Response to Terms of Reference – Aviation White Paper Leaded AvGas

The LEAD Group

Terms of Reference

This response addresses the following Terms of Reference:

- changing aviation technologies and ways to position our policies, regulations and systems to encourage uptake and manufacturing of new, more efficient, transport technologies;
- how to support and regenerate Australia's general aviation sector;
- other significant issues raised during the consultation process.

Our submission refers to the sections on leaded aviation fuel on pages 88, and 124-125 of

AVIATION GREEN PAPER: TOWARDS 2050 by Department of Infrastructure, Transport, Regional Development, Communications and the Arts ("the Department"), at:

https://www.infrastructure.gov.au/sites/default/files/documents/aviation_green_paper.pdf

Extracts from the Aviation Green Paper regarding leaded AvGas

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Using currently available technology, electric aircraft will likely be limited to routes between 300–500km, due to battery energy density limitations, making them suitable for regional routes and general aviation. As new battery technologies offering greater energy densities become available, longer haul flights of 1–2 hours duration may be achievable by 2030. The projected cost efficiencies of battery-powered aircraft may see them adopted quickly for regional short-haul routes. The adoption of electric or hydrogen-powered AAM could also support future decarbonisation efforts in the sector (see Chapter 9 'Emerging Aviation Technologies').

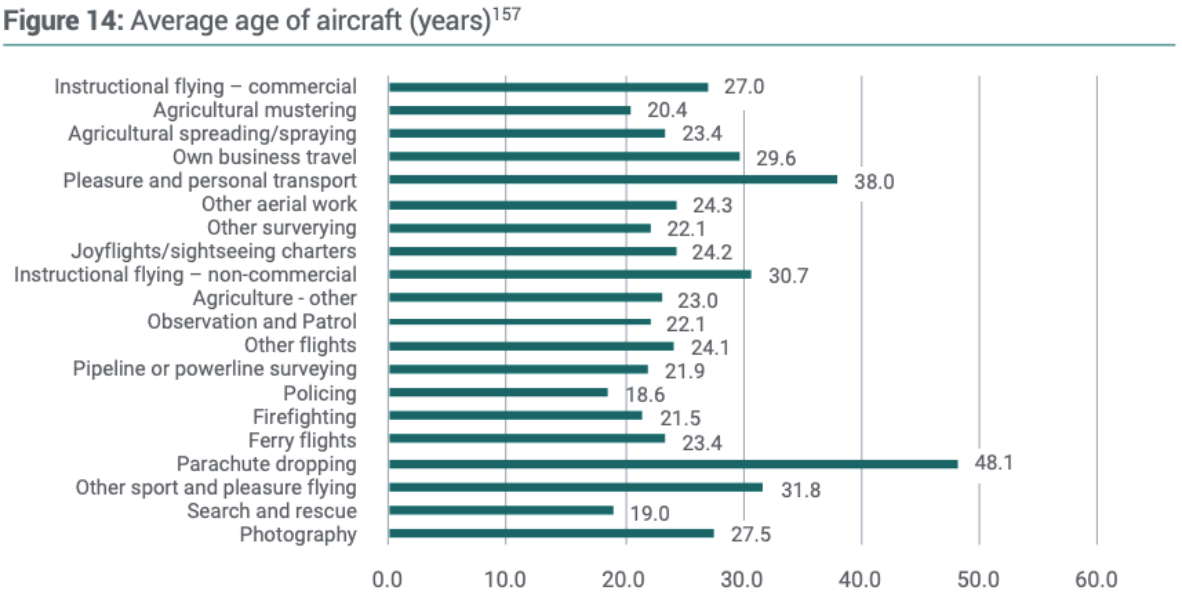
A proportion of Australia's GA [General Aviation] fleet, due to its age, relies on Avgas. Avgas is not currently substitutable with SAF [sustainable aviation fuel*], meaning SAF is not available as a pathway for that portion of the GA sector. Fleet modernisation and new propulsion technologies could form a pathway for GA operators who cannot use SAF to decarbonise.

[*SAF - Sustainable aviation fuel is produced from sustainable feedstocks and is very similar in its chemistry to traditional fossil jet fuel (ref Green Paper glossary). Note that Leaded AvGas is not a sustainable aviation fuel and while unleaded (UL) AvGas has no added lead, due to important sourcing and carbon reduction requirements that UL AvGas does not meet, UL AvGas is not a SAF either.]

