Lead Emissions from Small Aircraft Fuel at Sacramento Executive Airport

Sacramento Metropolitan Air Quality Management District

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Contents

Executive Summary

Lead emissions have long been identified as a toxic substance to humans, and efforts have been undertaken to reduce exposure to lead through regulatory and other measures.[i] The United States Environmental Protection Agency (U.S. EPA) identified lead as one of the six criteria air pollutants in the 1970s, and requirements to remove lead from gasoline fuel were among the first actions taken to dramatically reduce lead in the environment. With a 99 percent reduction in lead emissions since 1980, significant progress has been made in reducing the public's exposure to lead. One of the largest remaining sources of airborne lead emissions is from aviation fuel used by small piston engine aircraft, commonly referred to as aviation gasoline or Avgas. Federal and state efforts are underway to phase out the use of leaded aviation fuel, but the final phaseout is still a handful of years away. In the meantime, some General Aviation facilities have taken earlier than required steps to transition to unleaded fuel.

In Sacramento County, there are numerous General Aviation facilities used by small aircraft for private and commercial flights, flight training, and agricultural purposes. Although there are several small aviation facilities within Sacramento County, the Sacramento Executive Airport is the primary General Aviation airport due to its size, amenities, and prime location within the City of Sacramento. As neighborhoods developed around the Sacramento Executive Airport, nearby community groups and neighborhood associations have expressed concerns about exposure to air pollution from airport activities, including lead contamination.

Previous local monitoring efforts for airborne lead emissions near the airport show compliance with air quality standards. However, given the recognized health benefits that could be achieved by phasing out the use of leaded Avgas earlier than required by the recent federal and state laws, the Sacramento Metropolitan Air Quality Management District (SMAQMD) initiated discussions with the Sacramento County Department of Airports to understand possibilities and challenges to using an unleaded Avgas option at the Sacramento Executive Airport earlier than required by the current regulatory deadline of December 31, 2030.

To date, the Sacramento County Department of Airports and its fixed-based operator, which provides the aircraft fuel, are awaiting a commercially available 100-octane unleaded Avgas that can be safely used for all General Aviation aircraft operating at their facilities. Until then, they will continue to provide the 100-octane low-lead (100LL) Avgas at Sacramento Executive Airport.

SMAQMD will continue discussions with the Sacramento County Department of Airports to support their transition to unleaded Avgas through voluntary early action solutions, where possible, and to assure proper air quality permitting of unleaded fuel tanks in the future. SMAQMD will also facilitate discussions and information sharing with the AB 617 South Sacramento Florin community, elected officials, and other groups interested in understanding the topic of lead in aviation fuel, the local air quality monitoring efforts that have been done to date, the regulatory landscape, and the challenges to transitioning to unleaded fuel options earlier than required. While the ultimate transition to unleaded fuel may still be years away, these actions will help to inform multiple stakeholders and ensure this important public health topic remains at the forefront of conversation and action.

Introduction

The adoption of Assembly Bill 617 (C. Garcia/E. Garcia, 2017) and the implementation of the Community Air Protection Program by the California Air Resources Board and local air agencies, including the SMAQMD, have put focused effort into finding measures that will reduce emissions and reduce community exposure to air pollution in overburdened neighborhoods. In 2018, the South Sacramento-Florin community was officially identified to be one of the first of ten communities to take action under this program. In the intervening years, the program's Steering Committee, with the support of SMAQMD, has developed a Community Air Monitoring Plan (CAMP) and is currently developing a Community Emission Reduction Plan (CERP) that will include measures to help reduce exposure to air pollution.

The program's Steering Committee members and community members have identified the area around the Sacramento Executive Airport as an area of concern due to multiple potential sources of air pollution, including the Sacramento Executive Airport, the former Mangan gun range, roadway traffic, and other nearby fleet hubs. Specifically, lead contamination has been a pollutant of concern due to testing and remediation that has occurred in surrounding neighborhoods. In other national and state forums, leaded aviation gasoline (Avgas) has also been a topic of discussion, following the EPA's endangerment finding released in October 2023, which states that lead emissions from leaded fuel used in aircraft pose a threat to public health and welfare. There are ongoing efforts to eliminate the lead content of Avgas. At the federal level, there is the Eliminate Aviation Gasoline Lead Emissions (EAGLE) program with the stated goal of eliminating leaded aviation fuels used in piston engine aircraft safely by the end of 2030. At the state level, Senate Bill 1193 was enacted on September 22, 2024, and will prohibit an airport operator or aviation retail establishment from selling, distributing, or making leaded aviation gasoline available to consumers on or after January 1, 2031.[lviii] While federal and state regulations are pushing toward a phase-out of leaded Avgas, those are still several years away from showing meaningful reductions in lead emissions from Avgas. Sooner than required actions can be taken that will reduce exposure to this source of lead contamination, and there are examples of General Aviation airports that have taken voluntary steps to switch to unleaded Avgas options.

To provide local decision-makers and the public with background information and current data on lead emissions from small aircraft using leaded Avgas at Sacramento Executive Airport, the Sacramento Metropolitan Air Quality Management District (SMAQMD) has prepared this white paper. The history of using leaded Avgas, associated health impacts from exposure to lead, and the current regulations that affect the future of Avgas use are discussed, as well as the background, aviation activity, and related lead emission profile from the Sacramento Executive Airport. Case studies of early actions being voluntarily taken at other General Aviation airports are presented in this summary. Finally, next steps are outlined for continued dialogue with Sacramento County Department of Airports, local leadership, and community stakeholders to further discuss the topic of lead in aviation fuel and the opportunities and challenges related to an early transition to unleaded fuel options.

Background

Location of Sacramento Executive Airport

The Sacramento Executive Airport, located at 6151 Freeport Boulevard in Sacramento, California, is situated approximately seven miles south of downtown Sacramento and is one of eight public-use airports within Sacramento County. Sacramento County has one Commercial Service international airport (Sacramento International Airport), one closed General Aviation airport (Elk Grove),[ii] and six active General Aviation airports (Executive, Franklin Field, McClellan, Rancho Murieta, Rio Linda, and Mather,[iii] which also specializes in Cargo Aviation).[iv, v]

As mentioned, Sacramento Executive Airport is classified as a General Aviation airport and is operated by the Sacramento County Airport System.[vi] The Federal Aviation Administration (FAA) classifies public use airports that do not have scheduled service or have fewer than 2,500 passenger boardings per year as General Aviation airports.[vii] The FAA and the International Air Transport Association (IATA) use "SAC" as the three-letter station code, or location identifier, for the Sacramento Executive Airport.[viii, ix]

History of Sacramento Executive Airport

The airport was originally a city-owned facility that opened in 1930, called the Sutterville Aerodrome. During World War II, the United States Army Corps took control of the airport, and when it was returned to the city after the war, the airport was renamed Sacramento Municipal Airport. Over the years, the airport underwent improvements to its facilities and its three runways. All commercial airline flights through the Sacramento region were handled at this airport, but once the Sacramento Metropolitan Airport (currently known as Sacramento International Airport), located approximately 12 miles northwest of downtown Sacramento, opened in 1967, all commercial airline operations were transferred to the Sacramento Metropolitan Airport. The Sacramento Municipal Airport was then renamed Sacramento Executive Airport and became a General Aviation facility.[vi, x] A simplified map of Sacramento Executive Airport and its three runways is shown in Figure 1.

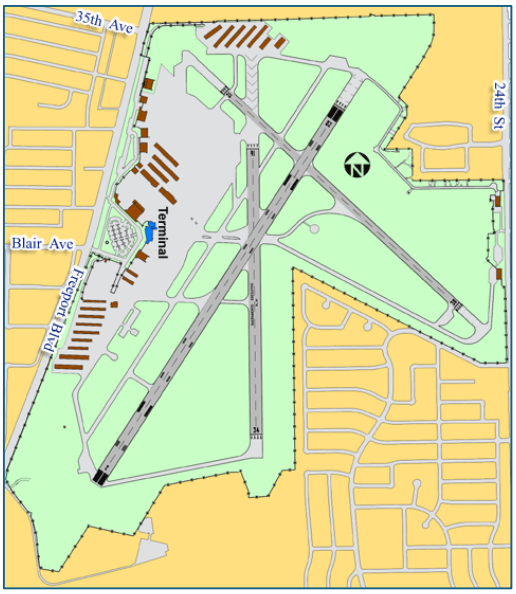


Figure 1. Map of Sacramento Executive Airport [xi]

Sacramento Executive Airport Businesses and Surroundings

Sacramento Executive Airport has a multitude of businesses onsite, which affect its activity level and air pollutant emissions. These businesses include a flight training school, aerial photography services, and facilities for aircraft charter, rental, fuel, maintenance, and sales.[xii]

Currently, residential land uses surround Sacramento Executive Airport. A golf course buffers the airport's southwestern side from the residential properties, and the commercial land uses along Freeport Boulevard buffer the airport's western side from the residential properties. The City of Sacramento Corporation Vehicle/Equipment Fleet Yard occupies a large parcel adjacent to the northeastern side of the airport. Along the northern boundary of the airport is James Mangan Park, where the city-owned indoor rifle and pistol range was closed in 2014 due to unsafe levels of lead exposure. Clean-up of the impacted area around the rifle and pistol range was completed in 2017. The lead remediation work on the interior of the former rifle and pistol range building was scheduled to begin in 2019, but a completion date has not been published by the County of Sacramento's Environmental Management Department.[xiii] Other notable land uses are the multiple school sites within one mile of the airport's boundaries, in every direction. Land use compatibility and the agencies with jurisdiction over the airport are discussed later in this document.

Community Air Protection Program Boundary

Sacramento Executive Airport is within the expanded boundary of SMAQMD's South Sacramento-Florin *Community Air Monitoring Plan* (CAMP) and *Community Emissions Reduction Program* (CERP), as shown in Figure 2. SMAQMD initiated its Community Air Protection Program in 2018 in response to California Assembly Bill 617, which mandated the development of community-focused programs to more effectively reduce exposure to air pollution and preserve public health, particularly in communities disproportionately affected by air pollution. The SMAQMD's air monitoring efforts around Sacramento Executive Airport are discussed later in this document.

