Technical Proposal for an Air Quality and Noise Study of the Relative Environmental Impacts of Four Groups of Aircraft by Weight at DeKalb-Peachtree (PDK) Airport
August 4, 2022

I. Background

1. In 2012, DeKalb County and Open DeKalb entered into a Memorandum of Understanding under which the County agreed to fund a thorough environmental study of the relative noise and pollution impacts of three different weights of aircraft: (1) those with maximum take off weights (MTOWs) below 66,000 lbs., (2) those between 66,000-75,000 lbs., and (3) those above 75,000 lbs. Note that a 4th weigh class has now been added for piston aircraft. The County, Open DeKalb and DeKalb Peachtree Airport (PDK) jointly drafted written goals for the study, which are attached to this technical proposal for reference.

2. In an effort to get a reliable study, the County and Open DeKalb agreed to assemble a series of round table discussions with technical experts in aviation, air quality, and noise pollution to explore what should be studied, what realistically could be studied, and which methodologies would best achieve the goals stated in the attachment to this technical proposal. The technical experts were representatives from the Federal Aviation Administration (FAA), the United States Environmental Protection Agency (EPA), The Georgia Environmental Protection Division (GA EPD), and the Georgia Department of Transportation (GDOT).

3. The County, Open DeKalb, and PDK Airport held virtual round table meetings with the technical experts. Building on the results of the round table discussions, this document represents an initial draft technical proposal for a noise and emissions study at PDK. This draft technical proposal will be the focus of upcoming round table discussions to finalize a solid scope of work that the County, Open DeKalb, and PDK Airport can consider funding to achieve the goals listed in the Attachment.

II. Purpose

The Study is intended to provide data about the relative pollutant and noise emissions and air quality impacts in the community from four different groups of aircraft using PDK, categorized by size/certified MTOW. See agreed-upon Goals in Appendix. The results should then be used by PDK Airport owner, DeKalb County, to make decisions about the Airport and its operations and plan for the Airport's future in an informed manner. The study seeks in-depth research capable of giving the County credible data to make better-informed decisions about Airport operations and development in its community environment.

III. Aircraft Activity Data for Baseline and Future Year

This work scope section provides the contractor with important details of the analysis of pollutants emitted by aircraft operated at PDK airport.

1. Data Year(s) to be Studied:

The full operational year of 2018 will be used as the base year for this study. It is expected that operational data for the entire year of 2018 is available from PDK, EPA and FAA sources, including but not limited to Airport Noise and Operations Monitoring System (ANOMS) data, meteorological data, airport activities that produce aircraft emissions, flight path information, and any other pertinent data that contributes to the quality and scope of this work scope.

To evaluate the future effects of PDK aircraft emissions based on the expected future development of PDK, an additional year of analysis of 2040 should be evaluated. The future year modeling scenario should include PDK aircraft emissions with and without the proposed improvements of PDK's Master Plan document. It will be important to identify the cumulative impact of all potential future changes at PDK, contained in the Master Plan. This includes airport configuration, consideration of various future fleet mixes (including the worst-case emissions scenario and the most operations of the future year critical aircraft, etc.), the addition of based aircraft, changes to Declared Distances, and other airport changes (*e.g.,* addition of hangers, tie downs, use of the Engineered Material Arrester System (EMAS)).

2. Aircraft Fleet Mix:

Working with PDK Airport personnel to identify the relevant aircraft to be studied, the contractor shall develop a list of the types of aircraft engaged in flight operations at PDK Airport during 2018, using any and all ANOMS data, FAA data, and other available data. The total aircraft operations from FAA tower data should be used and informed by the ANOMS data in order to get fleet composition on an hourly basis (the period of frequency used in EPA's AERMOD dispersion model). The fleet mix shall be approved before proceeding with the study by at least PDK Airport and Open Dekalb, Inc. The aircraft will then be grouped into four categories for analysis:

- Group 1 Aircraft with MTOWs of 66,000 lbs. and less, but not included in Group 4 Aircraft;
- Group 2 Aircraft with MTOWs above 66,000 lbs but at or below 75,000 lbs.
- Group 3 Aircraft with MTOWs in excess of 75,000 lbs.
- Group 4 Aircraft powered by piston-engine powerplants, generally aircraft less than 12,500 lbs MTOW (based on airport-specific data and not limited to IFR data).

