Summary comments from airport workers on the Oakland Airport EIR

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Submitted

for The Plumbers and Steamfitters, U.A. Local 342.

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We used standard procedures and agency guidance throughout. Health risks from air-borne contaminants were estimated using a three-step procedure. First, a toxic emission inventory was prepared. This inventory quantifies the amount of each pollutant of concern that would be emitted from the airport in 2010 for the Project and no Project cases. The increase in emissions due to the Project is determined by subtracting the no Project emissions from the Project emissions. Second, the increase in toxic emissions due to the Project was used to estimate corresponding increases in ambient concentrations of each pollutant that are actually breathed by exposed individuals using U.S. EPA and California Air Resources Board ("CARB") approved models. Third, the ambient concentrations were converted into estimates of cancer and noncancer risk using standard U.S. EPA and California risk assessment procedures.

SUMMARY

These analyses indicate that off-site health impacts of the Project are significant and would increase the incidence of cancer and respiratory disease in residential neighborhoods around the airport and among employees at the airport itself. The highest exposures would occur in residential areas in Alameda in the southeast section of Bay Farm Island, in residential areas on both sides of 98th Street adjacent to I-880 in Oakland, and north of the San Leandro Marina. The maximum incremental cancer risk in 2010 due to the Project in these locations is 22 in one million and exceeds the significance threshold of 10 in one million by over a factor of two. The maximum incremental noncancer hazard index in 2010 due to the Project is 5 and exceeds the significance threshold of 1 by a factor of five.

The Project would also increase the risk of cancer and noncancer diseases to workers within the MOIA. The maximum exposures would occur north of Runway 29 along a service road in the North Airport. The maximum incremental cancer risk at this location is 16.9 in one million and the maximum chronic noncarcinogenic hazard index is 28.2, both of which exceed significance thresholds by large margins. Workers within the terminals would also receive significant exposures. The increase in cancer risk among workers within the terminals would be 10.5 in one million and the increase in chronic noncancer risk would be 16.4.

These estimates substantially underestimate the actual health risks posed by the Project because most of the toxic emissions were omitted due to the lack of adequate information in the FEIR and time constraints. The health risks calculated here are only those due to exhaust emissions from aircraft and associated ground support equipment. There are numerous additional sources of toxic emissions at airports, including the exhaust from passenger and employee automobiles, evaporative emissions from refueling aircraft, emissions from boilers, heaters and generators, and solvents from maintenance operations such as degreasing and coating. The FEIR did not contain adequate information to include these additional emissions in the health risk assessment. If these additional sources of toxic emissions were included, the actual health risks of the Project would be substantially higher than reported here. Finally, cumulative impacts from the Project and the 2010 baseline operations of the MOIA would be substantially higher than estimated here.

TOXIC EMISSION INVENTORY

The first step in performing a health risk assessment is to identify and quantify the toxic compounds that are emitted. Toxic emissions are the amount of toxic substances that are released per unit time into the atmosphere. Toxic emissions from airports have been previously studied and reported.

There are a large number of emission sources at an airport. These include:

- the exhaust from burning jet fuel, diesel, or gasoline in aircraft, vehicles used to transport passengers, employees, and supplies to the airport, ground support equipment ("GSE") used to service the aircraft, and auxiliary power units used to generate electricity and compressed air to operate the aircraft's systems;

- natural gas combustion byproducts from boilers, space heaters, and emergency generators;

- evaporative emissions from fueling aircraft and GSE and fuel storage tanks; and

- solvents and other organic compounds from numerous maintenance operations, including degreasing, plating, and coating.[2]

The only emission sources included in this risk assessment are exhaust emissions from aircraft and GSE. The FEIR did not contain adequate information on any of the other emission sources to include them in this analysis. Further, the time between the release of the FEIR on December 4 and the public hearing on December 16, 1997 was inadequate to acquire the information missing from the FEIR, prepare a detailed emission inventory for all of these sources, and perform the risk assessment. The FEIR either contained no information at all (maintenance, APUs, evaporative emissions from

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[2] Federal Aviation Administration and United States Air Force, Air Quality Procedures for Civilian Airports & Air Force Bases, April 1997, Sec. 3.2.

fueling), or there was inadequate information to estimate toxic emissions (evaporative emissions from fuel storage tanks, exhaust from passenger and other vehicles), or the location of the source was unknown and therefore could not be modeled (boilers, space heaters).

The increase in toxic exhaust emissions from aircraft and GSE in 2010 due to the Project was calculated using basic information in the FEIR coupled with standard U.S. EPA and CARB guidance. The increase was calculated in pound per year ("lbs/yr") as the difference between the Project in 2010 and no Project in 2010. Procedures used to estimate toxic emissions from aircraft and GSE are separately discussed below.