Pages 124-125

New aviation technologies may provide opportunities for General Aviation's decarbonisation The average age of the traditional fixed wing GA fleet is over 31 years old. However, the age of aircraft in different sub-sectors varies.[156]

Figure 14: Average age of aircraft (years) [157]



Many of these aircraft are reliant on leaded Avgas, which produce CO2 emissions. Due to compatibility requirements, these aircraft cannot use SAF to reduce emissions. The US is seeking to reduce and eliminate leaded Avgas from its GA fleet by 2030 by developing unleaded fuel infrastructure, supporting research and development, authorising safe unleaded fuels, and considering further regulation or policy needed to support unleaded fuel infrastructure. CASA has issued recommendations on the use of unleaded aviation fuels. (AWB 28-019 Issue 2 – 17 March 2023).

The most common and reliable type of Avgas is 100 octane Low Lead, also known as 100LL.[158] While viable alternatives to 100LL are in development and may be ready for use in Australia in the near future, with typically shorter flight lengths and lower weights than scheduled air services, emerging propulsion technologies such as electric batteries are likely to be a key part of the transition of the GA sector to net zero. With large international markets moving away from the use of leaded Avgas, access to leaded Avgas imports for the domestic market in Australia may be adversely affected.

FOOTNOTES

[156] Bureau of Infrastructure and Transport Research Economics (2022) Timeseries 2014–2021 Australian Aircraft Activity 2014–2021 [data set], bitre.gov.au.

[157] Bureau of Infrastructure and Transport Research Economics (2022) Timeseries 2014–2021 Australian Aircraft Activity 2014–2021 [data set], bitre.gov.au.

[158] United States Federal Aviation Administration (n.d.) Aviation Gasoline, Federal Aviation Administration website.

The LEAD Group's Australian Aviation White Paper Submission

The LEAD Group fully supports Ian Ryan's submission on the issue of leaded AvGas as presented in the extract below of Ian Ryan's Australian Aviation White Paper submission (Ian's full submission can be found at https://www.infrastructure.gov.au/sites/default/files/documents/awptor2023-submission-a80-tristar-aviation.pdf).

The LEAD Group proposes the earliest possible date, certainly well before 2030, for leaded AvGas phaseout in Australia and looks to Europe for the mechanism of phasing it out.

The lead additive for leaded fuel is called tetraethyllead (TEL). Leaded AvGas has a phaseout date of 2025 in the European Union because TEL has a 2025 sunset date in European Union countries.

See https://echa.europa.eu/authorisation-list/-/dislist/details/0b0236e1828a5e98 – this European Environment Agency website explains that TEL is a Substance of Very High Concern and is thus on the "Authorisation List". For Substances on the Authorisation List to continue to be used beyond the specified sunset date for that substance, the manufacturer, importer or downstream user must apply for an authorisation which may be granted or refused by the European Commission. As at September 2023, according to https://echa.europa.eu/received-applications there have been no applications for TEL authorisations to use TEL (required in leaded AvGas) beyond its sunset date of 1st May 2025.

In support of the USA planned date of leaded AvGas phaseout of 2030, on 18th October 2023 the US Environmental Protection Agency (EPA) put out an Endangerment Finding on AvGas, which can be found at https://earthjustice.org/press/2023/epa-issues-endangerment-finding-for-leaded-aviation-gas. According to Earth Justice:

"This critical step means EPA must issue emission standards for lead pollution from these aircraft and work with the Federal Aviation Administration (FAA) on aircraft engine emissions standards."

Hopefully Australia could simply adopt the resulting US lead emission standards for general aviation aircraft, in order to speed the elimination of leaded AvGas in Australia.

