Overview

This document highlights the specific detrimental impacts of the Norwood Airport flight operations on the town of Canton, its children and families. It provides specific details of the pollutants and Noise emitted by the aircraft along with their effects on the children and families of the Town of Canton Massachusetts. Intrusive chronic noise is covered along with serious emissions health effects especially lead.

- Note1: These aircraft are using Leaded fuel, which was banned in our other transportation uses decades ago! The emissions from these aircraft, especially the lead are being directly distributed beneath and downwind from the flight path of these aircraft. The flight paths of these aircraft are directed over the town of Canton's Elementary schools, playgrounds, sports fields and residential homes. The flight paths over our town are well under 1000 feet, focusing the health impacting noise and serious emission pollution directly on us.

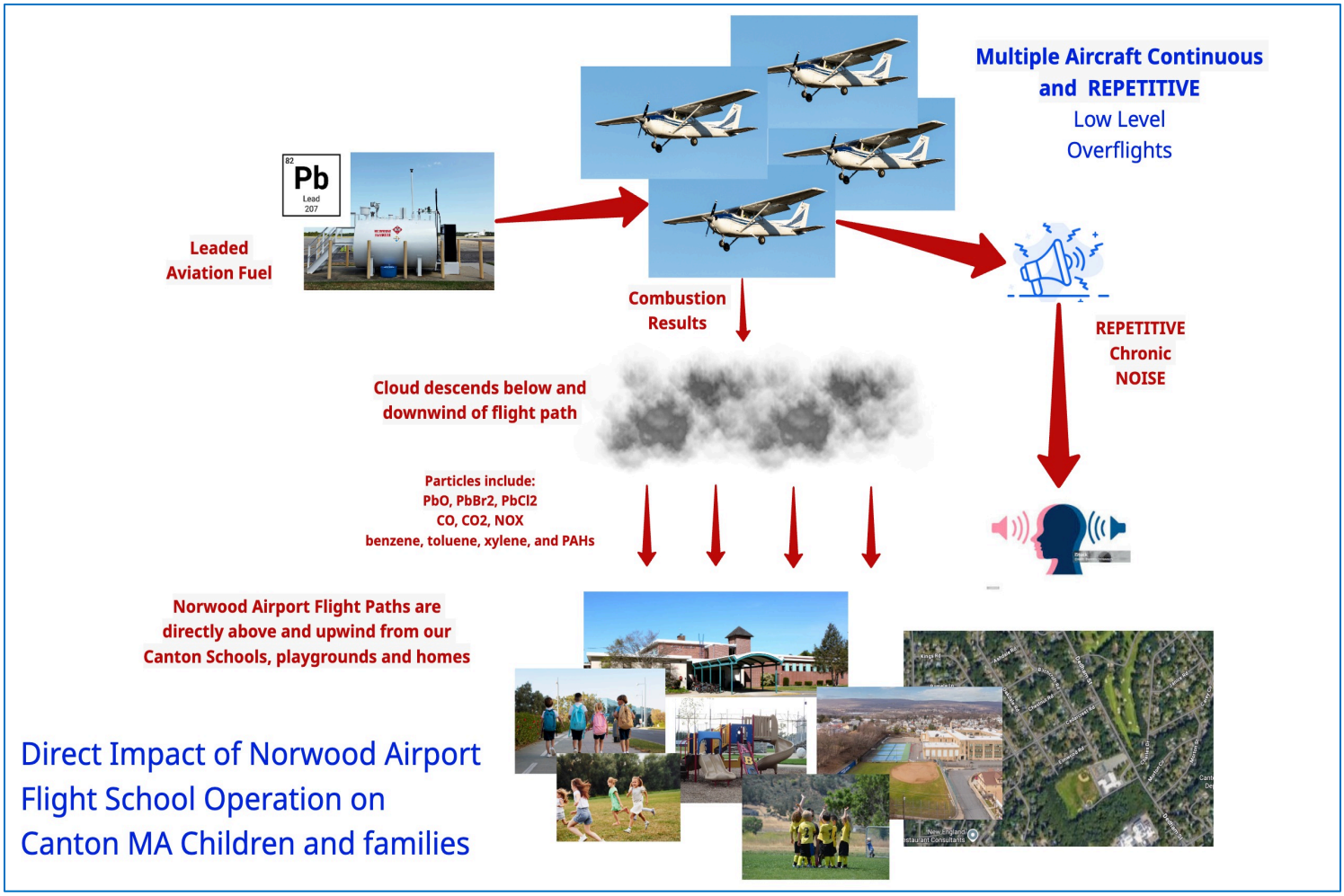
- Note2: included in this document is the Town of Canton study of Lead levels in children's blood. The data clearly shows an increase in blood Lead levels in the 2020 timeframe and remain elevated.