Aircraft Exhaust

Aircraft emit toxics from burning fuel. There are two general classes of aircraft engines, jet engines, which are turbines, and piston engines, which are used on smaller aircraft such as Cessnas. The emissions from each class of engine are distinct because of differences in the engines and their fuels. Jet engines burn jet fuel while piston engines burn aviation gas. The exhaust emissions from burning this fuel are emitted directly to the atmosphere.

The exhaust from jet and piston engines used in aircraft contains a large number of organic compounds. Review of the literature performed by the U.S. EPA[3] and studies performed by others[4] demonstrate that aircraft exhaust is a substantial source of

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[3] PEI Associates, Literature Review Concerning Air Carcinogens Near Airports, Report Prepared for the U.S. EPA, September 1987 and U.S. EPA, Toxic Emissions from Aircraft Engines: A Search of Available Literature, Report EPA-453-/R-93-028, July 1993.

[4] D.J. Robertson, R.H. Groth, and T.J. Blasko, Organic Content of Particulate Matter in Turbine Engine Exhaust, Journal of the Air Pollution Control Association, v. 30, no. 3, 1980, pp. 261-266; D.A. Berry, M.W. Holdren, T.F. Lyon, R.M. Riggin, and C.W. Spicer, Turbine Engine Exhaust Hydrocarbon Analysis, Air Force Engineering & Services Center Report ESL-TR-82-43, June 1983; C.W. Spicer, M.W. Holdren, T.F. Lyon, and R.M. Riggin, Composition and Photochemical Reactivity of Turbine Engine Exhaust, Air Force Engineering & Services Center Report ESL-TR-84-61, June 1985; C.W. Spicer, M.W. Holdren, S.E. Miller, D.E. Smith, R.N. Smith, and D.P. Hughes, Aircraft Emissions Characterization, Air Force Engineering & Services Center Report ESL-TR-87-63, March 1988; C.W. Spicer, M.W. Holdren, D.L. Smith, D.P. Hughes, and M.D. Smith, Chemical Composition of Exhaust from Aircraft Turbine Engines, Journal of Engineering for Gas Turbines and Power, v. 114, 1992, pp. 111-117; C.W. Spicer, M.W. Holdren, R.M. Riggin,

toxic air emissions and includes many carcinogens. Air emissions in weight per unit weight of fuel consumed substantially exceed those from catalyst-equipped automobiles.[5] Toxic organic compounds that have been detected in aircraft exhaust include acetaldehyde, benzaldehyde, formaldehyde, benzene, 1,3-butadiene, acrolein, toluene, xylenes, styrene, phenol, and numerous polynuclear aromatic hydrocarbons ("PAHs"), including anthracene, benzo(a)anthracene, dimethylnaphthalene, fluoranthene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, perylene, chrysene, benzacridine, and benzo(a)pyrene, among many others.

The composition of the exhaust from commercial jets for three power settings (idle/taxi, approach, and climbout/takeoff) for a CFM-56 engine is summarized in Table 1. The CFM-56 engine represents newer jet engine technology, was designed for low emissions, and is equivalent to the CF6-6 engine that powers the McDonnell Douglas DC-10 Series 10 tri-jet aircraft. This data has been used by both the U.S. EPA and the CARB to estimate speciation profiles for jet aircraft by weighting the concentrations for each mode by the time in that mode. Older generation engines, which are frequently found on aircraft used for cargo, have much higher toxic emissions, frequently double the concentrations reported in Table 1. Because about half of the increase in emissions in 2010 at the MOIA due to the Project are due to increases in cargo traffic, the use of profiles based on the data in Table 1 will underestimate health risks.

The health risk assessment only evaluated the impact of 10 compounds out of the 78 that were measured (marked by an asterisk in Table 1). The compounds that were evaluated include all of the known carcinogens (benzene, 1,3-butadiene, formaldehyde, acetaldehyde, carcinogenic polynuclear aromatic hydrocarbons) and three noncarcinogens (acrolein, xylene, styrene). Actual health impacts would be higher than estimated here because there are many additional toxic compounds present in aircraft exhaust that were not evaluated due to lack of adequate data.

Toxic emissions from jet and piston aircraft are estimated by multiplying the amount of total organic gases ("TOG") present in the exhaust by the fractional weight of each compound. The fractional weights can be estimated from the data in parts per million as carbon ("ppmC") in Table 1 by dividing the total measured organic gases by

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and T.F. Lyon, Chemical Composition and Photochemical Reactivity of Exhaust from Aircraft Turbine Engines, Annales Geophysicae, v. 12, 1994, pp. 944-955.

[5] C.W. Spicer, M.W. Holdren, S.E. Miller, D.L. Smith, R.N. Smith, and D.P. Hughes, Aircraft Emissions Characterization, Air Force Engineering & Services Center Report ESL-TR-87-63, March 1988.

