Introduction to the Issue of Leaded Avgas

Leaded avgas, short for aviation gas, is used by small-aircraft in the US. The general aviation industry is a critical part of the US economy, with small-aircraft used for commerce, flight schools, recreation, and medical transports to just name a few applications.[1–3] However, using leaded avgas releases hundreds of tons of lead into the air each year, which is a serious threat to people's health.[3–9] With high-octane unleaded fuels applicable for the entire fleet now certified, it is critical to accelerate the transition to the use of unleaded fuels. This is an opportunity to simultaneously strengthen the American general aviation industry and protect the health of millions of Americans from toxic lead exposure.

Background on Lead & US Regulations

For **centuries**, lead has been known to be **dangerous.**[4]

Consensus among experts and agencies, including the World Health Organization, is that **any exposure to lead is unsafe.**[5][6]

Lead harms our health, causing effects such as:

- cognitive limitations (IQ loss)[5][6][7][8]
- pre-term births[5][7]
- cardiovascular mortality[5][7][9]
- & more...[5][6][7][8][9]

Children and pregnant women are particularly vulnerable, but lead harms everyone.[5][6][7][8][9]

This is why in **1973,** the EPA issued regulations on lead emissions under the Clean Air Act.[10][11]

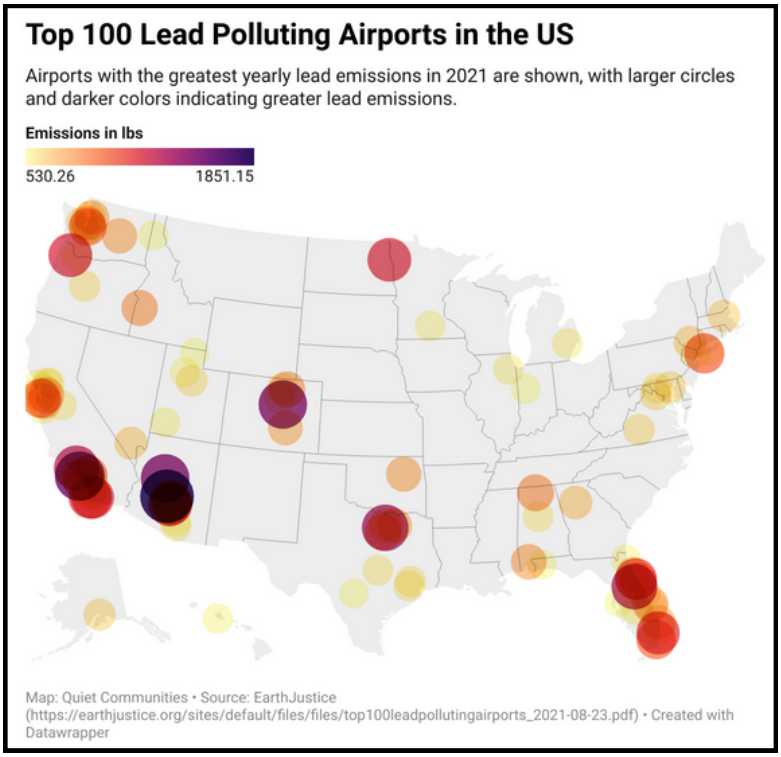
By **1996**, there was a full ban* of leaded-gas by the EPA for vehicles like cars, trucks, and commercial planes; however, there were exceptions, including for [small] aircraft.[10][11]

*exception
- [small] aircraft
- racing cars
- farm equipment
- marine engines

470 tons of lead

are emitted by small-aircraft into the air **each year**.[3]

Scope of the Issue



The **top 100 lead-polluting airports** in the US are shown in the map to the left.[12] Larger circles that are darker in color indicate greater lead pollution.

While the map only shows the top 100 greatest lead-polluting general aviation airports in the US, there are **20,000 general aviation airports in the US**.[13]

Over **16 million** people live within 1 km of a general aviation airport in the US.[14]

This is an Environmental Justice Issue[12][13][14] with many of these airports in **minority** & **low-income** communities,
as well as communities with many **children under 5** & **seniors**.

Research

- In **Santa Clara County,** near Reid Hillview airport, **a study** lead by Dr. Zahran in 2021 found increases in blood-lead levels (BLL) **comparable to the increase in BLL during the Flint, Michigan water crisis.**[15]

- The study **Canfield et al. (2003)** found that for very small increases in blood-lead levels (BLL) of 0.0000001 g lead/dL blood there was 4.6 IQ point decline in the lifetime average.[9]

↑ just 0.0000001 g lead/dL blood → **4.6 IQ points in lifetime average**

(And remember, 470 tons are emitted into the air each year.[3])

- The study **Miranda et al. (2011)** found from geospatial analysis there was **significant association** between potential avgas exposure (proximity to general aviation airport) and blood-lead levels (BLL).[16]

Recent Updates

Environmental Protection Agency's (EPA) Proposal to Issue an Endangerment Finding

October 7th, 2022

- This proposal to issue an endangerment finding means EPA began the process of officially stating this leaded emission is dangerous.[3][17]
- If an Endangerment Finding is issued, it would prompt regulations of lead emissions from general aviation aircraft, and begin to "address the largest remaining source of lead pollution to the air." [17]

Unleaded Fuel & the Federal Aviation Administration (FAA)

September 1st, 2022

FAA approved **GAMI's G100UL** high octane, unleaded fuel for use in the entire piston engine general aviation fleet.[18][19]

Other News:

- Previously, **Swift Fuel's UL94** had been approved for use in specific aircraft. Swift Fuels is currently in the process of getting FAA approval for 100R unleaded fuel for the entire fleet.[18][19][20]
- Afton/Phillips66 and Lyondell/VP-Racing also have unleaded fuels in testing.[19]

- FAA **Eliminate Aviation Gasoline Lead Emissions (EAGLE)** Initiative was launched in February 2022 as a government-industry partnership to eliminate leaded avgas use by 2030.[21]

Takeaway Points

- Lead is a toxin that is harmful to our health even in small amounts.[4][5][6][7][8][9]
- Lead emissions from avgas account for 70% of US lead inventory.[3]
- Lead in avgas generates octane which small-aircraft need to safely fly by preventing knock in the piston engines; however, there is now completely **high octance, unleaded fuel** for the **entire fleet.**[18][19][2]

The goal needs to be further accelerating the transition to the use of unleaded fuels. This requires creative thinking and collaboration.

Consider looking at the materials from the conference, "*Accelerating the Transition to Lead-free Skies*" from **Quiet Communities** and the **Boston University class CAS EE 538** to learn more about implementing solutions.

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