Our colleagues in the US at Citizens Against Gillespie's Expansion and Low Flying Aircraft (CAGELFA) have put out a video called *Callous Indifference – Propellor planes dump 467 tons of lead into our breathable air every year* The callous indifference in the video title refers to the myth-creation and pushback from the US aviation industry and lobbyists on the need to prevent child lead poisoning through the use of leaded aviation fuel. For instance, the video notes that whereas the industry promotes "low lead" 100 LL AvGas, the concentration of lead in 100 LL is 20 times more than was previously permitted in US automotive gasoline. The video and transcript (you can read the transcript as it plays) is at https://www.youtube.com/watch?v=QDdw8dECodE

The LEAD Group – the only Australian charity focussed on prevention of lead poisoning and protection of the environment from lead – regrets that we do not have the resources to make a similar video based on the Australian scene, or even investigate how to overcome the administrative and cost-of-entry barriers to all general aviation aircraft in Australia being able to use unleaded fuel, as mentioned in Ian Ryan's submission extract below. This task must fall to the Department if they are to be seen to be protecting the Australian population from totally preventable lead exposure.

While the focus in the move away from Leaded AvGas in the US is protection of children from lead, The LEAD Group has argued (see below) that sniffing of leaded AvGas in First Nations communities is adequate reason to phase out leaded AvGas as an Indigenous

health priority, but is also very concerned about the significant issue of lead (which is readily absorbed through the skin when in fuel) exposure of pilots and other refuelling staff.

In October 2009, an ex-navy helicopter pilot contacted The LEAD Group and informed us that the type of helicopter he and his squadron flew (Iroquois) always spilled leaded AvGas (that also contained benzene and xylene) on their skin when refuelling as the fuel inlet was above head height. He told our Lead Scientist and Lead Advisor, Elizabeth O'Brien, that he had kidney disease which began in his first year of refuelling this type of helicopter. At the time, he said that 9 of his squadron of 12 had already died and the remaining 3 were on dialysis. Soon after, we were unable to reach him, despite contacting doctors and the hospital in his hometown of Toowoomba. A search of the Ryerson Index of Australian published obituaries located a match of his full name and location with the date of death just 3 months after contacting us and the funeral notice dated in March 2010 gave his age as 48 years old. His name and last address are available from The LEAD Group to any government official or researcher wishing to research this leaded AvGas-exposed cohort of at least 10 dead men.

It is not clear to The LEAD Group that despite obvious hazards from spilling leaded fuel on the skin or breathing leaded fuel fumes during refuelling of some general aviation aircraft with leaded AvGas, that such occupationally exposed individuals are ever routinely blood lead tested. The helicopter pilot and his deceased colleagues mentioned above, were likely never blood lead tested. The LEAD Group strongly recommends that workers exposed to leaded AvGas must have blood lead biomonitoring prior to commencing their employment and regularly as required under OHS regulations and that the Department undertake a study that includes collation and analysis of blood lead results and responses to a health questionnaire (to be completed by doctors of deceased workers) to determine the lead exposure and health status of current, past and retired leaded AvGas-exposed workers.

Here's what Elizabeth O'Brien wrote to the Northern Territory Chief Minister in September 2021:

> It appears that there is currently a small issue in Northern Australia with children stealing and sniffing aviation fuel (AvGas) in small communities that need light air craft. This is because they have iOpal for cars which doesn't give a buzz when sniffed. Of course AvGas is leaded and these children have high blood lead levels. You are probably aware that there are two types of AvGas: High lead that has low aromatics and is not enticing for kids to sniff and low lead that has high aromatics and is very enticing for children. Neither fuel is a good option but the low lead AvGas is more common. The issue of leaded AvGas sniffing in remote indigenous communities is not new. On the 6th July 2017 the ABC reported in *NT children sniffing 'unsniffable' fuel [AvGas] have blood lead levels higher than previously thought*, that:
>
> "The NT has the highest levels of lead detected in blood of anywhere in the developed world, according to NT Centre for Disease Control acting director Charles Douglas." (Reference: https://www.abc.net.au/news/2017-07-06/higher-blood-lead-levels-for-nt-kids-sniffing-fuel/8676550).

For the sake of Indigenous Australians, workers, children and communities around general aviation airports and flight paths, the Department must commit to phasing out leaded AvGas as soon as possible and preferably well before 2030 - the US phaseout year.

