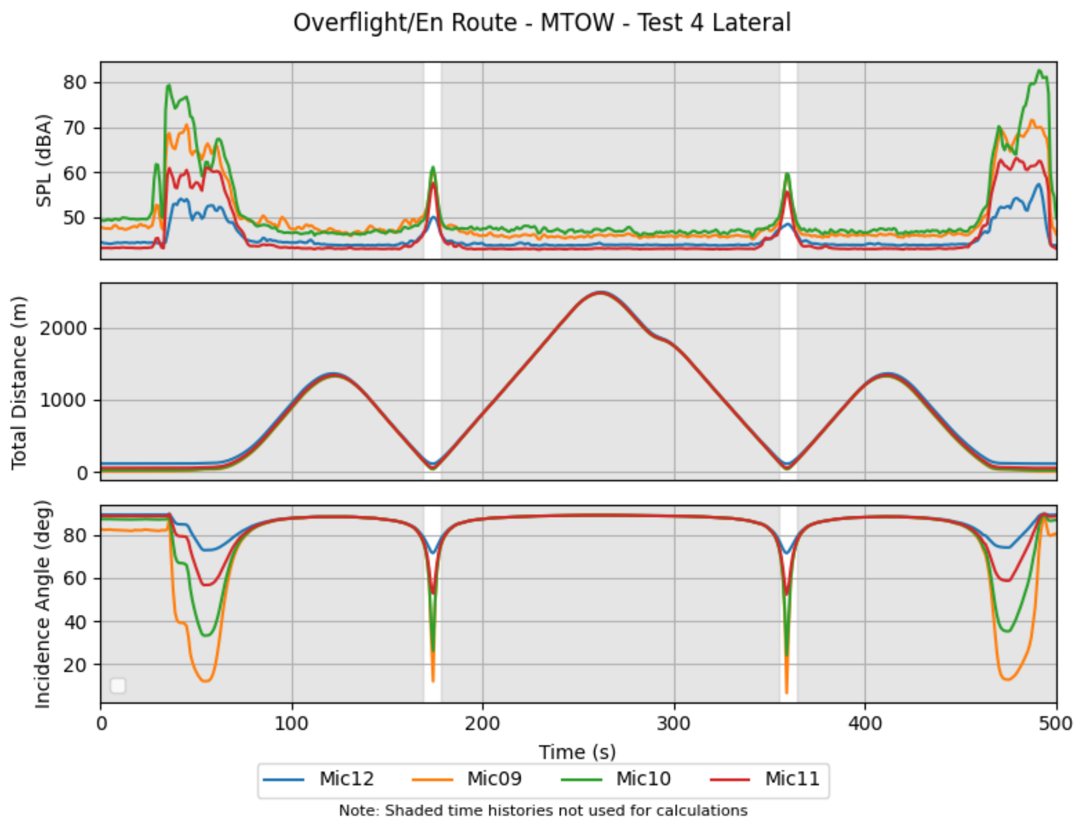
Note: Shaded time histories not used for calculations