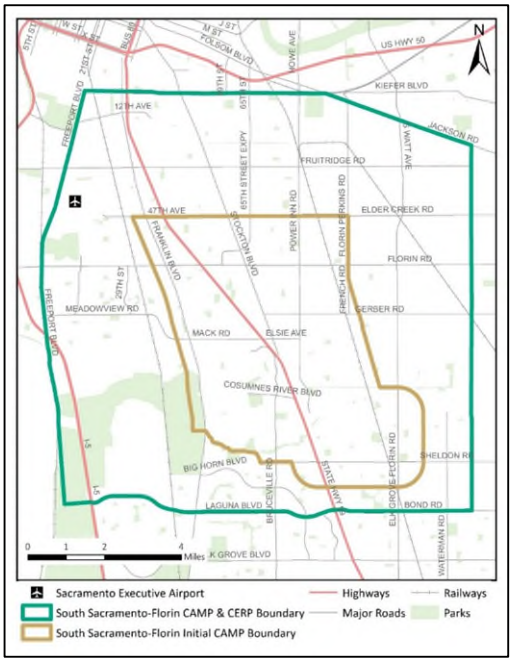


Figure 2. Map of South Sacramento-Florin Boundaries for the Community Air Protection Program

History of Lead in Fuel

A California Air Resources Board (CARB) report on the updated exhaust profile of piston-engine aircraft using Avgas estimated that over 50 percent of airborne lead emissions in the United States originate from General Aviation airports.[xiv]

Lead, in the form of tetra-ethyl lead, was originally added to gasoline in the 1920s as an octane booster, which prevented automotive piston engines from knocking. The knocking or rattling sound occurs when gasoline prematurely ignites rather than burning smoothly inside an engine cylinder; this premature ignition causes damage to the engine and decreases fuel efficiency. Higher octane rated fuel mixtures are more resistant to knock.[xv] The term detonation is more commonly used in the aviation industry instead of knock. The invention of higher octane, leaded fuel ushered in the advancement of powerful, high-compression engines that extended to the aviation industry. Military aircrafts during World War II were dependent on lead additives in the Avgas to prevent pre-ignition and detonation.[xvi] Pre-ignition and detonation cause large pressure spikes in the combustion chamber, which decrease power output and cause damage to the engine, and in some cases, can induce aircraft engine failure within minutes.[xvii] After the war, aircraft engine manufacturers continued to build piston engines designed to operate with leaded fuel.[xvi]

Based on CARB's California Aircraft Inventory 2024 Model (CAI2024), approximately 93 percent of General Aviation aircraft and 27 percent of General Aviation rotorcraft use Avgas (see Table 1).[xviii] Currently, the most commonly available Avgas in California is the 100-octane low-lead (100LL) fuel, which contains up to 2.12 grams of lead per gallon (up to 0.56 grams of lead per liter).[xiv] The 100LL is dyed blue to differentiate it from the regular Avgas 100-octane fuel, which contains up to double the lead content per gallon and is dyed green.[xix, xx] There is currently an FAA-approved 100-octane unleaded Avgas (G100UL) that has a green to blue-green tint, but G100UL is not yet widely available.[xxi] The ongoing efforts to eliminate lead in Avgas are discussed later in this document.

Table 1. Aircraft Categories based on CARB's California Aircraft Inventory 2024 Model [xviii]

Categories of Aircraft

Category	Type	Jet Engine (Jet Fuel)	Piston Engine (Aviation Gas)
Agricultural	Aerial Applicator	84%	16%
Commercial	Air Carrier	~100%	< 0.1%
	Air Taxi	~100%	< 0.1%
General Aviation	General Aviation Aircraft	7%	93%
	Rotorcraft (helicopters)	73%	27%
Military	Military Aircraft	99%	1%
	Rotorcraft (helicopters)	100%	0%

CARB classified aircraft with 6 or fewer seats as General Aviation; and aircraft with 7 to 60 seats inclusive as Air Taxis in the Commercial category.

The majority of aircraft that operate on leaded Avgas are small piston-engine aircraft that carry 2-10 passengers; the average age of these aircraft is 46 years.[xxii] Larger aircraft used for commercial air travel/transport, commonly referred to as jet aircraft, do not operate on Avgas or a fuel containing lead; these gas turbine-engine aircraft are designed to operate on aviation turbine fuel (ATF), also known as jet fuel. Examples of General Aviation aircraft (in the center column) and commercial jet aircraft (in the left column) are shown in Figure 3.

Figure 3. Examples of Commercial Jet Aircraft, General Aviation Aircraft, and Military Aircraft [xviii]

Although most small piston engine aircraft are older, their engines have newer components due to the rigorous maintenance and inspection schedules required by the FAA to maintain their Airworthiness Certificate. Engine maintenance primarily involves regular inspections, oil changes, and eventually, a major overhaul, which requires a complete dismantling and inspection of the engine. For example, an overhaul for a Cessna 172, a popular small aircraft, is typically performed between 1,800 and 2,000 hours of operation.[xlvii] According to the FAA, there are more than 220,000 General Aviation aircraft nationwide, which rely on leaded Avgas, meaning those aircraft are safety certified to operate on some type of leaded Avgas, such as 100LL.[xlv]

Health Impacts of Lead

Lead is a toxic metal and one of the six criteria air pollutants for which ambient air quality standards have been established at both the federal and state levels to protect public health. Lead is a naturally occurring element found in small amounts in the Earth's crust. Its use in human products and technology advancements has caused environmental contamination and worldwide public health problems.

The World Health Organization has stated that there is no known safe level of blood lead concentration, and no level of exposure to lead is known to be without harmful effects. Once lead enters the body, it is distributed to the brain, kidneys, liver, and bones, and it is stored and accumulated in the bones and teeth. Lead stored in the bones may be released into the blood during pregnancy and become a source of exposure to the fetus. Lead exposure during pregnancy can cause premature birth, low birth weight, and neurodevelopmental problems for the baby. Children exposed to lead can suffer from developmental damage to the brain and central nervous system,

learning and behavioral difficulties, slowed growth, high blood pressure, kidney damage, immunotoxicity, and lowered intelligence quotient (IQ). Malnourished children are more vulnerable to the toxicity of lead because they absorb more lead when other nutrients are deficient, especially calcium or iron.[xxiii] Adults exposed to lead can suffer from reproductive problems (in both men and women), high blood pressure, nerve disorders, cardiovascular problems, kidney damage, memory and concentration problems, and muscle and joint pain.[xxiv]

Exposure to Lead

Exposure to lead contamination varies depending on the sources of lead in the environment. For example, some pre-1978 constructed homes may contain lead-based paint, which poses a health risk if the paint dust is ingested or inhaled.[xxv] Regarding General Aviation airports, the California Department of Public Health's *Childhood Lead Poisoning Prevention Branch* has stated that the deposition of lead air pollutants from small aircraft operating on leaded Avgas can contaminate neighborhoods around the airports, creating soil and dust with lead levels that are unsafe for children.[xxvi] The lead emissions from Sacramento Executive Airport are discussed later in this document.

Once a person's exposure to lead stops, the amount of lead in the blood decreases slowly as it is released through urine, sweat, and feces. The lead stored in the bones can take decades to decrease. Human exposure to lead is assessed by measuring lead in the blood, but the lead in the blood only represents a portion of the total amount of lead in the body.[xxvii]

In 2010, the U.S. EPA took action to evaluate the impact of lead emissions and exposure from piston engine aircraft using leaded Avgas.[xxviii] Studies related to this action in 2011 and 2017 suggest that children living near (within 1,000 feet) an airport where planes use leaded Avgas have higher blood lead levels than other children.[xxix]

In 2021, a study commissioned by Santa Clara County to assess the risks of lead exposure to children living near the Reid-Hillview Airport in San Jose, California, compared blood lead levels of children based on their proximity to the airport, both upwind and downwind of the airport. Overall, the study found that leaded aviation fuel from airport operations contributed to significantly increased blood lead levels for children living within a half mile of Reid-Hillview Airport. Furthermore, the study showed that children living downwind of the airport had blood lead level increases comparable to the increases experienced by the children in Flint, Michigan, during the peak of the Flint Water Crisis.[xxx, xxxi] After the study was released, Santa Clara County implemented measures to prohibit the sale of leaded aviation gasoline at its two General Aviation airports and petitioned the U.S. EPA to take action to implement a nationwide ban of leaded Avgas.[xxxii] The results of Santa Clara County's early actions to eliminate the use of leaded Avgas at their airports are discussed later in this document.

Current Regulatory Actions and Responsible Agencies

A multitude of agencies have jurisdiction over various parts or processes at the Sacramento Executive Airport. The main agencies responsible for enacting regulations or that have some level of oversight and enforcement authority over airport operations are reviewed below (Figure 4).