TABLE 1. COMPOSITION OF JET EXHAUST (ppmC)[1]

Analyte	CFM-56 Engine		
	Idle/Taxi	Approach (30% Power)	Climbout/ Takeoff (80% Power)
Organic Compounds			
Methane	5.58	0.58	0.44
Ethane	1.11	0.04	ND
Ethene	35.25	ND	0.05
Propane	0.17	0.01	ND
Acetylene	9.67	ND	ND
Propene	10.34	0.01	ND
1-Butene	4.00	0.01	0.02
* 1,3-Butadiene	3.99	ND	0.01
c-2-Butene	0.48	0.01	ND
l-Pentene	1.77	ND	ND
n-Pentane	0.44	ND	ND
C5-ene	0.82	ND	ND
2-Methyl-2-butene	0.42	ND	ND
C5-ene	0.63	ND	ND
2-Methylpentane	0.91	ND	ND
1-Hexene	1.68	0.01	ND
* ✓ Benzene	4.13	0.02	0.02
l-Heptene	0.98	ND	0.04
n-Heptane	0.14	ND	ND
Toluene	1.56	0.01	ND
Hexanal	0.32	ND	0.01
l-Octene	0.63	ND	ND
n-Octane	0.14	ND	ND
Ethylbenzene	0.42	ND	ND
* m-p-Xylene	0.68	ND	ND
Styrene	0.76	0.01	ND
* o-Xylene	0.40	ND	0.01
l-Nonene	0.56	ND	ND
n-Nonane	0.14	0.01	ND
Phenol	0.40	ND	ND
l-Decene	0.42	ND	ND
n-Decane	0.72	0.013	0.002
C4-Benzene	0.52	ND	ND
n-Undecane	1.00	0.009	0.022
l-Decene	0.42	ND	ND
n-Decane	0.72	0.013	0.002
C4-Benzene	0.52	ND	ND
n-Undecane	1.00	0.009	0.002
C5-Cyclohexane	0.58	ND	ND
C5-Benzene	0.50	ND	ND

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Analyte	CFM-56 Engine		
	Idle/Taxi	Approach (30% Power)	Climbout/ Takeoff (80% Power)
n-Dodecane	1.04	0.071	0.042
C13-branched alkane	0.42	ND	ND
C14-branched alkane	0.42	ND	ND
n-Tridecane	1.21	0.015	0.022
2-Methyl naphthalene	0.51	ND	ND
1-Methyl naphthalene	0.61	ND	ND
C15-branched alkane	0.40	ND	ND
n-Tetradecane	0.94	0.019	0.02
C16-branched alkane	0.33	ND	ND
n-Pentadecane	0.39	0.01	0.009
n-Hexadecane	0.11	0.008	0.007
C16-branched alkane	0.004	ND	ND
n-Heptadecane	0.02	ND	ND
Carbonyl Compounds			
✓ * Formaldehyde	13.1	0.77	0.17
* Acetaldehyde	6.2	0.03	0.041
* Acrolein	4.2	< 0.01	< 0.01
Propanol	1.2	0.01	< 0.01
Acetone	0.61	0.16	0.069
Butanal/Crotonaldehyde	1.7	0.025	0.021
Benzaldehyde	0.99	< 0.01	< 0.01
Glyoxal	2.0	0.041	< 0.01
Methyl Glyoxal	2.0	< 0.01	< 0.01
Carcinogenic PAHs			
* Benzo(a)anthracene	0.00018	0.00018	0.00010
* Chrysene	0.00018	0.00002	0.00002
* Benzo(a)pyrene	0.00010	0.00012	0.00008
Non-carcinogenic PAHs			
Naphthalene	1.1	0.003	0.003
2-Methylnaphthalene	0.6	0.00002	0.0002
1-Methylnaphthalene	0.7	0.00002	0.0001
Dimethyl Naphthalene	0.04	0.00002	0.0002
Dimethyl Naphthalene	0.06	0.00002	0.0002
Dimethyl Naphthalene	0.2	0.00002	0.0002
Dimethyl Naphthalene	0.006	0.00002	0.0002
Phenanthrene	0.009	0.001	0.002
Anthracene	0.0010	0.00004	0.0001
Fluoranthrene	0.002	0.0003	0.0004

TABLE 1. COMPOSITION OF JET EXHAUST (ppmC)[1]

Analyte	CFM-56 Engine		
	Idle/Taxi	Approach (30% Power)	Climbout/ Takeoff (80% Power)
Pyrene	0.003	0.0002	0.0003
Benzo(e)pyrene	0.0002	0.0003	0.0002
Perylene	0.00002	0.00002	0.00002
Coronene	0.00002	0.00002	0.00002
Total Identified Species (ppmC)	**136**	**1.93**	**1.04**
Total Resolved Species (ppmC)	**182**	**2.67**	**3.95**
Total Species (ppmC)	**201**	**2.67**	**3.95**
Total Organics by Continous FID (ppmC)	**179**	**2.31**	**4.71**

1 Spicer et al., 1994.

* Compounds included in health risk assessment.