Sydney Aircraft Noise Insulation Project (SANIP) spent an extra $12m removing ceiling dust (dust inside the ceiling void of buildings) in aircraft-noise affected areas of Sydney prior to

the installation of noise insulation in the ceiling voids in the mid-late 1990s. Ceiling dust can be highly leaded due mainly to the past use of leaded automotive fuel and the high lead content of AvGas. Homes, childcare centres and schools not grossly affected by aircraft noise in Sydney did not have ceiling dust removed. Once leaded AvGas is finally eliminated in Australia, the Department should set aside a fund and set up a rebate scheme to encourage householders and managers of child-use buildings near general aviation airports and flight paths to obtain rebated or government funded ceiling dust removal so that the lead (and other contaminants) does not continue to fall from the void into the breathing zone forever, or be released en masse whenever re-roofing, demolition or roof- and ceiling-damaging storm events occur.

In July 2023, The LEAD Group published our *Model National Lead Safety Policy Proposal Towards a Lead-Safe World* and we recommend the Department fully utilise this model policy to inform leaded AvGas phaseout policy in its White Paper. Our model policy can be downloaded from here https://leadsafeworld.com/fulldoc-natpol.

Here are some relevant excerpts -

Leaded petrol/gasoline and the consequent lead exposure of every organism on earth has rightly been described as *the* mistake of the twentieth century.

Lead in air continues to be a problem in urban areas due to the continued use of leaded AvGas, diesel and unleaded petrol, burning of fossil fuels and the past use of leaded petrol/gasoline, and this is due to re-entrained road dust, exhaust from old lead-petrol-using vehicles (BBC & Edwards 2021, Resongles *et al* 2021, Gioia *et al* 2017). Air lead pollution aside, the global elimination of leaded petrol (O'Brien 2021) does not on its own stop lead from petrol from reducing IQ and shortening longevity.

…

Every use of lead affects living organisms and their environment, whether it be exposure of farm animals, backyard chickens and aquatic life which allows lead to enter the human food chain; or the use of leaded ammunition and fishing sinkers which eventually harm wildlife; or allowing historical uses of lead, such as in paint and petrol and current uses of lead such as lead-acid batteries and AvGas, to be further distributed in the environment through poor management of demolition, paint on surfaces, storm water run-off, rainwater, dredged sediments, human sewage, and so on.

…

1.0 Steps in Primary Prevention of Lead Exposure

"Primary prevention aims to prevent disease or injury before it ever occurs. This is done by preventing exposures to hazards that cause disease or injury, altering unhealthy or unsafe behaviours that can lead to disease or injury, and increasing resistance to disease or injury should exposure occur" (Institute for Work & Health 2015).

Some examples of Primary Prevention of Lead Exposure are:

- Banning leaded fuel (including AvGas), paint, ammunition, fishing sinkers, wheel weights, jewellery, plumbing solder, switching from lead soldered to welded food cans, and so on

…

Some national Primary Lead Exposure Prevention measures in relation to existing leaded products could include:

- Proposing to international bodies (such as the World Bank, International Civil Aviation Organisation (ICAO), and similar) by national governments, that similar global alliance/partnership (to the PCFV) to eliminate leaded AvGas be established. This alliance can be utilised to exchange information, strategies and raise awareness so that the global elimination of all leaded fuels could follow as closely as possible on the heels of the global elimination of leaded petrol.

…

1.5 Set maximum legislated limits for lead in various media, aimed at preventing blood lead levels from exceeding the current blood lead target and reset the limits once this is met

Taylor *et al* 2012… also stated that "Relevant legislation and standards relating to health and environmental levels of lead should be revised to achieve blood lead levels below 1 ug/dL."

Governments will set lead limits in environmental media and consumer products and will lower (reset) these whenever the blood lead action level is lowered for the relevant sub-population. Other lead limits will be set and similarly reset (lowered) to prevent and address environmental lead contamination.

For example, once leaded AvGas is eliminated, a government-funded ceiling dust removal service will be provided to all homes, childcare and child educational facilities above a set level of lead contamination in the ceiling dust. Further to this, areas under flight paths that have higher lead levels in soil, on surfaces and in water will also be remediated.

…

2.3 Identify persons at risk using known risk factors and set action blood lead levels to prevent further lead exposure in each of the sub-populations for which target blood lead levels have been set

The action blood lead level is the level at which the government will intervene, or in the case of Secondary Lead Exposure Prevention, create regulations which require others (e.g., landlords, employers, state or provincial agencies) to take action, to bring down an individual's blood lead level.