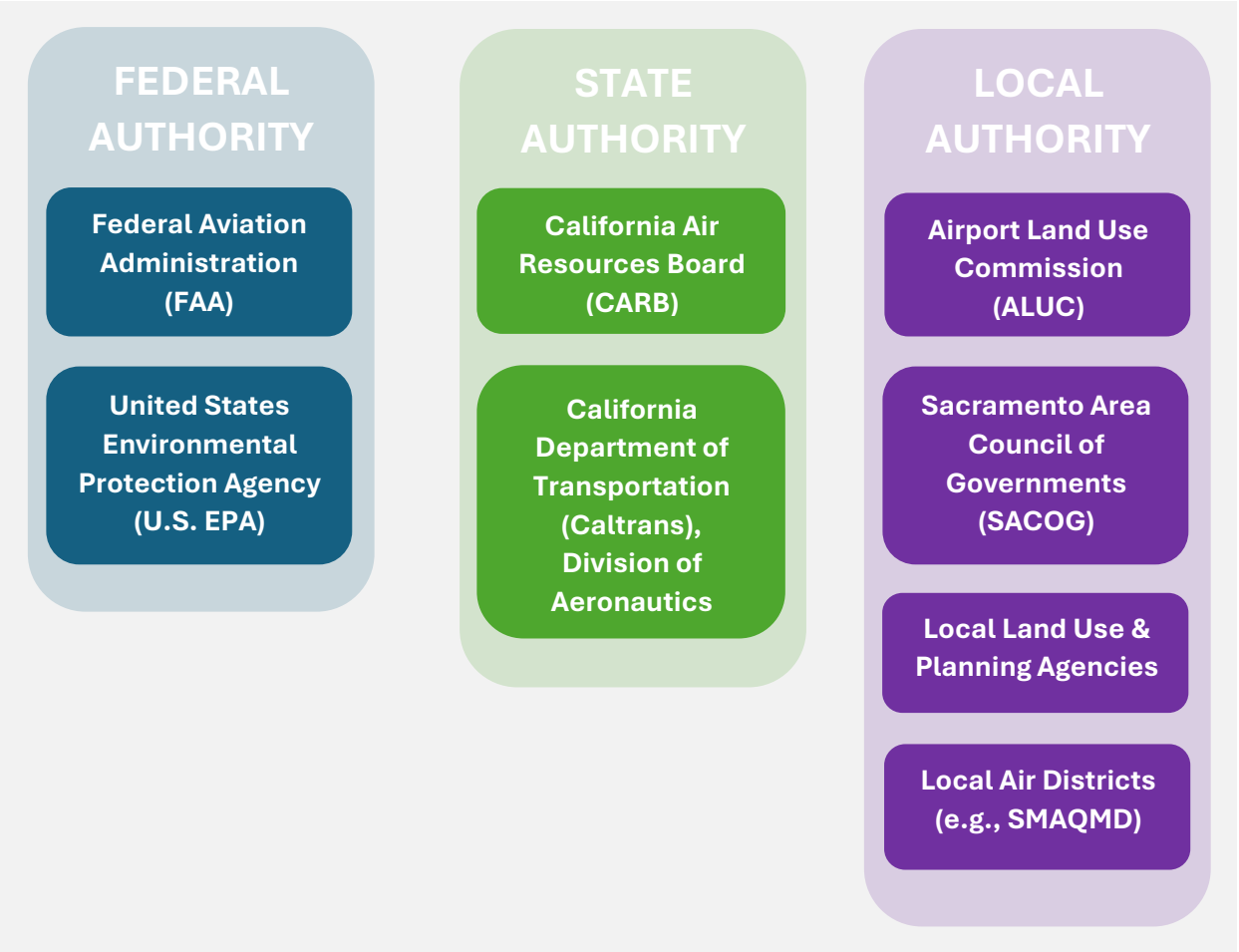


Figure 4. Summary of the main federal, state, and local government agencies that have some level of authority over General Aviation airports to enact regulations, issue permits, or provide review and oversight regarding airport operations.

Federal Agencies

U.S. Environmental Protection Agency (U.S. EPA)

In 1970, the federal Clean Air Act authorized the U.S. EPA to establish National Ambient Air Quality Standards (NAAQS) for the six criteria air pollutants: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead. The NAAQS were established to protect public health and welfare and to regulate emissions of hazardous air pollutants. Each state was required to develop a State Implementation Plan (SIP) to identify sources of pollutants and develop measures to achieve these standards.[xxxiii]

The first NAAQS for lead was established in 1978, which required the ambient lead concentrations to not exceed 1.5 micrograms per cubic meter (1.5 $\mu g/m^3$) measured as a maximum quarterly calendar average. In 2008, the NAAQS for lead was significantly lowered; the new lead standard was set to 0.15 $\mu g/m^3$ measured as a rolling 3-month average, which was tenfold lower than the original standard. The 2016 NAAQS revision maintained the 2008 standard for lead.[xxxiv]

Recognizing the negative health impacts and environmental contamination caused by lead, the U.S. EPA mandated the removal of lead from motor vehicle gasoline starting in 1973,[xxxv] and by 1996, all lead had been removed from automobile gasoline.[xxxvi] Federal regulations, primarily the removal of lead from gasoline, have resulted in a 99 percent decrease in airborne lead levels since 1980.[xxii, xxxvii] The remaining sources of lead air emissions include industrial sources, such as lead smelting and battery recycling operations, as well as small piston engine aircraft that operate on leaded Avgas.[xxxviii]

In October 2023, the U.S. EPA released its endangerment finding, concluding that lead emissions, specifically those from leaded fuel used in aircraft, pose a threat to public health and welfare.[xxxix] This endangerment finding does not establish new control measures for aircraft lead emissions, nor does it ban or restrict the use, sale, or distribution of leaded Avgas. Instead, this action requires the U.S. EPA and the FAA to take regulatory steps to reduce emissions from leaded aviation fuel.[xxii] To date, the U.S. EPA has not implemented any specific measures to restrict or ban the use of leaded Avgas.

Federal Aviation Administration (FAA)

The FAA was created under the Federal Aviation Act of 1958. FAA's regulatory role within the U.S. Department of Transportation is to oversee and regulate all aspects of civil aviation in the United States, ensuring safety and efficiency in air travel. This includes setting standards for aircraft manufacturing, operation, and maintenance, as well as certifying airmen and airports. The FAA also manages air traffic control and navigation systems, researches and develops new aviation technologies, and addresses environmental concerns related to aviation. [xl, xli]

The U.S. EPA's 2023 endangerment finding related to lead emissions from piston engine aircraft requires the FAA to regulate fuel composition and initiate regulatory steps to control or eliminate aviation lead emissions. On May 16, 2024, the FAA Reauthorization Act of 2024 was signed into federal law. This Reauthorization provides funding and policy direction for the FAA through Fiscal Year 2028.[xlii] Under the grant assurances section of the Reauthorization, it states that an airport owner or operator may not restrict or prohibit the sale or self-fueling of any 100LL Avgas until December 31, 2030, or when an FAA-certified 100-octane unleaded alternative is commercially available for almost all piston engine aircraft and engine models.[xliii] Airports in Alaska had an extended deadline of December 31, 2032, due to Alaska's reliance on piston engine aircraft.[xliv] Although the FAA Reauthorization Act of 2024 ensures the continued availability of 100LL Avgas for piston engine aircraft to the end of 2030, it also implies that leaded Avgas will no longer be available at airports in 2031.

The FAA has committed to transitioning to unleaded Avgas without adversely affecting the safe and efficient operation of more than 220,000 General Aviation aircraft nationwide. The FAA encourages the early adoption of alternate unleaded fuels and the management of lead emissions by increasing the distance between piston engine run-up locations and communities. As stipulated in the Reauthorization, the FAA emphasized the importance of aviation safety and that 100-octane low-lead (100LL) fuel must continue to be available for piston engine aircraft that require its use based on the aircraft's safety certification.[xlv] As mentioned earlier, the current and historic use of tetra-ethyl lead in Avgas is for the operational safety of the aircraft, because the lead additive is needed to maintain the octane levels necessary for the fuel to resist detonation. Use of a lower octane fuel than required by the aircraft's safety certification could result in engine failure.[lvi]

The FAA and partners in the General Aviation community, including the petroleum industry, launched the *Eliminate Aviation Gasoline Lead Emissions* (EAGLE) initiative in 2022. As its name suggests, the goal of this government-industry initiative is to eliminate leaded Avgas used in piston engine aircraft by the end of 2030 without compromising the safety or economic health of the General Aviation industry.[xlvi] Figure 5 illustrates the four pillars of EAGLE's path to a lead-free aviation system.[xlvii]

Figure 5. The Four Pillars of EAGLE's Path to a Lead-free Aviation System [xlvii]

FAA Authorization Pathways

There are two pathways for aircraft owners and operators to obtain FAA authorization to use a new unleaded fuel in an existing aircraft that has its FAA safety certification based on the aircraft operating on leaded Avgas. The first is the FAA Fleet Authorization process established by Congress, in conjunction with the Piston Aviation Fuels Initiative (PAFI). The second is the traditional FAA aircraft type certification (TC)/supplemental type certification (STC) process.[xlvii]

Fleet Authorization Process

For the Fleet Authorization process, after the new unleaded Avgas completes the PAFI testing and evaluation and its American Society for Testing and Materials (ASTM) production specification has been published, the new fuel is then qualified as a replacement fuel and the FAA would issue a Special Airworthiness Information Bulletin (SAIB) to identify the qualified new fuel, specify the aircraft and engines eligible to use the qualified new fuel, and provide references and other information to accomplish the alteration necessary to enable the use of the new fuel. The person performing the alteration is responsible for verifying the eligibility of the aircraft and its engine for operation with the qualified new fuel and for installing the new fuel placards, including the Approved Flight Manual Supplement on the aircraft, and making associated logbook entries for the aircraft and its engine in accordance with the SAIB and applicable regulations.

Typically, the fuel developer is the applicant seeking FAA approval through the Fleet Authorization process to modify an aircraft from its original type certificate (TC), which includes the fuel used by the aircraft engine. Once the new fuel has been qualified as a replacement fuel through the Fleet

Authorization process, there is no charge to the aircraft owners and operators to implement the modification on an aircraft with a standard Airworthiness Certificate.

