

## **Measured Atmospheric Change in Lead Particulate Matter From UL94 Fuel Switch by Major Aerospace College**

Alex Mendez and David Delene

General aviation commonly uses 100 Low Leaded Octane Rated Fuel (LL100) to power piston-powered engine aircrafts. LL100 contains the additive tetra-ethyl lead to increase the fuel's octane rating and prevents spontaneous combustion. Burning tetra-ethyl lead containing fuels releases lead (Pb) that is a toxic metal which accumulates in the blood and impacts human health. New aircraft can safely operate using unleaded fuel with 94 and 100 octane ratings (UL94 and UL100). The Aerospace College at the University of North Dakota switch their entire aircraft fleet to UL94 during June of 2023. The research objective is to obtain lead particulate matter measurements before and after the switch from LL100 to UL94. A high-volume filter sampler is deployed to collect daily and weekly samples on 8x10 inch filters at the Grand Forks airport. Daily and weekly filter samples were post and pre-weighed using a high precision scale. X-Ray Fluorescence (XRF) is used to analysis the elemental composition of each filter sample. XRF sample analysis detected zero, or very small, amount of lead compared to the filter material. A filter loaded with a large amount of lead sulfide (Pb-S) confirmed XRF's detection of lead on filters. Discussion with the XRF manufacturer indicated that there is not enough particular matter mass on the collected filters for elemental qualification using the energy dispersion XRF detector method employed and suggested testing the collected filter samples using a wavelength dispersion XRF. Additionally, a high and low mass filter are being analyzed using Inductively Coupled Plasma Mass Spectrometer (ICP-MS) to determine if the method can be used to quality lead amount on the 2023 collect filters.