ScienceNews
MAGAZINE OF THE SOCIETY FOR SCIENCE & THE PUBLIC

http://www.sciencenews.org/view/generic/id/74131

Idling jets pollute more than thought

Sunlight turns oily emissions into potentially toxic particles

By Janet Raloff

Web edition : Tuesday, May 10th, 2011

Airports can pose a far bigger threat to local air than previously recognized, thanks to the transformative power of sunlight.

In the first on-tarmac measurements of their kind, researchers l shown that oil droplets spewed by idling jet engines can turn int particles tiny enough to readily penetrate the lungs and brain.

Allen Robinson of Carnegie Mellon University in Pittsburgh and h team collected the pollution spewed from a plane powered by or the most common types of commercial jet engines as it operate different loads. Though jet engines operating at full power produ mostly solid particles, at low engine loads — such as when a pla idles at the gate or on the runway — emissions are predominant the form of microscopic droplets.

The researchers piped the engine's exhaust into a 7-cubic-meter covered Teflon bag. When the bag was full the researchers unco it, allowing sunlight to fire up chemical reactions that would nor occur in the open air.

Within minutes solid particles were generated by interactions between the oily microdroplets and gases. "Driving this chemist Robinson notes, "was hydroxyl radical," or OH — the oxidant tha most effective at catalyzing the breakdown of oily hydrocarbons create this hydroxyl radical, you need sunlight," he explains.

Sunlight's oxidation of the exhaust emitted at idling can generat times more particles than the engine originally emitted and 10 t what computer models have typically predicted, the researchers report online May 5 in *Atmospheric Chemistry and Physics*. Robi says he found these new data "unbelievable. It sort of blew our minds."

He point out that at busy airports, "If you're number 46 in line awaiting takeoff, you could spend an hour idling."

Sunlight's boost for submicrometer particles from exhaust at hig engine loads was smaller — but always many times the particle count present in the jet's starting exhaust.

Although researchers have measured emissions directly coming the back of an aircraft, this is the first to look at what happens those emissions age in sunlight, notes Richard Miake-Lye of Aerodyne Research in Billerica, Mass. The new data are "very important to be clear on how aircraft emissions impact local and regional air quality," he says.

When scientists considered jet pollution in the past, observes Ge Thurston of the New York University Langone Medical Center in Tuxedo, "I don't think they looked much at the particle implicati This generation of particles by aging gases and hydrocarbons ca hard to figure out, he says, "but it's where a lot of the action is atmospheric chemistry."

As pollution from cars, trucks and most smokestacks has fallen, airport emissions have tended to climb, notes Ronald Henry of t University of Southern California in Los Angeles. Although pollut from airports tends to be localized within a few kilometers, he s "It now appears it could be a significant source of ultrafine parti — and health effects."

SUGGESTED READING :

- **J. Raloff. Destination brain: Inhaled pollutants may inflame mor**

- the lungs. Science News, Vol. 177, May 22, 2010, p. 16. Availab subscribers:
- J. Raloff. Bad Breath: Studies are homing in on which particles polluting the air are most sickening — and why. Science News, ' 176, July 18, 2009, p. 26. Available to subscribers:
- J. Raloff. The goop in our air. Science News blog, July 15, 2008.
- J. Raloff. Air Sickness: How microscopic dust particles cause sul serious harm. Science News, Vol. 164, Aug. 2, 2003, p. 72. Avai to subscribers:
- J. Raloff. Dust to dust: A particularly lethal legacy. Science New 139, April 6, 1991, p. 212.

CITATIONS & REFERENCES :

- M.A. Miracolo . . . and A.L. Robinson. Secondary aerosol formati from photochemical aging of aircraft exhaust in a smog chambe Atmospheric Chemistry and Physics, Vol. 11, May 5, 2011, p. 41 doi: 10.5194/acp-11-4135-2011. Abstract available:
- T.B. Onasch . . . R.C. Miake-Lye, et al. Chemical properties of ai engine particulate exhaust emissions. Journal of Propulsion and Vol. 25, September-October 2009, p. 1121. doi: 10.2514/1.363' First page:
- K.N. Yu . . . R.C. Henry. Identifying the impact of large urban ai on local air quality by nonparametric regression. Atmospheric Environment, Vol. 38, September 2004, p. 4501. doi: 10.1016/j.atmosenv.2004.05.034.