

Aviation and Lead

Frequently Asked Questions

Q: What are the health effects of lead?

Answer: Too much lead can harm both children and adults. Once in the body, lead is rapidly absorbed into the bloodstream and can affect many organ systems. Lead poisoning can damage developing nervous systems in young children, including neurological effects that lead to behavioral problems, learning deficits, and lowered IQ. In adults, lead can cause high blood pressure and kidney damage, among other health problems.

Q: How is lead in the air measured or quantified?

Answer: The United States Environmental Protection Agency (USEPA) has developed national ambient air quality standards for six pollutants, including lead, to protect public health and welfare. The standard adopted by the USEPA for lead is 0.15 micrograms per cubic meter measured as a rolling 3-month average (i.e., the average measurements during a 3-month period such as June through August). These measurements are taken by capturing the total suspended particulates in the air and then determining the portion that consists of lead.

Q: How do I know if there is too much lead in the air?

Answer: There are several places to check. First, the USEPA designates areas where measured emissions have exceeded the national standards designed to protect public health and welfare. The map to the right shows the locations where lead has been found to exceed the USEPA standards; 21 locations in the United States have exceeded the lead standard in the past. In most cases, industrial processes have caused the standards to be exceeded. These sites are further described at <http://www3.epa.gov/airquality/greenbook/mnc.html>.



Finally, your state and/or local air quality agency can provide information about measurements that they take in your local community and if lead is a concern.

Q: Why is lead in general aviation aircraft fuel?

Answer: General aviation (GA) refers to all flying except scheduled passenger airlines, commuters, and military. GA as a category of airport operations includes recreational flying, package delivery, emergency medical evacuation, sightseeing, crops dusting, and police and traffic helicopter activity. Because of the need for high performance piston engines, many GA aircraft were designed to use a very high octane leaded gasoline, called aviation gasoline (AVGAS). The octane boost provided by lead in AVGAS prevents improper combustion or "knock" that can lead to engine failure, which is catastrophic in flight.

It is the need for high octane that has prevented the elimination of lead from AVGAS, whereas car and truck engines have been designed for lower octane unleaded motor gasoline (MOGAS) in order to avoid poisoning the catalytic converters. As a result, use of leaded MOGAS ended in the 1990s.

Q: Why can't general aviation aircraft use unleaded fuel?

Answer: Although it is estimated, based on FAA-sponsored research, that between 40% to 50% of GA aircraft can operate on lower octane unleaded fuel, known as MOGAS, as well as AVGAS, the remaining 50% to 60% of GA aircraft were designed to operate only on AVGAS and can operate safely only on that fuel. At this time, only leaded fuel is commercially available as AVGAS.

Q: What has been and is being done to remove lead from general aviation fuels?

Answer: Despite the continued use of AVGAS, lead emissions related to GA have declined over time for two reasons: (1) the introduction of low-lead AVGAS with less than half the lead content of older AVGAS, and (2) a decline in the use of AVGAS in GA. In addition, much research has been conducted over the past two decades focused on finding a safe replacement for leaded AVGAS. The FAA has established the Fuels Program Office to help meet the Agency's goal of making an unleaded fuel available for the existing fleet of piston-engine aircraft. The FAA is working with the USEPA, the aviation industry, fuel producers, academia, and others to identify a replacement for leaded AVGAS by 2018. More information is available at <http://www.faa.gov/about/initiatives/avgas/>.

Q: Are there ways an airport can reduce leaded fuel impacts?

Answer: The Airport Cooperative Research Program (ACRP) has conducted several research efforts associated with lead at airports. ACRP Project 02-57 examined two potential options to reduce lead emissions from GA activity:

1. Based on research sponsored by the FAA, it has been determined that approximately 40% to 50% of the U.S. GA fleet could potentially operate with unleaded MOGAS. Thus, making unleaded MOGAS available as an alternative to leaded AVGAS for use in aircraft that can safely operate with that fuel could reduce lead emissions.
2. Relocating engine test (run-up) areas or redistributing the use of existing run-up areas may lead to lower maximum lead concentrations in the air.

This study found that maximum lead concentrations could be reduced by 19% to 56% with the implementation of one or both of the recommendations at the three airports that were evaluated.

The results showed the following reductions in maximum lead concentrations:

- Making MOGAS available for the aircraft that could operate using it: 19% to 35% reduction
- Relocating the engine test run-up areas: 7% to 31% reduction
- Both MOGAS availability and relocating run-ups: 36% to 56% reduction

The magnitude of the reduction that can be achieved at any one airport is dependent on the number of aircraft that would actually use MOGAS and the availability of alternative engine test run-up locations. A guidance document developed to assist airports in considering these strategies can be found at www.trb.org/ACRP.

Q: Can my airport use these lead reduction actions?

Answer: Each airport is different, and not every airport may be able to implement one or more of these actions. In all cases, careful study by the airport is recommended to avoid potential adverse impacts on safety, noise, and other important factors.

Q: How can my airport use the results of this study?

Answer: The role of the airport operator today is to address lead emissions on a voluntary basis, as there is currently no regulatory mandate for airports to take any action. However, the USEPA reported that in 2017 it intends to issue a finding on whether aviation lead emissions represent a sufficient public hazard so as to warrant regulation.

Airport operators may choose to begin formulating plans to address lead either as part of a State Aviation System Plan, an individual airport master plan, or an airport sustainability plan. The results of this ACRP study would aid airports in being proactive through their planning process to identify (1) the aircrafts that require AVGAS, versus those that could operate on MOGAS, and the quantities of fuel consumed; and (2) locations where ground run-ups could be conducted to reduce off-airport concentrations of lead. Armed with this information, an airport operator could implement one or more of the findings of this ACRP study in advance of being required to take action if regulations are subsequently adopted.