In addition, the fleet mixes, justified by the most reliable data, of each of the four categories for the year 2040 will be identified based on the review of the cumulative impact of all potential future changes at PDK identified in the Master Plan. The fleet mixes shall be approved before proceeding with the study by at least PDK Airport and Open Dekalb, Inc.

The Study contractor, working with FAA and EPA, will ensure that the proper aircraft emissions source characteristics[1] are utilized to represent the different aircraft, ranging from single engine piston-powered airplanes to the larger multi-engine business and cargo jets.

IV. Relative Air Pollution Impacts

1. Air Pollutants to be Studied:

This study will include evaluation of the annual emissions inventory for the following air pollutants in the base year of 2018 and future year of 2040.

- Carbon monoxide (CO)
- Lead (Pb)
- Nitrogen Oxides (NO_X)
- Primary Particulate Matter (PM) reported out as ultra-fine particles (UFP), comprised of:
  - Non-volatile particulate matter (nvPM). Aircraft engine emissions of direct, nvPM are predominately in the ultra-fine-particle (UFP) size range (1 um or less) in the form of black carbon.
- Sulfur Dioxide (SO_2)
- Unburned hydrocarbons (HC)
  - A subset of compounds that partially comprise unburned hydrocarbons, and can be quantified individually, are 1,3 butadiene, acetaldehyde, acrolein, benzene, ethylbenzene, formaldehyde, isopropylbenzene, methanol, m-xylene and p-xylene, naphthalene, o-xylene, phenol, propionaldehyde, styrene, and toluene. This approach will allow for an estimate of polycyclic aromatic hydrocarbons (PAHs) emissions.

2. Methodology for Quantifying Air Pollutant Emissions:

The Study contractor, working with the FAA and EPA, will utilize information on the pollutants generated by the specific aircraft / engine combinations found in FAA's Aviation Environmental Design Tool (AEDT) software, manufacturers' data, or any other data sources available. Times in mode in AEDT will be modified to reflect actual times in mode averages at PDK after multiple stop watch measurements of each mode of operation. Such measurements should be taken during weekdays and weekend days. That data set must be reviewed and approved by PDK Airport, Open DeKalb, EPA and FAA prior to proceeding and will be published as part of the study. Using the latest version of AEDT, or supplemental data as needed (*e.g.,* for lead emissions), each pollutant of concern will be quantified for both 2018 and 2040 based on:

- The number and type of aircraft in each of the 4 categories,
- The number of engines per aircraft,

[1] Consultation with EPA/FAA will be needed in this technical area, as this is a current topic of research and evaluation. The recommendations resulting from the consultation should be included in the Modeling Protocol discussed later in this section.

- The diurnal frequency of landing/take off operations of each aircraft/engine combination up to a height of 3,000 feet above ground level,
- The diurnal frequency of touch-n-gos of each aircraft/engine combination within a radius of five miles from PDK, as applicable,
- The taxiing of each aircraft/engine combination at PDK,
- The engine run-ups performed, as applicable;
- Flight paths, based on historical arrivals and destinations; and
- Topography/terrain

Annual emissions should be summarized by pollutant listed in Section IV.1 for both 2018 and 2040, according to aircraft Groups 1, 2, 3, and 4. This work is single source (aircraft only) modeling.

3. Methodology for Quantifying Air Pollutant Concentrations:

A. For both baseline and future year modeling, each of the following items needs to be supplied by the Study contractor: 1) AEDT emissions data that will be input into EPA's AERMOD software; 2) Determination and entering in the spatial aspects of aircraft movements at PDK. Spatial elements such as engine run up locations, taxiways, departure queues, etc. should be captured with the assistance of the FAA and PDK airport staff; and 3) Determination and entering in the average temporal duration of each mode of operation, which may need to be measured at the airport via a mutually agreed upon methodology. Temporal aircraft operations should be represented in the AERMOD dispersion runs to ensure that pollutant concentrations are calculated during the appropriate times of the day and night and accounting for seasonal changes.