Type Certification (TC) / Supplemental Type Certification (STC) Process

The TC/STC approval process is limited to individual aircraft and engine types or for a broad range of applicable types of aircraft and engines by an Approved Model List (AML), AML STC.[xlviii] Typically, the fuel producer is the applicant seeking STC approval from the FAA to modify an aircraft from its original type design or TC, which includes the fuel used by the aircraft engine. Aircraft owners and operators can purchase an STC from the STC holder or authorized dealer, thereby acquiring the right to install/use an existing, approved modification for their specific aircraft frame and engine.[xlix] An STC for operating the aircraft with a new unleaded fuel would include an Approved Flight Manual Supplement and placards that must be installed around the fuel filler ports on the aircraft, as well as one on each engine. As a pricing example, General Aviation Modifications Inc. (GAMI), the producer of G100UL unleaded Avgas, sets its STC pricing based on engines and horsepower, in a manner that is similar to pricing for other fuel STCs that have been available for low octane Avgases.[l]

Status of Unleaded Avgas Options with Respect to the FAA Authorization Pathway

G100UL

In September 2022, a 100-octane unleaded Avgas produced by GAMI (G100UL) received its AML STC approval for use with every spark ignition piston engine and every airframe using a spark ignition piston engine in the FAA's Type Certificate database.[l] However, G100UL is currently available at only two airports in California: Watsonville Municipal Airport in Watsonville and Reid-Hillview Airport in San Jose.[li] GAMI estimates that the G100UL Avgas could cost $0.70 to $1.05 more per gallon than 100LL Avgas until G100UL becomes more widely available.[lii] As mentioned earlier, aircraft owners must obtain an STC to be able to use G100UL unleaded Avgas in their aircraft.

UL94

In 2023, the FAA approved the use of a lower octane (94-octane) unleaded Avgas produced by Swift Fuels (UL94) that is commercially available for specific aircraft (based on airframe and engine type), but certified aircraft owners must obtain an STC to be able to use UL94 unleaded Avgas in their aircraft.[liii] Currently, UL94 unleaded Avgas is only available at approximately 35 airports nationwide.[xxii]

100R

Swift Fuels has indicated that it may merge its STC efforts for its 100-octane unleaded Avgas (100R) with the PAFI Fleet Authorization process to accelerate FAA approvals or expand its deployment efforts.[liv] As of December 2024, the 100R unleaded Avgas is only available for two types of aircraft according to its STC approval, and aircraft owners must obtain an STC to be able to use 100R unleaded Avgas in the two qualifying aircraft types. Swift Fuels expects the 100R to have its ASTM International production specification ratified and full commercial transition to 100R to occur during the second half of 2025. However, to date, no additional updates have been posted on the Swift Fuels news website in 2025.[lv]

UL 100E

The FAA is currently working with the LyondellBasell/VP racing team to test and evaluate its high octane unleaded fuel (UL 100E). The FAA expects to issue a Fleet Authorization for the UL 100E unleaded Avgas after it successfully completes the PAFI testing.[xlvii]

Mixing or Commingling Fuels

To date, the most available Avgas in the United States is the 100-octane low-lead Avgas (100LL). This grade of Avgas satisfies the requirements of all piston engines using Avgas, regardless of their performance level, because the higher octane rating means the fuel is more resistant to detonation. According to the FAA, it is generally safe to operate piston engines on a higher octane fuel than required by the aircraft engine's minimum octane level, but it is not safe to use a lower than required octane fuel.[lvi]

The mixing of fuels, or commonly referred to as commingling fuels in aviation terms, is allowed for leaded Avgas fuels as long as the leaded fuel meets the engine's minimum octane level and the aircraft's safety certification requirements. However, the FAA approvals for the new unleaded Avgas options will only allow commingling with 100LL Avgas, and not commingling with unleaded Avgas options produced by a different company. For example, G100UL unleaded Avgas cannot be mixed with 100R unleaded Avgas.[lvii, l]

These factors of fuel availability and commingling options will be challenges to consider for converting to unleaded Avgas.

State Agencies

California Legislative Actions

On September 22, 2024, California Governor Gavin Newsom signed Senate Bill 1193, which bans the sale and distribution of leaded aviation gasoline (Avgas) throughout the state, beginning on January 1, 2031. Senate Bill 1193 was added to existing law under the State Aeronautics Act (also known as the California Public Utilities Code, Section 21001 et seq.), which governs aviation-related matters in the state, and authorizes the California Department of Transportation (Caltrans) to adopt, administer, and enforce rules and regulations for the administration of the State Aeronautics Act.[lviii]

Senate Bill 1193, authored by Senator Caroline Menjivar, aligns California state law with the U.S. EPA's 2023 endangerment finding that lead emissions from aircraft operating on leaded fuel threaten public health and welfare under the federal Clean Air Act. Senate Bill 1193 makes California the first state in the nation to eliminate the sale of leaded Avgas to protect children and other vulnerable members of the population from the harmful effects of lead emissions from aircraft operating on leaded Avgas.[lix]

However, Senate Bill 1193 does not apply to airport operators subject to a federal grant assurance in effect on or before December 31, 2030, until the federal grant assurance expires.[lviii] Federal grant assurances for airports are a set of legally binding obligations that airport owners and operators must adhere to when they receive federal funding for airport development and improvement projects. These assurances ensure that airports are operated and maintained safely, efficiently, and in accordance with federal regulations. They cover various aspects, including airport safety,

operations, finances, land use, and aircraft fuel types and fuel availability. The duration, or expiration date, of these obligations depends on the conditions stipulated in the assurances.[lx]

California Department of Transportation (Caltrans), Division of Aeronautics

The Caltrans Division of Aeronautics is responsible for airport and heliport permitting and inspection, as well as other aviation-related matters within the State of California. It is illegal to operate an airport in the State of California without a State Airport Permit or a qualifying permit exemption pursuant to the California Public Utilities Code section 21661 and the California Code of Regulations section 3533.[lxi]

The Caltrans Division of Aeronautics is also responsible for publishing the California Airport Land Use Planning Handbook, which establishes statewide guidelines for airport land use compatible planning based on the State Aeronautics Act. The law requires each county's Airport Land Use Commission (ALUC) to prepare an Airport Land Use Compatibility Plan (ALUCP) with a 20-year planning horizon that should be updated every 5-10 years to ensure consistency with General Plans, Specific Plans, etc. The primary focus of an ALUCP is on broadly defined noise and safety impacts. ALUCs also make compatibility determinations for compliance of all proposed development around an airport. A local government body, meaning the land use jurisdiction such as a city or county, may override an ALUC compatibility determination for any proposed incompatible land use by a two-thirds majority vote; however, the local agency must notify the Caltrans Division of Aeronautics and the ALUC of this intent 45 days prior to approving the override. Caltrans would then respond within 30 days to the local agency's comments regarding the override. [lxii]

As mentioned above, Caltrans also adopts, administers, and enforces rules and regulations for the administration of the State Aeronautics Act. Therefore, Caltrans will be one of the agencies enforcing Senate Bill 1193's ban on leaded Avgas sales and distribution, effective January 1, 2031.

California Air Resources Board (CARB)

CARB's regulatory role within the California Environmental Protection Agency is to oversee and regulate all air pollution control efforts in California and to attain and maintain health-based air quality standards. CARB coordinates its efforts with the U.S. EPA and the 35 local air pollution control districts/air quality management districts in California. CARB is also the lead agency in California for climate change programs.[lxiii]

The original California Ambient Air Quality Standards (CAAQS) were established in 1962 by the California Department of Public Health (CDPH), and later adopted by CARB in 1969, two years after the legislature created CARB.[lxiv] In addition to the six national criteria air pollutants (ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead), the current CAAQS also include visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride.[lxv] The CAAQS predate the NAAQS established by the U.S. EPA in 1970. Although California law mandates the CAAQS, attainment of the NAAQS has precedence over attainment of the CAAQS due to federal penalties for failure to meet the U.S. EPA attainment deadlines. Unlike the NAAQS, the CAAQS do not have specific deadlines; state law only requires incremental progress toward attainment of the CAAQS.[lxiv] The CAAQS for lead was established in 1970 as a 30-day average where lead concentrations cannot exceed 1.5 $\mu g/m^3$.[lxvi]

Regarding airports, CARB's regulatory authority is limited to controlling criteria air pollutants from mobile sources to achieve air quality standards. Airport-related emissions come from several sources, including traffic emissions, ground support equipment, and aircraft activity (Figure 6). However, the majority of airport-related emissions occur during the aircraft landing and take-off cycles, with the Commercial aircraft sector generating the largest percentage of those emissions. Therefore, to achieve emission reductions from the Commercial aircraft sector, CARB has been attempting to leverage its partnerships with airports, airlines, aircraft engine manufacturers, community and airport workers, local air districts, the U.S. EPA, the FAA, and the International Civil Aviation Organization.[lxvii] Although the General Aviation sector generates fewer emissions, compared to the Commercial aircraft sector, CARB has no authority over General Aviation aircraft or the Avgas fuel types they are required to use based on their safety certification.

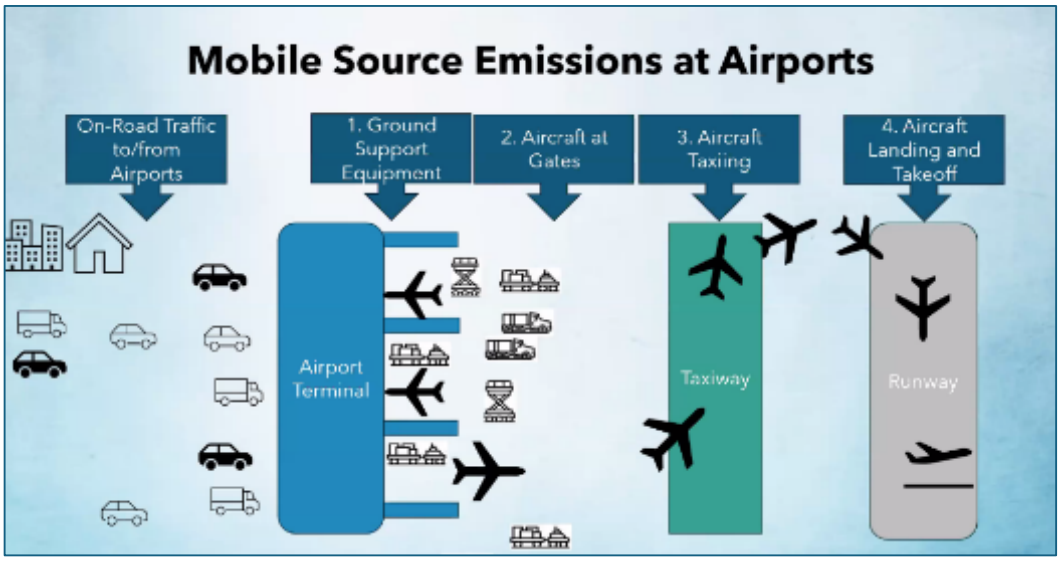


Figure 6. Mobile Source Emissions at Airports [lxvii]

Local Governments

Airport Land Use Commission

The Sacramento Area Council of Governments (SACOG) Board of Directors serves as the Airport Land Use Commission (ALUC) for Sacramento, Sutter, Yolo, and Yuba counties. SACOG has 28 member cities and counties and is designated by the federal government as the Metropolitan Planning Organization (MPO) that oversees the regional transportation plan for the Sacramento region.

