

From: Thomas C. Edwards

Re: Dr. Boyle's Proposal

Date: 5/4/09

The following is an updated outline regarding the current proposal by Dr. Karleen Boyle-Sudol and the City's monitor of the potential environmental impacts of aircraft emissions at John Wayne Airport, Orange County, California. Hopefully it will serve as a basis to respond to continuing questions and concerns that the City may face as regards the study.

History

Initially, various components of the City have continually raised the question of what and if any emissions are generated by aircraft that pass overhead at the rate of approximately 150 per day. Numerous comments through out the City confirmed that people felt they were being inundated with black soot that collected on patio furniture, pool covers, air filters and the like. It was with that in mind that the City began to investigate the possibility of conducting its own study to monitor the potential impacts of aircraft emissions. Independently through one source at the City and through my own investigation the person most likely to conduct such a study was determined to be Dr. Karleen Boyle-Sudol.¹

Rather than accept anything at face value the City asked Dr. Boyle to make a proposal but unlike most proposals it was to include and did include a complete survey of literature to support the type of project that Dr. Boyle was proposing. The proposal substantiated that the scientific community was able to demonstrate that "fingerprinting" of ambient emissions to demonstrate their source was possible.

Proposal

With the foregoing in mind Dr. Boyle proposed a variety of research approaches for evaluating the potential impacts of aircraft emissions. Included in the proposal and the one that the City decided to pursue was a Detailed Air Sampling, which included the measure of ambient particulate air pollution and associated polycyclic aromatic hydrocarbons ("PAHs") and heavy metals near the airport, including areas used for residential and recreational purposes. The current proposal's approximate cost is approximately \$52,000.

¹ The staff person at the City located and passed on almost simultaneously the study conducted by Dr. Boyle: "Evaluating Particulate Emissions From Jet Engines: Analysis of Chemical and Physical Characteristics and Potential Impacts on Coastal Environments and Human Health" which appeared in *Transportation Research Record*.

The proposal includes the use of Minivols, which are air samplers placed in certain locations around the airport and therefore utilizing the field methodology and sample design would be able to compare or create a signature of airport vs. urban background; in light of outstanding studies such as the one conducted at LAX which demonstrated that particle associated concentrations of Copper and Vanadium were statistically significantly elevated in air samples.

Essentially what testing determined was that in terms of associating the elevated Copper and Vanadium levels with aircraft, the best hypotheses is that the copper particles are due to brake wear as the planes land. Also, vanadium is used as an additive in jet fuel. These facts coupled with the lack of elevations in these metals in freeway sampling sites have led so far to the conclusion that they are aircraft-associated. The City's proposed testing would compare therefore the amount and type of particulate emissions associated with the airport and testing and whether they are distinguishable from urban background and freeway emissions. Assuming that the tests move forward it appears that the science supports the ability to distinguish between the two, because of the heavy metal and PAH fingerprinting of airport associated impacts versus other normal urban background.

Questions

Q: Is there science to support distinguishing airport versus urban background?

A: Yes. Numerous Studies, including the supporting literature and studies, numbering 56 as cited in the City's proposal.

Q: What about the question of diesel fuel versus jet fuel?

A: Because of the testing which has demonstrated the ability to distinguish heavy metals and PAH fingerprints from sampling, while difficult it is obtainable. Moreover, the sample design and field methodology were designed with the objective of distinguishing airport-associated emissions from other urban background sources. Since substantial diesel emissions are associated with airport activities, including baggage transport vehicles, aircraft support vehicles, public transit vehicles, etc.; these emissions should be included in assessing overall airport impacts to air quality. That is the purpose of having multiple field sampling stations, to allow us to measure airborne particulates (and associated PAHs and heavy metals) in proximity to the airport in comparison to "clean" coastal control sites, airport-adjacent residential areas, and non-airport adjacent urban sampling stations. Dr. Boyle's study at LAX used a similar design and did find statistically significant differences between the amount of particle-bound heavy metals in air samples near the airport vs. samples adjacent to a freeway with a high volume of diesel truck traffic. Airport air samples had significantly higher levels of particulate copper (possibly from brake wear on landings) and vanadium than control and freeway stations, while freeway stations had significantly higher levels of particulate lead than airport or control stations.

Simply put testing has demonstrated elevated levels of lead at freeway sites which is associated with diesel whereas airport samples show elevated levels of copper and vanadium which are associated with jet fuel - not diesel in any significant respect.

In addition one of the peer-reviewers specifically addressed this question and concluded that there is sufficient data available that supports that there are differences between emission profiles of diesel and jet engines. In particular, a clear difference exists between the ratio of organic carbon to elemental carbon (OC/EC) found in the two emission types.