- Note3: The 2020 corresponding timeframe is when the increase in flight school overflights of Canton became noticeably intrusive.

- Note4: Massachusetts reporting is lagging the National reference value (CDC) of 3.5 µg/dL, the Massachusetts regulatory "level of concern": Is still 5 µg/dL (venous), there is no confirmed public update yet that MA has shifted the regulatory threshold lower to 3.5 µg/dL

Purpose:

This document is to be used for educational / illustrative purposes for the town's representatives and residents. Additionally, to provide specific context to the serious and increasing health impacts we are experiencing due to the Norwood Airports operation.



Piston Aircraft Leaded Fuel Emissions with Citations

Executive Summary

This document summarizes the scientific and public-health evidence linking piston-powered aircraft operations using leaded aviation fuel (100LL) to harmful air and noise pollution over the Town of Canton, Massachusetts. It compiles verified information from the U.S. EPA, FAA, CDC, NIH, and WHO. The goal is to provide town officials and residents with accurate data on emissions, associated health effects, and evidence-based thresholds for learning, cardiovascular, and community well-being impacts.

Overview

This summary highlights the detrimental impacts of Norwood Airport flight operations on Canton's residents. It includes pollutants, health and learning effects, and a review of Canton's 2023 lead-level data showing an increase since 2019. Although correlation does not prove

causation, the overlap between rising flight activity and lead detections warrants public-health investigation.

Key Context Notes

- Aircraft operating from Norwood Airport use leaded aviation gasoline (100LL), which remains the largest airborne source of lead in the U.S. (EPA/FAA 2022).
- Flight paths routinely pass over Canton's elementary schools, playgrounds, and residential areas at altitudes typically between 200–1,000 ft AGL.
- Canton's 2023 blood-lead screening data show levels elevated relative to Massachusetts averages since 2019.
- Massachusetts still uses 5 µg/dL as the regulatory level of concern (venous), while the CDC's national reference value was lowered to 3.5 µg/dL in 2021.

Pollutants from Piston-Powered Aircraft Using Leaded Fuel (100LL)

Primary pollutant categories and their impacts are summarized below:

- Lead Compounds (Pb, PbO, $PbBr_2$, $PbCl_2$) – Neurotoxic; accumulates in soil, dust, and human tissue.
- Carbon Monoxide (CO) – Reduces oxygen transport in blood; acute and chronic toxicity risks.
- Carbon Dioxide (CO_2) – Major greenhouse gas; climate relevance.
- Nitrogen Oxides (NO_x) – Forms ozone and smog; respiratory irritant.
- Unburned Hydrocarbons & PAHs – Carcinogenic; contribute to ozone formation.
- Particulate Matter ($PM_{2.5}$) – Respiratory and cardiovascular effects; long-range transport.
- Sulfur Oxides (SO_x) – Cause acid rain; respiratory irritant.
- Volatile Organic Compounds (VOCs) – Smog precursors; evaporative losses from fuel systems.
- Aldehydes (Formaldehyde, Acrolein) – Eye and airway irritants; carcinogenic potential.

Public Health and Learning Impacts from Repetitive Low-Altitude Aircraft Overflights

Learning and Cognitive Impacts on Children

Repeated impulsive aircraft noise disrupts reading, memory, and attention. Studies such as WHO RANCH (Clark & Stansfeld, 2005) show delays of up to six months in reading age among children near airports.

Cardiovascular and Physiological Effects

Long-term exposure to >55 dB average or frequent peaks >70 dB increases hypertension and heart disease risk (WHO 2018).

Psychological and Community Well-being

Noise annoyance, anxiety, and loss of outdoor quality of life are WHO-recognized health outcomes.

Sleep and Childhood Development
Even low-level nighttime or early-morning flights fragment sleep; chronic effects include hyperactivity and weakened immune response.

Auditory and Sensory Impacts
Peak flyovers often exceed 90–100 dB, producing temporary hearing threshold shifts and tinnitus risk.

Combined Exposure: Noise + Leaded Exhaust
Lead particulates deposit onto surfaces; combined toxic stress magnifies cardiovascular and neurological effects (EPA 2021; National Academies 2021).