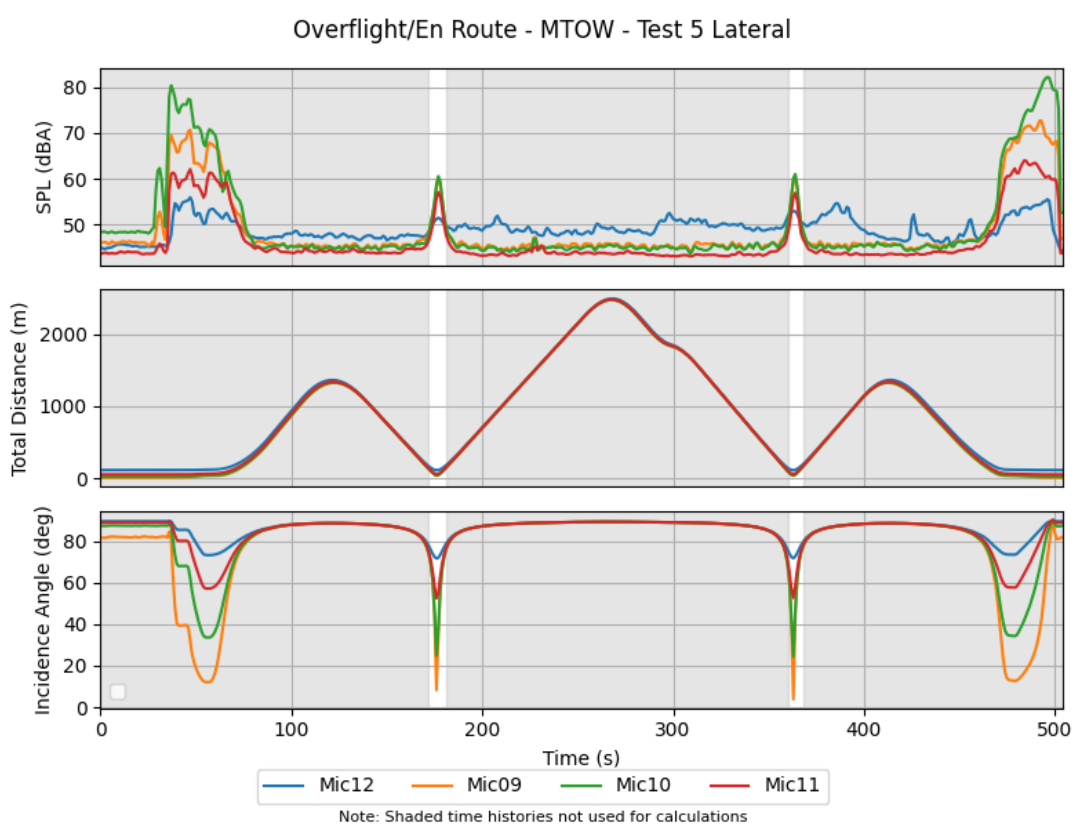


Note: Shaded time histories not used for calculations

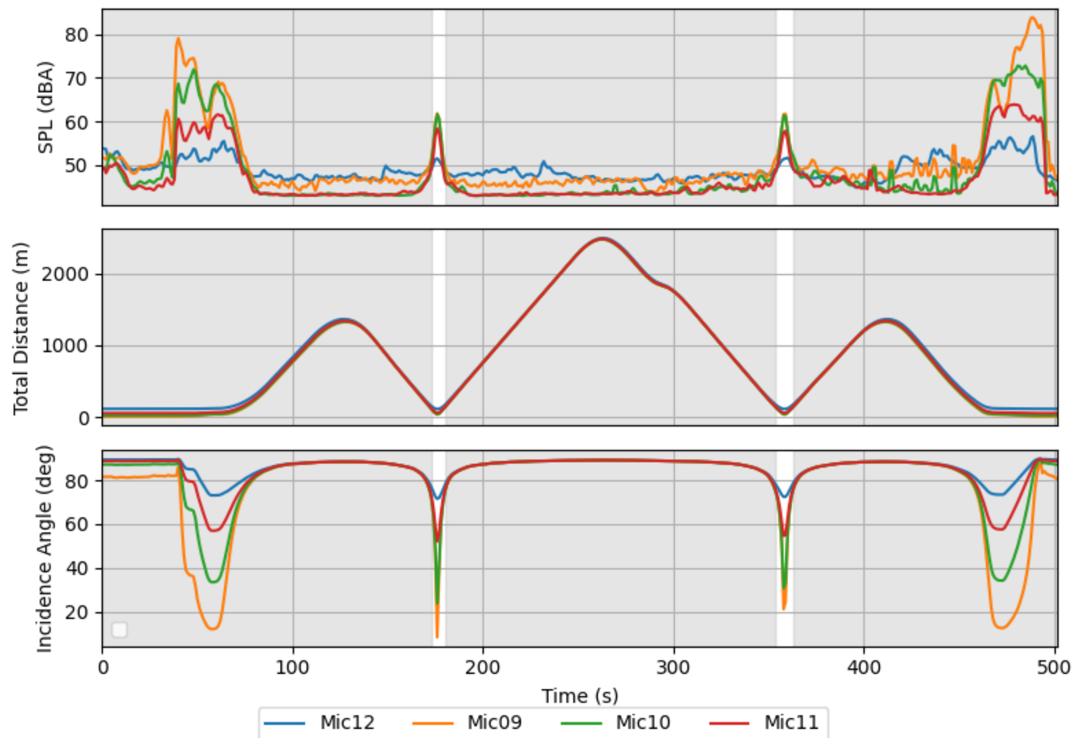


Note: Shaded time histories not used for calculations


Overflight/En Route - MTOW - Test 4 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations


Overflight/En Route - MTOW - Test 5 Lateral
SPL (dBA)
Total Distance (m)
Incidence Angle (deg)
Time (s)
Mic12
Mic09
Mic10
Mic11
Note: Shaded time histories not used for calculations

Overflight/En Route - MTOW - Test 6 Lateral



Note: Shaded time histories not used for calculations