The State Aeronautics Act establishes the role and responsibilities of ALUCs in land use planning, ensuring that proposed land uses in areas surrounding public-use airports (usually within a two-mile radius) are compatible with continued airport operations. ALUCs encourage the adoption of land use measures that minimize exposure to excessive noise and safety hazards within areas around public-use airports to the extent that these areas are not already devoted to (built out with) incompatible land uses.[lxii] As the County of Sacramento's ALUC, SACOG is required to develop and adopt an Airport Land Use Compatibility Plan (ALUCP) for each public-use airport within its jurisdiction. The ALUCP includes land use policies focused on four compatibility factors: safety, noise, airspace, and

overflight.[lxviii] The ALUCP for Sacramento Executive Airport was adopted in May 1998 and amended in May 1999.[lxix]

Land Use Jurisdiction

The Sacramento Executive Airport is located within the City of Sacramento. Therefore, the City's general plan, specific plans, and zoning around the airport must align with the ALUCP developed by SACOG for this airport. As mentioned above, the ALUCP for Sacramento Executive Airport was adopted in 1998; by then, the area surrounding the airport had been built out, and incompatible land uses already existed.

Air Quality Management District

The Sacramento Metropolitan Air Quality Management District (SMAQMD) is one of the 35 local air districts in California. SMAQMD is responsible for monitoring air quality, regulating air pollution emissions from businesses and stationary facilities, and developing and administering programs to reduce air pollution levels below the health-based standards set by the state and federal governments. When necessary, SMAQMD also develops and adopts local rules to further reduce air pollutants from specific source or equipment categories.

Within SMAQMD's permitting authority of stationary sources, SMAQMD can regulate gasoline storage tanks for motor vehicles and aviation gasoline (Avgas) storage tanks for aircraft. However, SMAQMD cannot regulate the volume of Avgas or the fueling process into an aircraft. Additionally, SMAQMD cannot regulate diesel or jet fuel storage tanks, nor can it regulate emissions from any aircraft or mobile equipment at an airport, such as mobile refueling trucks. Although the diesel and jet fuel storage tanks are exempt from SMAQMD's permitting requirements (SMAQMD Rule 201, Section 117.3) due to the low vapor pressure of the fuels, they are regulated and permitted by the local Certified Unified Program Agency, which is the County of Sacramento's Environmental Management Department. As mentioned earlier, motor vehicle gasoline, diesel fuel, and jet fuel do not contain lead; only the leaded Avgas contains lead.

SMAQMD is currently processing two Avgas-related permit applications at the Sacramento Executive Airport: one bulk fueling plant used for 100LL Avgas and one above-ground storage tank used for 100LL Avgas. The bulk fueling plant will use mobile refuelers to transport and pump the 100LL Avgas into the aircraft. The above-ground storage tank will be used for direct-fueling into the aircraft. Because combustion does not occur within a fuel storage tank, there are negligible emissions of tetra-ethyl lead from the vapor emissions associated with the Avgas being added or removed from the tank.

In regard to ambient air quality standards for lead, SMAQMD has been designated as achieving "attainment" for national and state lead standards. The NAAQS and the CAAQS for lead are shown in Table 2.

Table 2. National and California Ambient Air Quality Standards for Lead [lxx]

	30-day Average	Rolling 3-month Average
National Ambient Air Quality Standard	None	0.15 µg/m^3
California Ambient Air Quality Standard	1.5 µg/m^3	None

Early Action at Other Airports

Prior to or soon after the U.S. EPA's October 2023 endangerment finding, the FAA Reauthorization Act of 2024, or the California Senate Bill 1193 being signed into law in September 2024, some airport operators and communities took early actions to reduce or eliminate the use of leaded Avgas.

However, it is important to note that the U.S. EPA's endangerment finding does not establish new control measures for aircraft lead emissions, nor does it ban or restrict the use, sale, or distribution of leaded Avgas. To date, the U.S. EPA has not implemented any specific measures to restrict or ban the use of leaded Avgas.

Although the FAA Reauthorization Act of 2024 does not specifically ban the sale or use of leaded Avgas in 2031, it is implied that leaded Avgas will no longer be available at airports in 2031 since the Reauthorization only protects the availability of 100LL Avgas for piston engine aircraft until the end of 2030. The Reauthorization aligns with EAGLE's target deadline. During the transition to unleaded Avgas options, the FAA emphasized the importance of aviation safety, particularly that the higher octane option of leaded Avgas (100LL) must continue to be available for aircraft that require this fuel due to the aircraft's safety certification requirements.

It is also important to note that California Senate Bill 1193, which bans the sale and distribution of leaded Avgas throughout the state, beginning on January 1, 2031, is the first law in the nation (but only applicable to California) to set a specific date to eliminate the sale and distribution of leaded Avgas. The bill includes a caveat which states that an airport subject to federal grant assurances in effect on or before December 31, 2030, is not subject to this law until the federal grant assurances expire. The bill includes more direct language regarding the elimination of leaded Avgas compared to what is written in the FAA Reauthorization Act of 2024.

The early actions to reduce or eliminate the use of leaded Avgas at certain airports, along with their related court actions (if applicable), and the current status of Avgas options are discussed below.

Reid-Hillview Airport and San Martin Airport in Santa Clara County, California

Santa Clara County in California prohibited the sale of 100LL Avgas starting on January 1, 2022, at its two General Aviation airports: Reid-Hillview Airport and San Martin Airport. This early action to eliminate leaded Avgas resulted in the Aircraft Owners and Pilots Association (AOPA), local pilots, and aviation businesses filing a formal complaint with the FAA in October 2022 because aircraft users at these airports were unable to access 100LL for retail purchase or self-fueling. The formal complaint prompted the FAA to investigate multiple potential violations of grant assurances by Santa Clara County.[lxxi] On March 24, 2025, the FAA made an initial determination stating that the ban

on 100LL Avgas at these airports violated federal grant assurances, and the FAA mandated Santa Clara County to take the following three corrective actions.[lxxii]

1. Eliminate the restrictions on the purchase, sale, storage, distribution, and use of any FAA-authorized aviation fuel, including 100LL Avgas.
2. Eliminate the prohibition on self-fueling with 100LL Avgas by commercial aeronautical service providers.
3. Eliminate the County rules created to favor aircraft that can safely use unleaded Avgas over those that cannot.

Santa Clara County has 30 days to present a corrective action plan to the FAA or file an appeal. This case demonstrated that the FAA will not allow airports to completely ban leaded Avgas before high octane unleaded Avgas alternatives are commercially available for airport users, especially since the majority of General Aviation aircraft still require the use of 100LL Avgas based on the aircraft's safety certification.

To date, the Reid-Hillview Airport's surface map pilot handout from the airport's website still indicates that 100LL Avgas is not available at Reid-Hillview Airport or San Martin Airport.[lxxiii]

Livermore Municipal Airport in Alameda County, California

In July 2024, Livermore Municipal Airport introduced an unleaded Avgas option, the 94-octane unleaded Avgas produced by Swift Fuels (UL94), at their airport. UL94 is available for specific aircraft based on airframe and engine type, but aircraft owners must obtain an STC to be able to use UL94 in their individual aircraft. UL94 can only be used in approximately 67% of all piston engine aircraft because many older aircraft require a higher octane fuel to operate safely.

The airport was able to make the unleaded Avgas option available 18 months ahead of their original schedule with the support of their City Council through amendments to their municipal code, utilizing and updating a spare 1000-gallon tank, and working closely with their local air district, the Bay Area Air Quality Management District (BAAQMD), to re-permit the spare tank for storage of UL94.

In 2024, the Cities of Dublin, Livermore, and Pleasanton sent several letters to the BAAQMD requesting that their local air district develop a grant program incentivizing the acquisition of STCs for aircraft owners in their region. The cities emphasized that a grant program to obtain STCs for pilots could achieve significant benefits by accelerating the transition of the General Aviation fleet to unleaded fuels, which would further BAAQMD's goals of ensuring cleaner air and healthier communities.[lxxiv]

Although UL94 is available for certain aircraft, 100LL Avgas will continue to be readily available at Livermore Municipal Airport for all piston engine aircraft, in accordance with the airport's federal grant assurances.

Santa Monica Municipal Airport in Los Angeles County, California

In December 2024, the Santa Monica Municipal Airport, a city-owned and operated General Aviation airport, became the first airport in the nation to offer Swift Fuels' 100-octane unleaded Avgas (100R). The availability of 100R expanded the unleaded Avgas options for its airport users beyond the existing lower octane (UL94) unleaded Avgas, which has been available at the airport since March 2022,

when the airport was also the first in its region to offer unleaded Avgas. In addition to the two unleaded Avgas options, the airport will continue to make 100LL available to its users.