Sensitive Populations
- Children – developing nervous systems heighten vulnerability.
- Pregnant women – noise stress correlates with lower birth weight and preterm delivery.
- Elderly residents – increased risk of hypertension and sleep disturbance.
- Individuals with cardiac or respiratory disease – experience symptom exacerbation.

Quantified Benchmarks

Health or Learning Effect	Typical Threshold	Source
Learning & reading delay in children	> 50 dB day	WHO / RANCH Study
Chronic annoyance / stress	> 45 dB day	WHO 2018
Sleep disturbance	> 40 dB night	WHO 2018
Hypertension risk	> 55 dB night	European Environment Agency
Heart disease risk	> 60 dB Lden	WHO 2018
Short-term hearing strain	> 90 dB (per flyover)	EPA / FAA acoustic data

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Summary

Chronic exposure to low-altitude piston-engine aircraft noise and exhaust constitutes **a serious, multifaceted public-health risk** for surrounding communities:

- **Learning disruption and developmental harm** in children
- **Cardiovascular and stress-related disease** in adults
- **Sleep and psychological impacts** across all age groups
- **Persistent soil and air contamination with lead**

Canton's observed data trends together with this worldwide information with these effects represent a **public health and environmental justice concern** that requires urgent local, state, and federal response

Key References and Sources

- EPA (2010, 2021). Lead Emissions from Piston-Engine Aircraft Using Leaded Aviation Gasoline, EPA-420-R-10-023.
- FAA. Piston Aviation Fuels Initiative (PAFI) Reports (ongoing).
- CDC/ATSDR (2021–2022). Lead Toxicity and Environmental Noise and Health.
- NIH (2015). Health Effects of Airborne Lead. Environmental Health Perspectives, Vol. 123, No. 8.
- WHO (2018). Environmental Noise Guidelines for the European Region.
- Clark, C. & Stansfeld, S.A. (2005). RANCH Study. The Lancet 365:1942–49.
- Basner, M. et al. (2017). Auditory and Non-Auditory Effects of Noise on Health. The Lancet 383:1325–32.
- National Academies of Sciences (2021). Options for Reducing Lead Emissions from Piston-Engine Aircraft.

Limitations

This document summarizes verified scientific and public data but does not establish a direct causal relationship between airport operations and individual health outcomes. It is intended for educational and advocacy purposes.

Summary Table

Category	Example Pollutants	Source	Effects
Metals	Pb, PbBr2, PbCl2	Fuel additive TEL Tetraethyl Lead)	Neurotoxicity, soil & air contamination
Gaseous	CO, CO2, NOx, SOx	Combustion	Air quality degradation, climate impacts
Hydrocarbons	Benzene, PAHs, VOCs	Incomplete combustion	Cancer, smog formation
Particulates	Soot, PM2.5, lead particles	Combustion	Respiratory/cardiovascular disease
Oxygenated Organics	Formaldehyde, acrolein	Partial oxidation	Irritation, carcinogenic
Evaporative Emissions	VOCs from tanks/lines	Evaporation	Ground-level ozone precursor

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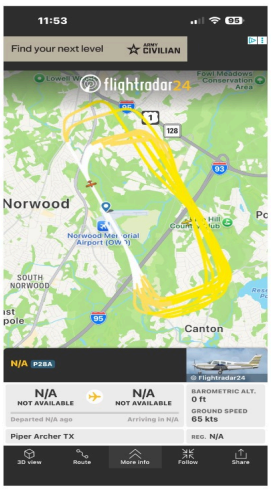
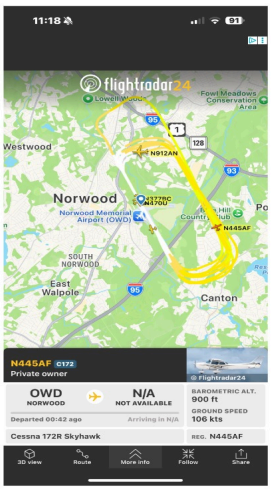
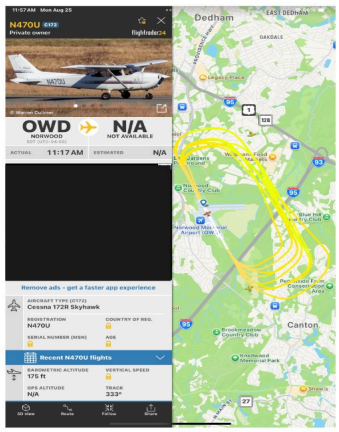
Prepared for: Airport Pollution Initiative — Educational summary on 100LL aviation emissions