The information (in educational materials) provided by a health department or health professional in an effort to determine or test for lead sources in the individual's environment will be specific to the country and indeed the region as local sources can impact hugely on case management.

Some of these local sources and personnel include…

- Trucking, shipping and wharf workers responsible for the handling, storage and transport of Tetra Ethyl Lead (TEL), AvGas, raw heavy metal materials between locations (such as from the mine/s to storage or processing facilities, refineries, smelters)
- Maintenance personnel working on the handling, storage and transport equipment for Tetra Ethyl Lead (TEL), AvGas, raw heavy metal materials who are not manufacturing plant personnel…
- General aviation airports (while leaded AvGas remains in use)

In order to prevent further lead exposure, any child or adult, including workers, with a blood lead level above the target level will be eligible for source and pathway identification/environmental testing, and nutritional and other interventions using the Hierarchy of Control for Managing Risk of Materials of occupational exposures.

Recent research into lead-related health effects makes clear that there is no longer any justification for accepting a higher blood lead level in an adult than in a child (Roberts *et al* 2020).

2021 Volcano Art Prize Entry. **Title:** Two Planes
Lead-safety Message: Aviation Fuel – The Last Lead Frontier
Artist: Dennis Leight
Description of Work: Photo Montage
Volcano Art Prize by The LEAD Group Inc. | Two planes

https://volcanoartprize.com/portfolio-item/two-planes/

Response to Terms of Reference – Aviation White Paper Unleaded Avgas

Ian Ryan

Terms of Reference

This response addresses the following Terms of Reference:

- how to maximise the aviation sector's contribution to achieving net zero carbon emissions including through sustainable aviation fuel and emerging technologies;
- changing aviation technologies and ways to position our policies, regulations and systems to encourage uptake and manufacturing of new, more efficient, transport technologies;
- how to support and regenerate Australia's general aviation sector;
- maintaining fit-for-purpose aviation safety, air navigation and aviation security systems and service delivery agencies;
- other significant issues raised during the consultation process.

Summary

Spark-ignition fuels (piston-powered engines) are two steps behind turbine fuels in terms of sustainability. First, Tetraethyl Lead (TEL) must be removed from Avgas. TEL is an octane booster, and also an environmental and health concern.[1] The use of TEL is banned worldwide for vehicle use, except for aviation.

Some 70% of spark-ignition powered aircraft in Australia could use unleaded fuels, but administrative and cost-of-entry barriers block its use. [2] In Australia, both the aircraft and engine must be certified to use unleaded Avgas. This does not meet international-best practice. In Europe and the UK, an aircraft with an engine certified to use unleaded avgas may do so, regardless of aircraft certification. [3] [4] Some aircraft manufacturers are slow to go through this costly recertification exercise for no benefit to their own company. Some manufacturers rely on the European provisions in their own countries, so do not bother to pursue the certification.

Australia needs regulatory relief - follow the European model and allow aircraft with unleaded certified engines to use unleaded fuels.

Small incentives for unleaded avgas and eventually disincentives for leaded avgas should be phased in to encourage its use:

- Immediately, fuel excise (3.556c per Litre) could be removed for unleaded avgas.
- Next, interest-free loans for unleaded avgas infrastructure (fuel bowsers, trucks etc.) should be offered to encourage take-up in the market.
- Finally, in a number of years when unleaded avgas can replace 100% of fuels, the fuel excise on leaded avgas can be progressively increased. Industry will need to be involved in the selection of an unleaded 100LL replacement, as there will be further regulatory hurdles to overcome (purchase of certification for aircraft/engine for the entire fleet).

In Europe and the UK, some unleaded avgas grades are cheaper than their leaded equivalents. This reduction (coupled with the suggested incentives listed above) will assist GA in reducing unnecessary costs.