B. The AERMOD air dispersion model will be used to simulate dispersion of aircraft pollutants within a receptor grid that extends ten kilometers in each direction from PDK airport for the entire years of 2018 and 2040. The AERMOD modeling shall include all modes of operation such as runup, taxiing, takeoff, climb out, landing, touch-n-gos from flight school operations, and any other operations such as maintenance, etc.

C. The Study contractor will generate concentrations ($\mu g/m^3$) for the following criteria pollutants, corresponding to their pollutant-specific averaging time(s) identified below (note: UFPs is representing $PM_{2.5}$):

Pollutant	Averaging Time
CO	8 hours
	1 hour
Lead (Pb)	Rolling 3 month average
NO_2	1 hour
	1 year
UFPs	1 year
	24 hours
SO_2	1 hour
	3 hours

Contractor shall provide data files reporting all AERMOD output, including hourly concentrations along with the criteria pollutant-specific averaging times listed in the table above for each year (2018 and 2040). Additionally, summary statistics should be provided for each averaging time and including min, max, median, mean, and standard deviation, including but not limited to maximum impact receptors per pollutant.

D. In addition to tabulating the results, the Study contractor shall generate concentration isopleths for each pollutant for each aircraft group displayed over an aerial view of PDK airport and the surrounding community. Concentration isopleths for each aircraft Group, and the overall aggregate from all aircraft Groups should be properly labeled.

E. The complete details of the proposed modeling study using AEDT and AERMOD should be fully described in a Modeling Protocol prepared by the study contractor. At a minimum, the Modeling Protocol must describe how AEDT will be applied to obtain the aircraft emissions and how AERMOD will be applied to model the dispersion of the criteria pollutants listed above. Note that EPA and FAA are currently collaborating on research to improve how aircraft sources are characterized in AEDT and AERMOD. If the results of this research are available before the modeling is performed, EPA and FAA will provide the information to the study contractor during the review process of the Modeling Protocol. Specific items that should be addressed in the Modeling Protocol are discussed in Section IV (PDF pages 3-10) of EPA's "Air Quality Analysis Checklist" available at the following URL: https://www.epa.gov/sites/production/files/2020-09/documents/air_quality_analysis_checklist-revised_20161220.pdf. This checklist is designed for New Source Review/Prevention of Significant Deterioration permit modeling, so not all the specific items will be applicable for modeling aircraft emissions, but it provides a good framework and "checklist" of major items that should be addressed in the Protocol. EPA air modelers are available for consultation if there are questions about specific portions of the checklist that are applicable to this modeling study. Specifically, the Protocol should include (at a minimum) discussions of the following items:

- Project Description
  - A narrative description summarizing the purpose and primary aspects of the modeling study should be provided in the Protocol.
- Source Characterization
  - Maps showing the locations of the different aircraft modes of operation (*e.g.,* runup, taxiing, takeoff, etc) at the airport should be provided.
  - The procedures for using AEDT for calculating emissions and model input parameters for each aircraft type and mode of operation should be explained.
  - The AERMOD source type options for modeling the aircraft emissions for the different modes of operation should be specified (*e.g.,* Point, Area, or Volume sources). A table should be provided summarizing the emissions rates (from AEDT) for the different pollutants and modes of operation for the aircraft sources that will be modeled.
  - Maps of the topography and areas of interest (*e.g.,* nearby neighborhoods, schools, etc.) around PDK airport should also be provided.