Flight Path Examples, directed by Norwood Airport Operations over the town of Canton





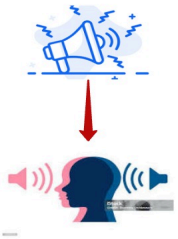


Multiple Aircraft Continuous and REPETITIVE
Low Level
Overflights

Cloud descends below and downwind of flight path

Combustion Results

Particles include:
PbO, PbBr2, PbCl2
CO, CO2, NOX
benzene, toluene, xylene, and PAHs



REPETITIVE Chronic NOISE

Norwood Airport Flight Paths are directly above and upwind from our Canton Schools, playgrounds and homes

Direct Impact of Norwood Airport Flight School Operation on Canton MA Children and families

APPENDIX – Additional Information, details, citations, reports

Public Health & Learning Impacts from Repetitive Low-Altitude Piston-Engine Aircraft Overflights

Overview

Small piston-engine aircraft — typically using **leaded aviation gasoline (100LL)** — produce both **intense repetitive noise** and **toxic emissions** during training circuits, touch-and-go operations, and flight-school patterns.
These flights often occur **between 200–1000 feet directly over neighborhoods, schools, and playgrounds**, exposing residents and children to multiple overlapping stressors: - Continuous **high-intensity noise events** (often 70–100 dB per flyover) - **Short interval repetition** (every few minutes) - **Toxic exhaust** containing lead, particulates, and carbon monoxide
Together, these constitute a chronic environmental health hazard, even when individual noise or pollution readings appear "within limits."

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1. Learning and Cognitive Impacts on Children

Aircraft noise from piston planes is uniquely intermittent and impulsive, making it more disruptive than steady background noise. Studies show that even moderate but repeated noise peaks impair cognitive performance and memory formation in children.

Documented impacts near small airports: - **Reading and comprehension delays:** Children in flight-path schools show reading ages **up to six months behind** peers in quieter areas (WHO, RANCH, Clark & Stansfeld, 2005). - **Reduced attention and working memory:** Low-altitude flyovers cause startle and stress responses that interrupt classroom concentration and task persistence. - **Speech and language perception:** Sudden overflights mask teacher voices and classroom instruction; younger students and ESL learners are most affected. - **Learning fatigue:** Frequent interruptions cause cognitive overload, leading to slower academic progress and lower standardized test performance.

Bottom line: chronic aircraft noise exposure is directly linked to measurable educational deficits.

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2. Cardiovascular and Physiological Effects

The propeller-driven noise profile of piston aircraft includes strong **low-frequency and harmonic components** that penetrate homes and bodies even when windows are closed.

Health outcomes documented in similar settings: - **Elevated blood pressure and hypertension** in adults and children exposed to average levels above 55 dB (WHO, 2018). - **Increased stress**

hormones (cortisol, adrenaline) triggered by each flyover, leading to chronic vascular strain. - **Heart disease and stroke risk** rises 10–20% with long-term exposure above 60 dB Lden. - **Sleep disruption:** repeated nighttime training flights or early-morning departures fragment sleep architecture, reducing restorative deep sleep.

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3. Psychological and Community Well-Being

- **Noise annoyance and stress:** recognized by WHO as a significant health outcome.
- **Anxiety, irritability, and helplessness** result from unpredictable overflights residents cannot control.
- **Loss of enjoyment of outdoor and family spaces**, especially when patterns extend into weekends and evenings.
- **Erosion of community cohesion** as residents withdraw indoors or consider relocation.

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4. Sleep and Childhood Development

Children are especially vulnerable because noise arousals occur even when they remain "asleep." Chronic fragmented sleep has been linked to: - **Behavioral problems, hyperactivity, and attention deficits** - **Weakened immune response** - **Reduced emotional regulation and resilience**

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5. Auditory and Sensory Impacts

While average exposures may not reach occupational safety limits, **peak levels under flight paths often exceed 95 dB**, enough to cause: - Temporary hearing threshold shifts ("ringing in the ears") - Auditory fatigue and increased tinnitus risk - Exacerbation of hearing difficulties in sensitive populations

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6. Combined Exposure: Noise + Leaded Exhaust

Piston-engine aircraft uniquely emit **lead (Pb)** in particulate and gaseous forms, along with **carbon monoxide, nitrogen oxides, hydrocarbons, and fine particulates**.
When residents are repeatedly overflown at low altitude: - Lead settles onto **homes, schoolyards, gardens, and playgrounds**. - Children inhale or ingest resuspended dust. - Combined **toxic stress (chemical + acoustic)** magnifies cardiovascular, neurological, and developmental impacts.