Q: What is a MiniVol?

A: It is the type of air sampler Dr. Boyle is proposing for use. It is an integrated sample over time. Dr. Boyle selected a standard EPA-approved air sampler (MiniVol) which means that both the sampling machine and sampling protocols have been extensively and scientifically reviewed before being approved by the EPA. The other benefit to using an EPA-approved methodology is that it allows her to make meaningful comparison of the City's data set with other data sets collected using these same methods. This makes the data scientifically defensible and provides a broader context for use when interpreting the results.

Q: What about the costs?

A: The costs quoted, which appear as an exhibit on her proposal were merely duplicated verbatim from the testing lab DRI. While it has been approximately six (6) months from the date of the proposal and the longer the time before actual testing begins as best as can be determined the quotes remain accurate.

Also because Newport Beach is a public agency, they obtain a break on costs and expenses from the Lab.

Q: What about review of the proposal by stakeholders?

A: From a scientific standpoint it is not normal for stakeholders to be involved in a scientific proposal at this stage. What is standard from a scientific standpoint is for peer-review by peers in the field for evaluation of sample design and field methodology. From the beginning Dr. Boyle has never opposed this and in fact had suggested a number of possibilities.

Q: Will the proposal receive peer-review?

A: Yes. Currently Dr. Boyle has oral commitments and has exchanged information with Dr. Gertler at DRI; Dr. Fine at AQMD and Dr. Weiner at UCLA. She is waiting for all of the comments back and then if necessary will refine the proposal to incorporate their suggestions. If there are additional costs or expenses associated with the proposal she will make the City aware of those as soon as possible.

As an example Dr. Gertler made certain suggested changes and comments including but not limited to his recommendation to change the proposed 24 hour MiniVol sampling period to a shorter sampling interval. He pointed out that airflow in the study area is typically onshore during daylight hours, switching to offshore flow in the evenings as temperatures drop. Sampling during both periods would include emissions from both upwind and downwind of our sampling locations, making our source profiles less concentrated and specific. The recommendation was incorporated.

Q: Why do the testing?

A: There are a variety of reasons. However the City obviously must decide what they determine to be in their best interests. Initially the citizens in the city have repeatedly raised the issue. Irrespective of the results the testing would establish some type of base line for measuring the future, including but not limited potential increases in the future. In addition it may prove to be a negotiating tool for the future.

Also, contrary to what other may say, what the data will provide is a measurement of the amounts of heavy metals and PAHs at sampling stations in varying proximity to potential urban emission sources, including heavy auto traffic (freeway) and the airport. That information can be used by planners to determine whether airport-associated emissions make up a significant portion of the overall air pollution load of the region. Or if automotive sources are so substantial that any airport effect is undetectable. Air quality data collected at the sites of concern allows city officials and regulators to use their limited resources to address real, rather than imagined environmental impacts. The data set can indicate whether mitigation measures should be explored, and if needed, how they can be most effectively focused. A frequently suggested strategy for mitigating airport air quality impacts is to switch from diesel-fueled support vehicles to less-polluting options such as electric or hybrid vehicles. This approach is usually more cost-effective and feasible than reducing emissions from jet engines themselves.

Q: What type of questions will be addressed in the study?

A: How many fine airborne particles are present in the ambient air?

What concentrates of PAHs, trace metals and nitrogen species are associated with these particles?

Does the particle load and/or chemical signature vary between sampling locations?

How do the levels of fine particles and/or PAHs and heavy metals measured near John Wayne Airport compare to field measurements of other sites from the scientific literature?

How do these levels compare to standards set by air quality regulations?

Q: But isn't LA doing a study?

A: They are doing a variety of studies, all of which are related to environmental impacts 45 miles away. Moreover Dr. Boyle's report will compliment the LAX report, however it is much more chemically detailed as it will be able to distinguish in particular, between the ratios of organic carbon to elemental carbon (OC/EC) found in the different emission types.

Q: Is there a guarantee that the results will support people's beliefs regarding the effects of the airport on air quality?

A: No. We are talking a scientific study; the science is what it is.

Q: Is there a risk of doing the study?

A: Yes, if people have a preconceived notion of the outcome. The results could be Inconclusive; conclusive but show no negative effects from the airport; or

Conclusive and show negative effects of the airport. In all cases a baseline of information will be established.

Q: If the study demonstrates that there are significant environmental impacts as a result of Jet Fuel Emissions will it shut down the airport?

A: No. However the County will have to deal with the issue of future expansion and its impacts as well as incorporating certain mitigating measures to deal with the impacts.