Recommended Actions by Government/Government Agencies

1. DITRDCA and/or CASA develop a Leaded Avgas exit strategy
2. Mirror EASA/UK CAA approval for use of unleaded avgas
3. Incentivise early adopters of unleaded Avgas by:
    a. Removing fuel excise on unleaded Avgas for 10 years
    b. Providing interest-free loans to build unleaded Avgas infrastructure at airports
4. As part of lessee agreements with Leased Federal Airports, require sale of unleaded avgas at Capital City Class D Aerodromes with extensive flight training (Moorabbin, Parafield, Jandakot, Bankstown and Archerfield)
5. With industry, choose a 100LL replacement and plan for fleet-wide replacement
6. Disincentivise late hold-outs by:
    a. Increasing fuel excise on leaded fuels only in 8 years' time, ramping up for 10 years

Detail

Leaded Avgas is the only type of fuel available in Australia for spark-ignition engine powered aircraft, either 100LL or 100/130. These fuels are required for some of the fleet, but not the majority of flight training aircraft, mostly operating out of the Capital City Class D Aerodromes. The amount of aircraft traffic at these airports would support an additional fuel grade, 91UL. This unleaded Avgas is 100LL without the TEL added in the first place. There is no need for the octane boost in most light aircraft (around 70% in Australia), and these aircraft have been run safely in Europe on 91UL (and even lower grades of unleaded Avgas) for decades.

TEL has many, many negative health and environmental issues, and is even acknowledged by aircraft engine manufacturers as reducing engine life. All sides agree that TEL should not be used unless strictly necessary.

In the USA, the largest user of TEL, plans are underway to eliminate leaded fuels entirely by 2030. Once the largest user of TEL no longer requires it, the world's only manufacturer will likely stop producing it.

On average 65 million Litres of Avgas has been sold in Australia over the last 13 years.5 This translates to up to 36 tonnes of Lead dispersed in the environment per year, mostly around aerodromes, and especially around the federally-owned Capital City Class D aerodromes.

There is an opportunity for the Commonwealth to require unleaded Avgas (eg, 91UL) be for sale now, at the largest of the federally owned Capital City Class D aerodromes. Most of the flight training in Australia occurs at these locations, and the flying training fleet is mostly permitted to run on unleaded Avgas.

In the USA, a replacement for 100LL has been approved, G100UL. This unleaded fuel is a drop-in replacement, however the manufacturer expects this fuel to be around 15-20% more expensive, adding yet another cost to the GA industry. In addition, because approval to use this fuel was obtained by the fuel manufacturer, every aircraft that wants to use this fuel has to pay for a copy of the approval documentation, at around US$400-600 per engine. There will also be licensing costs for any oil refineries to make G100UL. The next closest competitor will operate a similar scheme. For a fleet-wide replacement, government

intervention (and funding) will be required to obtain Australia-wide permission to use G100UL (or any other replacement).

FOOTNOTES

[1] Sammy Zahran, Christopher Keyes & Bruce Lanphear, 'Leaded aviation gasoline exposure risk and child blood lead levels', PNAS Nexus, vol. 2, no. 1, 2023, p. pgac285.

[2] Lycoming Service Bulletin 1070AB - Specified Fuels for Spark-Ignited Gasoline Aircraft Engine Models, Lycoming, 2020, viewed 10 March 2023, https://www.lycoming.com/service-instruction-no-1070-AB .

[3] Introduction of Generic Concession No.7 (Unleaded Aviation Gasoline (Avgas) UL91_3.pdf, Civil Aviation Authority (UK), 2012, viewed 10 March 2023, https://publicapps.caa.co.uk/docs/33/20121031Introduction%20of%20Generic%20Concession%20No.7%20(Unleaded%20Aviation%20Gasoline%20(Avgas)%20UL91_3.pdf

[4] May I use Unleaded Aviation Gasoline (Avgas) UL 91 even if the airframe TCDS states that the minimum fuel octane is 100?, EASA, n.d., viewed 10 March 2023, https://www.easa.europa.eu/en/faq/19380

[5] Australian Petroleum Statistics | energy.gov.au, n.d., viewed 10 March 2023, https://www.energy.gov.au/government-priorities/energy-data/australian-petroleum-statistics

2021 Volcano Art Prize Entry. **Title:** Beware Lead in Volcano Ash.
Lead-safety Message: The ash and smoke from volcanoes can contain as much lead as the lava. **When leaded AvGas is banned** and lead industry emissions are reduced, volcanoes will again become the major source of lead in the earth's atmosphere.
Artist: Christopher Nguyen, age 10. **School:** Creative Einstein
Description of Work: Computer art
Volcano Art Prize by The LEAD Group Inc. | Beware lead in volcano ash

https://volcanoartprize.com/portfolio-item/beware-lead-in-volcano-ash/