The City of Santa Monica is incentivizing the transition of approved aircraft to use 100R, similar to the incentives the city offered to its airport tenants when UL94 was introduced.[lxxv]

Also worth noting is the FAA's correspondence with the city in September 2022, when the FAA was made aware of the Airport Commission's June 27, 2022, motion to their City Council recommending that the city eliminate and prohibit the sale or storage of leaded fuel in all city-owned equipment. FAA warned that an outright ban or restriction on 100LL at a federally obligated airport would violate the airport's federal grant assurances, as well as the city's settlement agreement with the FAA regarding the airport closure. Therefore, the city cannot ban leaded Avgas at its airport.[lxxvi]

In January 2017, the city reached a settlement agreement with the FAA after decades of litigation aimed at closing the airport. The Santa Monica Municipal Airport is scheduled to close on December 31, 2028.[lxxvii] The city will convert the 227 acres of airport land into a large public use park.[lxxviii]

Centennial Airport in Arapahoe County, Colorado

Centennial Airport, one of the nation's busiest General Aviation airports, is owned and operated by the Arapahoe County Public Airport Authority.[lxxix] When the airport began offering UL94 unleaded Avgas in May 2023, it simultaneously launched two new programs to incentivize its piston engine aircraft customers to transition to unleaded fuel.

The first is a *UL94 STC Reimbursement Program*, which allowed flight schools and airport-based aircraft owners to be reimbursed up to $110 per aircraft[lxxx] to offset the cost of the STC required by the FAA to use UL94 unleaded Avgas. The second is a *fuel subsidy program* that subsidizes the difference in final cost between the existing 100LL leaded Avgas and the more expensive UL94 unleaded Avgas. The airport intends to continue this *fuel subsidy program* for the foreseeable future.

To date, the airport has independently invested over $300,000 in both incentive programs, which include reimbursements for over 100 STC applications.[lxxxi] To further support the airport's unleaded Avgas *fuel subsidy program*, the State of Colorado's Aeronautical Board approved two discretionary grants in 2024 and 2025, in the amounts of $300,000 and $350,000, respectively.[lxxxii]

Sacramento Executive Airport Air Quality Information

As previously mentioned, several factors influence emissions from airports, with the greatest source of emissions resulting from taxiing, takeoffs, and landings of aircraft. This section will review factors that influence air quality and pollution exposure from the Sacramento Executive Airport and specifically examine the estimated lead emissions originating from the airport.

Flight Path Information and Air Quality Considerations

Runway usage influences the flight path of an aircraft, which can, in turn, impact local air quality in communities near the airport. Sacramento Executive Airport has three runways (Figure 7). **Runway 02/20** is used 81% of the time because it is the longest and runs along the most common wind

directions. **Runway 12/30** is used 19% of the time when wind direction dictates. **Runway 16/34** is used infrequently.

Meteorological conditions, particularly wind speed and direction, play a critical role in evaluating the air quality impacts of a pollution source because they determine how emissions are transported and dispersed. Generally, the winds tend to originate from the southwest. Appendix A includes the average wind speed and direction from the Sacramento Executive Airport for ten years, from January 2015 to December 2024.

However, a particularly critical factor is the atmospheric "mixing height." The mixing height refers to the elevation above ground level above which air pollution no longer readily mixes with ground-level air and does not substantially impact ground-level air pollution levels. Together, meteorological conditions play a key role in determining air pollution impacts. Appendix B includes examples of common flight paths during landing and takeoff operations (LTO) from the most used runway and altitudes below the mixing height for Sacramento Executive Airport.

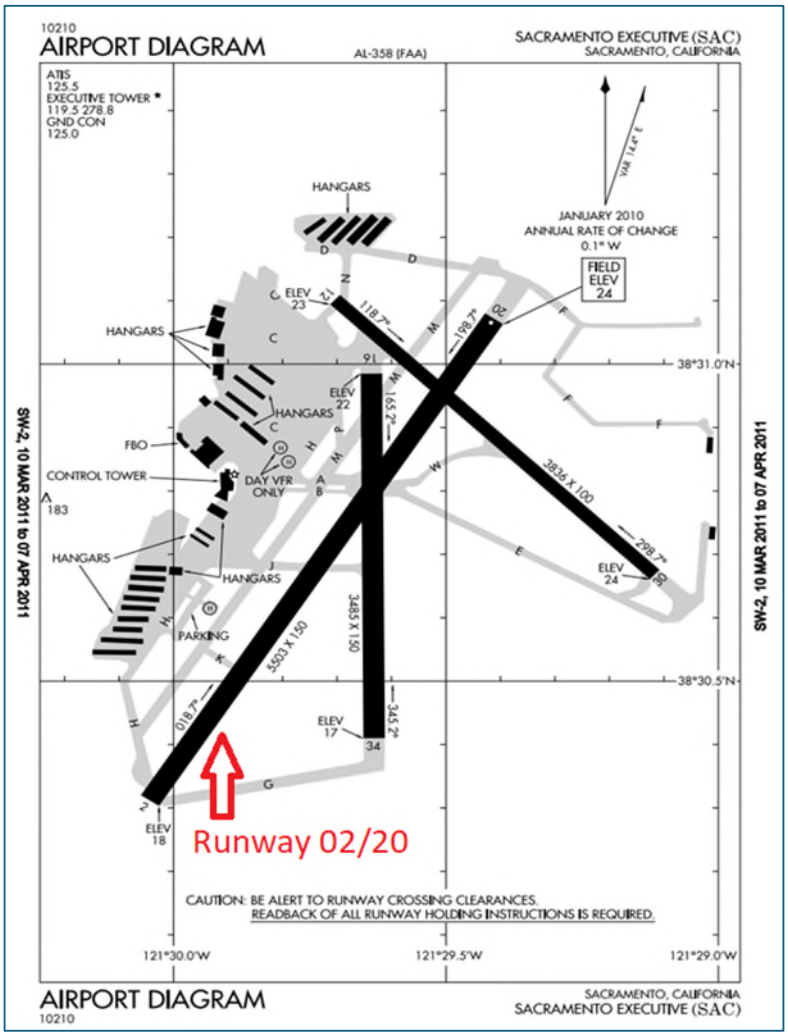


Figure 7. Sacramento Executive Airport Diagram showing its three runways and the most commonly used runway (Runway 02/20).[lxxxiii]

Lead Emissions at Sacramento Executive Airport

Because Sacramento Executive Airport's operations are primarily General Aviation, most aircraft that use the airport are piston engine airplanes, which use leaded Avgas fuel and can be a localized source of lead emissions, particularly during operations near the ground. A report from the National Academies of Sciences, Engineering, and Medicine found that most lead emissions occur during LTOs.[lxxxiv] CARB developed a statewide model to estimate emissions at airports in California, referred to as the 2024 California Aircraft Emissions Inventory (CAI2024). The model estimated emissions based on fleet activity, the annual average mixing height of 4,375 feet used in the CAI2024 model for Sacramento Executive Airport, and fuel usage during the following LTO activities: startup, takeoff, climb-out to cruising altitude, approach, taxi-in, taxi-out, and engine idling. [lxxxv]

In 2024, Sacramento Executive Airport recorded a total number of flight operations to be over 100,000 and leaded Avgas fuel usage to exceed 200,000 gallons. Using the amount of lead found in a gallon of Avgas and multiplying by the gallons of fuel used, lead emissions from the Sacramento Executive Airport are estimated to be 0.50 tons/year (Table 3).

Table 3. Activity data used to determine the annual lead emissions released from flight operations at Sacramento Executive Airport

Flight Operations (in Calendar Year 2024)	**Fuel Usage** (gallons of leaded Avgas used in 2024)	**Emission Factor** [lxxxvi] (grams of lead/gallon of fuel)	**Estimated Annual Lead Emissions *** (tons/year)
103,157	213,181	2.12	0.50

* Based on 213,181 gal x 2.12 g/gal x (1 lb/453.6 g) x (1 ton/2000 lb) = 0.50 tons/year

For reference, the activity levels of Reid-Hillview Airport, a primarily General Aviation airport similar in activity levels to Sacramento Executive Airport and Van Nuys Airport, the busiest General Aviation airport in the nation, are included in Appendix A (Table 6, Table 7, and Table 8). Using the estimates from the CAI2024 model, lead emissions from the three airports are summarized in Table 4, which indicates that lead emission levels from Sacramento Executive Airport are lower than those from the other two airports.

Table 4. CAI2024 Lead emission from Van Nuys, Reid-Hillview, and Sacramento Executive Airports

Year	Airport	Total Annual Fuel Usage (Gallons/Year)	Annual Lead Emissions (Tons/Year)
2024	Van Nuys	568,176	1.33
2024	Reid-Hillview	308,041	0.72
2024	**Sacramento Executive**	**213,181**	**0.50**

Ambient Lead Monitoring and Results in Sacramento County

National Ambient Air Quality Standard (NAAQS) for Lead

As mentioned earlier, the U.S. EPA has set the NAAQS for lead at 0.15 micrograms per cubic meter ($\mu g/m^3$). This standard is designed to protect public health, particularly for sensitive populations such as children, pregnant women, and the elderly.

Multiple efforts have been conducted in Sacramento County to monitor ambient air for lead concentrations. These efforts aimed to determine whether lead levels in the air remain below the federal health-based standard.

SMAQMD Regional Air Monitoring

The SMAQMD monitored lead levels in the air at the Del Paso Manor station in the Arden-Arcade area from April 2012 to January 2020 to help ensure our region meets federal lead health standards. This effort was part of the SMAQMD's broader work to protect air quality and public health. In 2020, with approval from the U.S. EPA, one of two lead monitors at this location was safely discontinued. The decision was based on years of data showing lead levels were consistently well below federal limits and met all EPA requirements for ending lead monitoring. The second monitor at the Del Paso Manor site began collecting lead data in 2000 and continues to operate today, providing valuable and informative insights on ambient lead levels. However, the data from this monitor is not intended for comparison to the NAAQS. See Table 5 for lead data from both monitors.