No other transportation source in the U.S. still uses leaded fuel, making piston aviation the **largest remaining airborne lead emitter** (EPA, 2021).

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7. Sensitive Populations

- **Children:** developing brains and nervous systems amplify both noise and lead effects.
- **Pregnant women:** noise and stress hormones correlate with lower birth weight and preterm delivery.
- **Elderly residents:** greater risk of hypertension, sleep disruption, and cognitive decline.
- **Cardiac or respiratory patients:** symptoms often worsen during repetitive flight days.

Prepared for: Airport Pollution Initiative — Educational summary for residents, educators, and community officials.

REPORT: 2023 Canton Childhood Lead Screening Data

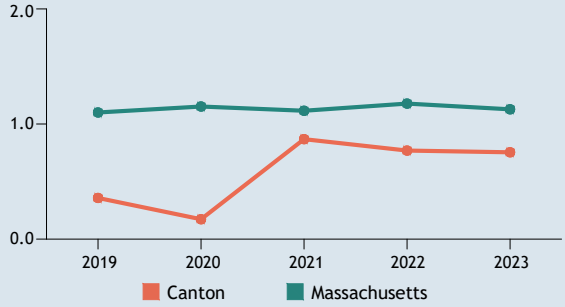
Canton's 2023
Childhood Lead Screening Progress Report

There is no safe level of exposure to lead. Children in Massachusetts continue to be exposed, and even low levels of lead may cause lasting harm. **State law requires health care providers to screen every child and to report results.** Action should be taken for a blood lead level ≥ 5 µg/dL, and a child is poisoned at ≥ 10 µg/dL.

How many children in Canton have elevated blood levels compared to the state?

A childhood blood lead level ≥ 5 µg/dL indicates the child's exposure is higher than 97.5% of children nationally and that the child is in need of intervention according to the Centers for Disease Control and Prevention (CDC).

Percentage of Children with First-Time Blood Lead Levels ≥ 5 µg/dL



How many children in Canton are not receiving a follow-up test?

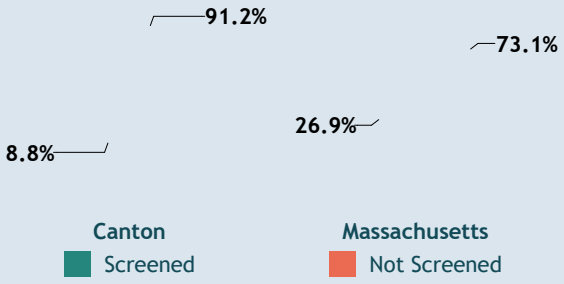
Chronic, low-level lead exposure can have harmful effects on a child. It is important to identify children at low levels to prevent further exposure and lead poisoning. State regulations **require** children with elevated capillary tests ≥ 5µg/dL to receive a **venous** follow-up test. The Childhood Lead Poisoning Prevention Program (CLPPP) provides free home visits and inspection services to children based on elevated venous levels. Without the required venous follow-up test, children may not receive these services and chronic exposure to lead may continue.

Percentage of children **without** the required venous follow-up test.

Are all children in Canton screened for lead?

Screening is the only way to know if a child has been exposed to lead. **Screening is required by the state,** and all children must be screened between 9-12 months, at age 2, and at age 3. Children in high risk communities must also be screened at age 4. **All blood lead results must be reported to the state health department,** and must include complete demographic information such as race and ethnicity. This data enables the CLPPP to identify populations that can most benefit from targeted outreach and prevention activities.

Screening Rate 9-47 Months



Why is screening through age 3 important?

In Massachusetts, 13% of children did not have an elevated blood lead level until age 3. All children must be screened annually through age 3. In Canton, 91% of children are screened at age 3.

Did You Know?

Capillary tests are prone to contamination. Venous tests are always confirmatory and recommended over capillary tests. An alcohol swab alone will not decontaminate a child's hand. Always wash the child's hand with soap and water first.

Call the Massachusetts Childhood Lead Poisoning Prevention Program at 1-800-532-9571