- Meteorological Input Data
  - One year of site-specific surface-level meteorology from the PDK airport ASOS station corresponding to the study base-year (2018) should be used in the modeling. The hourly data should be processed with the AERMET pre-processor and should be supplemented with 1-minute ASOS data from PDK, using the AERMINUTE pre-processor.
  - One year of upper-air data from Peachtree City-Falcon Field corresponding to the study base year (2018) should be used.
  - Procedures for processing the meteorology data described in the AERMET and AERMINUTE users guides should be followed and briefly described in the Protocol.
  - Prognostic meteorology is not necessary for this study as a high-quality site-specific dataset of surface-level meteorology is available from PDK.
  - AERSURFACE should be used to calculate the surface characteristics needed for AERMOD (albedo, Bowen ratio and surface roughness). The recommendations provided in EPA's 6/15/20 webinar presentation (https://www.epa.gov/sites/default/files/2020-10/documents/2020_aersurface_webinar_20200615.pdf) should be followed for applying AERSURFACE.
  - The checklist items under "General Considerations" on page 6 of the checklist are particularly important for ensuring quality modeling results and should be addressed in the Protocol.
- Air Quality Model Selection
  - The latest version of EPA's AERMOD dispersion model (currently version 22112) with emissions inputs from AEDT should be used.
  - AERMOD should be used to estimate ambient air concentrations ($\mu g/m^3$) of the pollutants listed in Section IV.3C of this scoping document. Modeling of wet and dry deposition of the pollutants is not necessary.
  - The URBAN option should be used in AERMOD to model the aircraft sources.
  - Because of the aircraft emissions characteristics, the discussion of building downwash on page 8 of the checklist is not relevant for this study.
- Modeling Domain and Receptors
  - The area to be studied in the modeling assessment should be described and shown on a map centered on PDK airport.
  - The modeling receptor grid should also be displaying on a map in the Protocol. Receptors should be located in any publically accessible location (ambient air) within the 20 kilometer (km) x 20 km receptor grid (grid extending 10 km in each direction centered on the PDK runways). The recommended receptor grid spacing should be 25 meters (m) along the PDK fenceline and 50 m extending to 200 m from the PDK fenceline. From 200 m to 2 km, receptor spacing should be 100 m. From 2 km out to 5 km, receptor spacing should be 500 m. From 5 km to 10 km, receptor spacing should be 1000 m.
  - After initial AERMOD modeling runs have been completed, if the results indicate maximum concentrations may be occurring more that 2 km from PDK, additional receptors should be added to ensure that the maximum concentration is resolved using a grid spacing of no more than 100m.

- Receptor elevations should be determined using EPA's AERMAP terrain pre-processor. The procedures in the AERMAP User's Guide should be followed.

- Modeling Protocol
  - The sections of the checklist titled: "Background Concentrations," "Analysis of Class I Area Impacts," "Additional Impact Analysis," and "General Conditions" (on pages 9-11 of the checklist) are not relevant for this modeling study and don't need to be addressed in the Protocol.
  - The Modeling Protocol shall be submitted to the EPA and FAA for review and comment, prior to performing the modeling study.

V. Relative Noise Impacts

1. Modeling:

Develop noise impact analysis using FAA approved tools for aircraft in the same Groups and the same baseline and future years included for the air pollution modeling in the modes of operation including runup, takeoff, climb out, landing, touch-n-gos from flight school operations, operations such as engine maintenance, and in-flight operations to a radius of ten kilometers from the Airport for the entire years 2018 and 2040.

The minimum "noise level of interest" shall be 45 dB for development of a *dynamic grid* for the noise impact study receptor points' geographic extent as defined in AEDT Technical Manual par 2.2.1.6 and 4.7 ("Minimum Closed Contour Value"), with the receptor set growing dynamically as necessary to close the grid-point area of interest. Gridpoint outputs are acceptable rather than full contours for the selected metrics.

The Initial Receptor Definition shall be a bounding box comprising a 2 x 2 grid that just contains the current physical limits of PDK property.

Noise metrics at minimum levels of interest and above shall be provided to better determine the full environmental noise health impact and level of annoyance on the public to include the following Standard Name metrics (with AEDT name in parentheses - Refer to AEDT Technical Manual par 2.2.1.7.).

Exposure:

L_{dn}	(DNL)	Day Night Average Levels
L_{den}	(CNEL)	Community Noise Level Equivalent
L_{AeqT}	(LAEQ)	Equivalent Sound Level
L_{d}	(LAEQD)	Day-Average Noise Level (0700-2200)
L_{n}	(LAEQN)	Night-Average Noise Level (2200-0700)

Maximum Level:

L_{ASmx}	(LAMAX)	A-Weighted Maximum Sound Level

Time-Above:

TA_{LA}	(TALA)	Time-Above A-Weighted Level 24-hr period by day of the week at 45, 50, 60, 65 dBA

Number Above Noise Level Metric:

NANL	(NANL)	Number Above Noise Level 24-hr period by day of the week at 45, 50, 60, 65 dBA

2. Comparative Analysis:

Models and analyses developed should be compared to real-time noise data collected in PDK's ANOMS equipment and multiple deployments of PDK's portable ANOMS mobile unit in communities in the10 km radius around PDK.