Overview of Monitoring Efforts near Sacramento Executive Airport

Community Air Protection Program – Air Monitoring

In 2017, Assembly Bill 617 was passed, which introduced community-led efforts to monitor and reduce air pollution in identified communities. The state selected the South Sacramento-Florin community to develop a Community Air Monitoring Plan (CAMP). The CAMP was developed with elements that were a response to concerns about understanding lead emissions from activities at the Sacramento Executive Airport within the community boundaries. The community monitored for lead using two different monitoring equipment: one method sampled lead as a fraction of PM2.5 starting in August 2020, and the other sampled lead as a fraction of PM10 starting in July 2021. The PM2.5-based monitoring continued through November 2021, while the PM10-based monitoring extended through December 2021. Additionally, PM10-based lead monitoring was conducted at Fern Bacon Middle School from April 2023 through March 2025.

In June 2025, the program's Steering Committee elected to relocate the portable monitoring laboratory from Fern Bacon Middle School to a new location near the Sacramento Executive Airport. The portable monitoring laboratory is expected to be located at the new site near Sacramento Executive Airport for at least six months to one year. Information collected will be publicly available and posted on the SMAQMD's website.

United Latinos – Air Monitoring Study

A local non-profit organization, United Latinos, also expressed concerns regarding potential lead emissions from the Sacramento Executive Airport. The organization, in collaboration with the

Mangan Neighborhood Association, conducted independent air monitoring to collect lead samples during the months of January 2022 and June 2022.

Lead Emission Data Interpretation

The lead monitoring data collected through various efforts are shown in Table 5 below, along with a map (Figure 8) illustrating the proximity of each monitoring site to the Sacramento Executive Airport. This map provides helpful context for understanding any differences in lead levels based on location.

When reviewing the emission data from these various monitoring efforts, two key points are essential to understand. First, these monitoring efforts were conducted over different time periods. Second, a variety of monitoring tools and methods were used across the different air monitoring efforts. Essentially, there is temporal, spatial, and monitoring equipment variation in data collection that should be taken into account.

It is also important to note that because of strict U.S. EPA guidelines on the type of monitoring equipment and sampling schedules required for regulatory comparisons, only the lead data collected by the SMAQMD's regional air monitoring station at Del Paso Manor from April 2012 to January 2020 can be directly compared to the federal health-based standard of 0.15 micrograms per cubic meter (µg/m^3).

However, data from the active Del Paso Manor monitor, the Community Air Protection Program monitoring efforts, and the United Latinos-led monitoring project are still valuable and informative. While they cannot be directly compared to the federal standard due to differences in equipment and methods, they provide important insight into air quality conditions in the community and support a fuller understanding of ambient lead exposure. Across all three monitoring efforts, lead levels were consistently well below the federal health standard of 0.15 µg/m^3, between 3 to 10 times lower than the standard.

Table 5. Air Monitoring Results for Lead

Monitoring Location	Date	Maximum (µg/m^3)	Average (µg/m^3)
SMAQMD Regional Air Monitoring			
Del Paso Manor[lxxxvii]	April 2012 – January 2020*	0.045	0.0016
Del Paso Manor[lxxxvii]	February 2000 – December 2024	0.055	0.0024
Community Air Protection Program Air Monitoring (As a fraction of PM2.5 or PM10)			
Sacramento Fire Station Number 56	Aug 2020 – Nov 2021 (PM2.5)	0.0126	0.0027
	July 2021 – Dec 2021(PM10)	0.0078	0.0026
City of Sacramento Sump 50	Aug 2020 – Nov 2021(PM2.5)	0.0102	0.0021
	July 2021 – Dec 2021(PM10)	0.0072	0.0013
Florin Elementary School	Aug 2020 – Nov 2021(PM2.5)	0.0132	0.0025
	July 2021 – Dec 2021(PM10)	0.0036	0.0011
Veterans of Foreign Wars Post 1267	Aug 2020 – Nov 2021(PM2.5)	0.0118	0.0030
	July 2021 – Dec 2021(PM10)	0.0036	0.0015
Cosumnes River College	Sept 2020 – Nov 2021(PM2.5)	0.0127	0.0025
	July 2021 – December 2021(PM10)	0.0046	0.0012

Impact Community Church	August 2020 – November 2021(PM2.5)	0.0144	0.0025
	July 2021 – December 2021(PM10)	0.0046	0.0014
Fern Bacon Middle School	April 2023 – March 2025 (PM10)	0.0075	0.00053
United Latinos Air Monitoring Study			
St Rose Church**	January 2022 and June 2022	0.0076	0.00527
Mangan Park	June 2022	0.0072	0.00695

* Lead monitoring at the Del Paso Manor station was discontinued in 2020 with the EPA's approval, having satisfied EPA's criteria for discontinuation, including consistently measured concentrations well below the federal standard[lxxxviii].
**United Latinos also conducted monitoring at St Rose Church in October 2021, but concentrations were below the level of detection, and no data were reported.

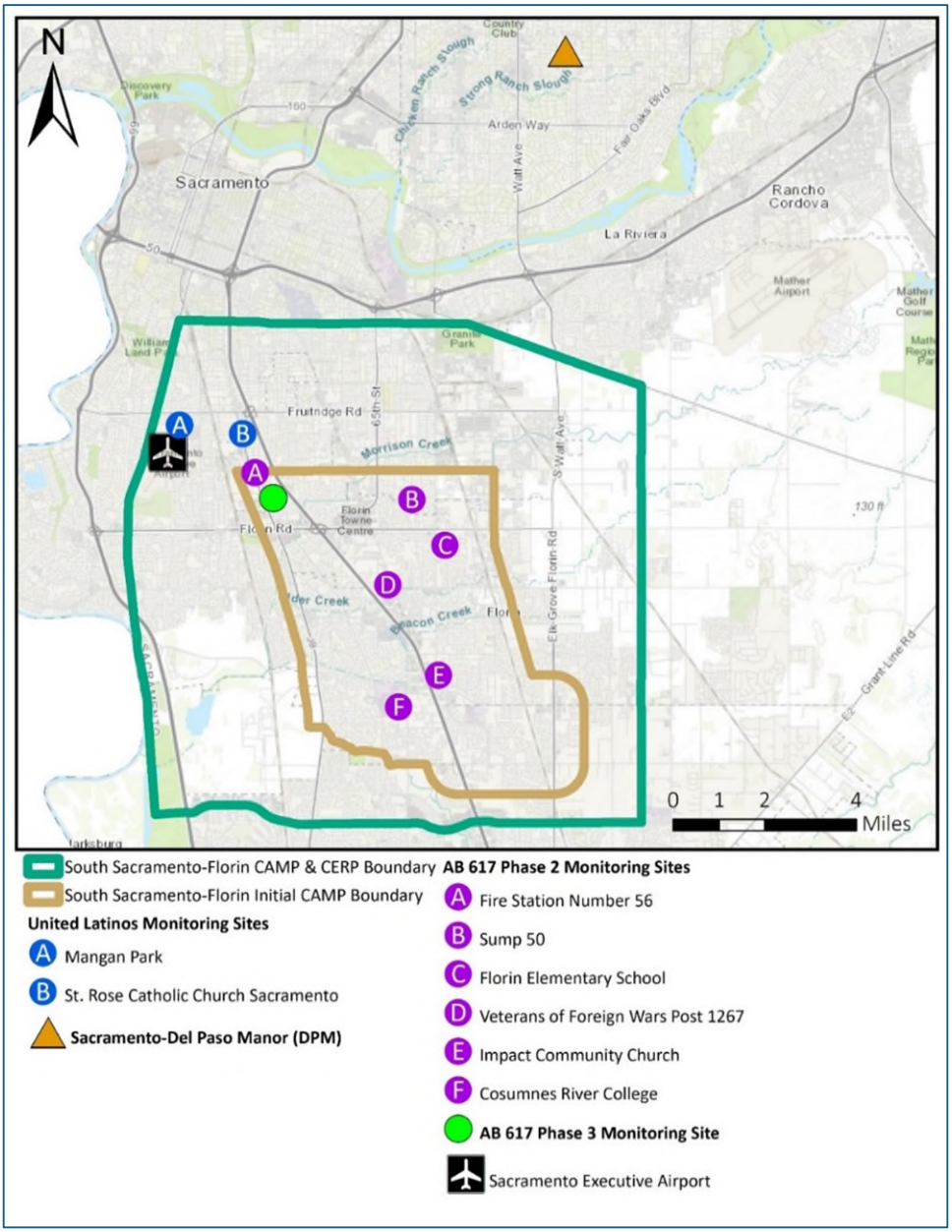


Figure 8. All Air Monitoring Sites in Relative Distance to the Sacramento Executive Airport

Next Steps

The information in this paper provides background information on lead in Avgas, lead exposure related health impacts, the current status of regulatory strategies to reduce lead emissions, voluntary measures taken at other General Aviation airports, lead emission estimates specifically for the Sacramento Executive Airport, along with other pertinent details to provide a thorough overview of the topic. Because Avgas is one of the remaining sources of airborne lead contamination in the region and because Sacramento County's largest General Aviation facility is located within the SMAQMD's Community Air Protection Program boundary, it has become imperative to review the feasibility of reducing lead exposure sooner than may be required by regulatory deadlines. Any early actions taken to reduce lead levels in Avgas can have a correlating public health benefit, especially in communities that have historically been exposed to higher levels of transportation and industrial sources of air pollution and bear a higher overall health burden.

Given the possibility of air quality and public health benefits, the SMAQMD has initiated discussions with the Sacramento County Department of Airports, which oversees the operations of the Sacramento Executive Airport, to: (1) provide an overview and build awareness of the information provided in this white paper, (2) examine the issues and complexities of reducing usage of leaded Avgas from the airport operator's perspective, and (3) gauge the airport's ability to provide an unleaded Avgas option at this airport earlier than required by the regulations (i.e., prior to the December 31, 2030 deadline).

To date, the Sacramento County Department of Airports and its fixed-based operator, which provides the aircraft fuel, are awaiting a commercially available 100-octane unleaded Avgas that can be safely used for all General Aviation aircraft operating at their facilities. Until then, they will continue to provide the 100-octane low-lead (100LL) Avgas at Sacramento Executive Airport.[lxxxix]

In the meantime, the SMAQMD will continue to discuss opportunities with local General Aviation airports and facilitate dialogue with those interested in understanding the topic of lead in aviation fuel such as elected officials and local community groups. SMAQMD's next steps in supporting the transition to unleaded Avgas, elected official and public engagement, and future air quality permitting requirements are shown below.

Continue Dialogue with Airport

- Continue dialogue with Sacramento Executive Airport
- Fully explore the challenges to using unleaded Avgas earlier than required by regulations and the possibilities for voluntary early actions based on other airport experiences
- Share updated information on commercially available unleaded 100-octane Avgas options, as the information becomes available
- Explore opportunities with other local General Aviation airports

Public Engagement

- Present information contained in this white paper to the SMAQMD Board of Directors on September 25, 2025
- Provide information on leaded Avgas to the AB 617 South Sacramento-Florin steering committee
- Facilitate education and information sessions for other interested groups (elected officials, local community groups, neighborhood associations, etc.)

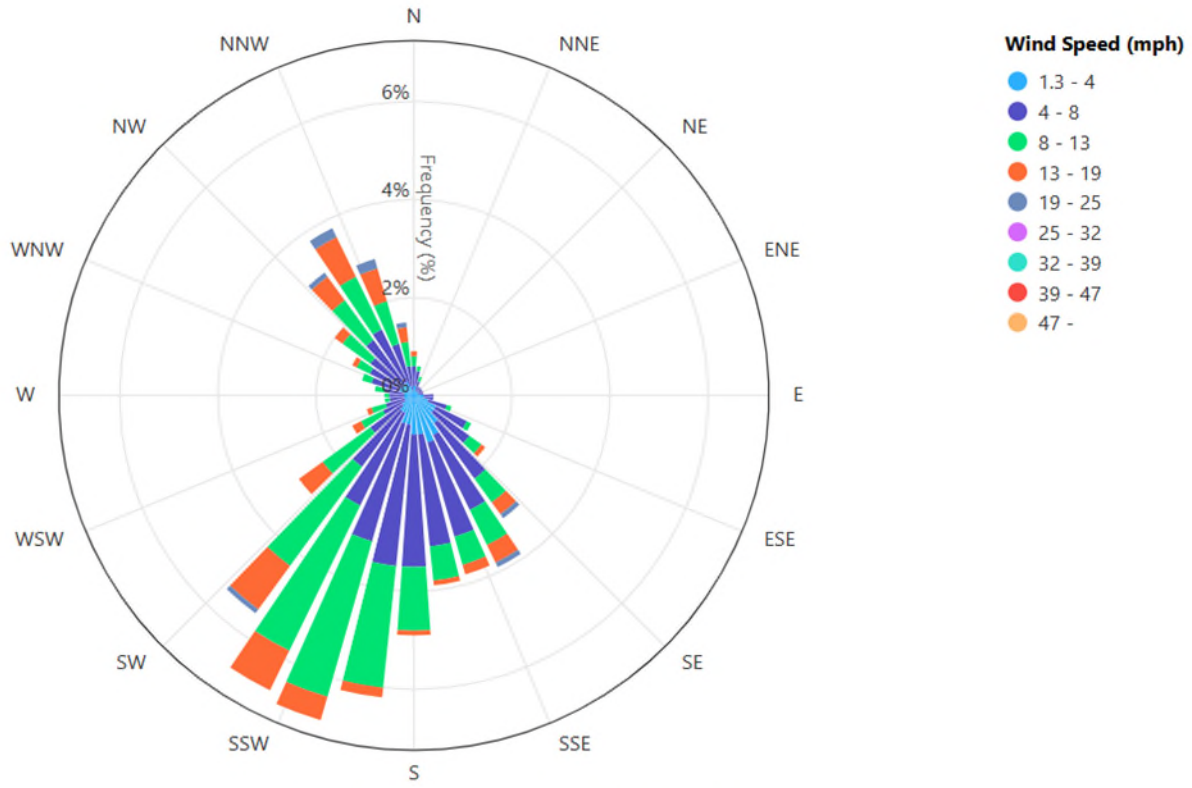
Permit Unleaded Avgas Tanks

- SMAQMD will remain aware of the December 31, 2030 deadline and the potential for new air quality permit requirements
- SMAQMD will notify permit holders of active leaded Avgas tanks of permit requirements for new unleaded fuel tank installations or if existing leaded Avgas tanks will be repurposed for unleaded Avgas

Appendix A

SACRAMENTO AP ASOS (CA) Wind Rose

January 01, 2015 - December 31, 2024
Sub-Interval: January 1 - December 31, 0 - 24



SACRAMENTO AP ASOS (CA)- Wind Frequency Table (percentage)

Latitude : 38.5066	Start Date : January 01, 2015	Sub Interval Windows
Longitude : -121.4960	End Date : December 31, 2024	Start End
Elevation : 19 ft.	# of Days : 3653 of 3653	Date January 1 December 31
Element : Mean Wind Speed	# obs : poss : 86491 of 87672	Hour 0 24

This tool uses standard hourly observations based on raw (non-quality controlled) decoded metar data from the ACIS-hourly database. Sub-hourly data (one-minute data, five-minute data, and special observations) are not included but are available from NCEI. Midwestern Regional Climate Center cli-MATE: MRCC Application Tools Environment Generated at: 6/18/2025 12:35:32 PM CDT

Note: Sacramento AP ASOS is the name of the Local Climatological Data Station located at Sacramento Executive Airport (KSAC).

Appendix B

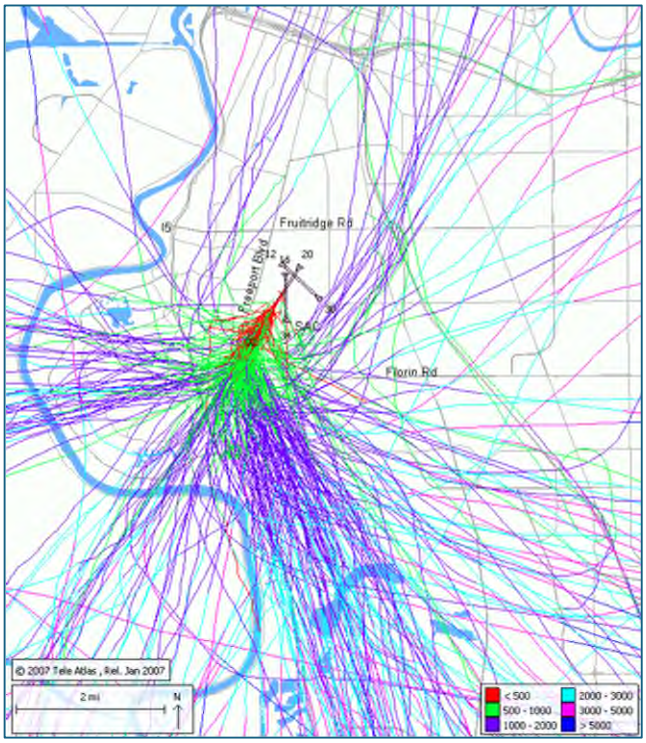


Figure 9. Sacramento Executive Airport Runway 20 Departure by Altitude[xc]

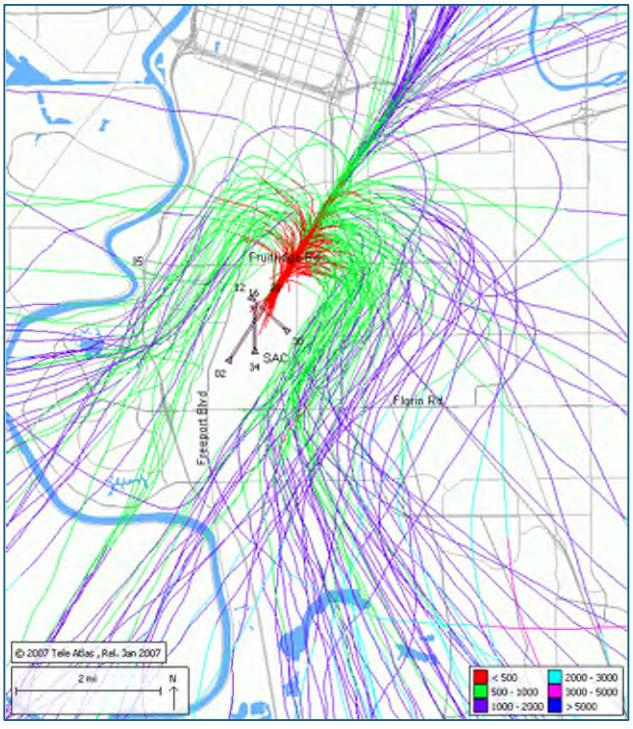


Figure 10. Sacramento Executive Airport Runway 20 Arrivals by Altitude [xc]

Table 6 . CAI2024 Sacramento Executive Airport Activity Levels

Year	Engine	Category	Total Ops (departure + arrival)	Fuel Usage (gallons/day)
2024	Piston	Air Carrier	1	0.20
2024	Piston	Air Taxi	0	0
2024	Piston	General Aviation	101,526	561.96
2024	Piston	Helicopter	2,316	21.87
2024	Piston	Military	6	0.03

Table 7. CAI2024 Reid-Hillview Airport Activity Levels

Year	Engine	Category	Total Ops (departure + arrival)	Fuel Usage (gallons/day)
2024	Piston	Air Carrier	4	0.60
2024	Piston	Air Taxi	0	0
2024	Piston	General Aviation	179,099	840.62
2024	Piston	Helicopter	166	2.64
2024	Piston	Military	22	0.10

Table 8. CAI2024 Van Nuys Airport Activity Levels

Year	Engine	Category	Total Ops (departure + arrival)	Fuel Usage (gallons/day)
2024	Piston	Air Carrier	3	0.49
2024	Piston	Air Taxi	0	0
2024	Piston	General Aviation	273,943	1484.94
2024	Piston	Helicopter	4159	68.71
2024	Piston	Military	748	3.52

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