Because there will always be some discrepancies due to a variety of factors including but not limited to weather, operations, the configuration of the monitoring equipment, ambient noise, etc., and in order for the comparison of modeled to measured noise values to be valuable, there needs to be close synchronization to the time periods and locations being measured and associated operations to the time periods, locations (i.e. locations of the existing fixed and portable ANOMS) and operations being used for the modeling inputs.

Discrepancies in model results and field results should be identified and further reviewed to determine likely causes and adjustments made to improve the modeling results for this study, as needed to achieve acceptable accuracy of results.

VI. Deliverables

1. Initial Products:

The contractor shall provide the following initial products for review and comment and shall incorporate changes as needed to maintain the goals of the program:

- An initial work plan, including timelines and proposed methodology.
- Input datasets (as referenced in Section IV.2) and methods to be used for development of the emissions inventory.
- Modeling protocol for air quality (as referenced in Section IV.3E), before modeling is performed.
- Dataset sources to be used in the noise modeling, before modeling is performed.

- Atmospheric adjustments and other input variables to be incorporated in the noise models.

2. Interim Products:

The contractor shall provide the following interim products for both years (2018 and 2040) for review and comment and shall incorporate changes as needed to maintain the goals of the program:

- Initial results, tables and isopleth maps for the following, as appropriate:
  - Emissions Inventory
  - AEDT outputs to be used for AERMOD modeling
  - Air Quality concentrations from AERMOD
  - Noise grid point map and identified discrepancies
  - Proposed number and location of portable ANOMS deployments for noise comparative analysis.

3. Final Products:

The contractor shall provide the following *draft* final products for review and comment and shall incorporate changes as needed to maintain the goals of the program:

- Draft Final Report
- Raw Datasets
- Final versions of interim products identified in Section VI.2.

VII. SOW Alternate 1 - Additional Work:

Interpretation of data and findings. The following impact evaluations should be conducted:

1. Predicted Health impacts from air and noise pollution from PDK Airport for the years modeled in the study.
2. Predicted impact on real estate property values and County tax revenue for the years modeled in the study.
3. Analyze relative environmental impacts for the four subgroups of aircraft activity for the years modeled in the study.

Selection Criteria for Qualified Bidders.

DeKalb County Purchasing officials will use this SOW to seek to obtain a competitively bid, non-sole source, qualified contractor to undertake the Work described herein. Experience performing research and investigatory air and noise studies is a prerequisite for bidders. All subcontractors and the work they would perform must be identified in the bid response to DeKalb County Purchasing. Any financial or other interest in the pending draft Master Plan for PDK must be disclosed and may be considered a conflict of interest.

ATTACHMENT:

Appendix I

Goals of Air and Noise Study at PDK Airport

Prepared by Open DeKalb, Inc. and Mike Van Wie, PDK Airport Director

April 22, 2011

The goal of the study is to collect hard data on the impact of PDK aircraft operations on air quality and noise over the geographic area reasonably impacted by the Airport. The study must to the greatest extent possible:

1. Analyze the air and noise pollution impacts of three categories of aircraft, (a) those with certified maximum takeoff weights of 66,000 pounds or less, (b) those with certified maximum takeoff weights in excess of 66,000 pounds but less than 75,000 pounds, and (c) those with certified maximum takeoff weights of 75,000 pounds or more;
2. not include air and noise pollution impacts from major vehicular highways near the Airport;
3. not include air and noise pollution impacts from air traffic in and out of Hartsfield-Jackson Airport;
4. provide analysis of PDK's relative impact on air quality in the area, so that PDK emissions can be understood as one contributor to the area's air and noise pollution, rather than with static figures for PDK's emissions without any qualifying context for the figures; and
5. provide comparative analysis of similar airport's(s') emissions.

The intent is to provide the DeKalb County Board of Commissioners, DeKalb CEO's Office and the Airport Staff, and the public with the ability to make informed decisions about Airport operations. As the County moves toward a Master Plan for the airport, policymakers, those who execute policy and those persons regularly impacted by the Airport either due to the location of their homes, offices or other regular physical contact with the Airport's operations, must be able to weigh costs and benefits of Airport operations intelligently.