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B. Lemond ✓ 2-28-90
NEW

February 5, 1990

MEMORANDUM

TO: Distribution

FROM: Kay Thomas

RE: DOT Cabin Air Quality Study

Attached for your review is a portion of the draft cabin air quality study expected to be released this week -- possibly as early as today -- by the Department of Transportation.

The study apparently concludes that of the contaminants studied, only cosmic radiation and ETS pose a health risk to cabin crew and frequent travelers. Mitigation strategies proposed will include a total smoking ban and careful scheduling of cabin crew to reduce exposure to cosmic radiation.

The study will present several lung cancer risk estimates for ETS exposure aboard airliners (see exhibit 3), based on both phenomenological and multistage models. On domestic flights, according to the phenomenological model, the lifetime risk per 100,000 nonsmoking cabin occupants is 12.06 for cabin crew members, 0.83 for frequent flyers and 0.11 for casual passengers. Figures based on the multistage model are 14.86. 0.27 and 0.08 for these respective groups.

I'm forwarding the material we have to several of our consulting scientists for any comments they may have that will assist us with The Institute's response.

Please keep this draft confidential, and please call with any questions or comments.

Attachment

Distribution

Brennan Dawson
Martin Gleason
Bob Lewis
Charley Powers
Susan Stuntz

John Rupp
Bill Davis

cc: Larry Holcomb
Max Layard
Maurice LeVois

EXHIBIT 1. AVERAGE CONCENTRATIONS OF ETS CONTAMINANTS ON SMOKING AND NONSMOKING FLIGHTS

Parameter	Smoking Flights[1]				Nonsmoking Flights	
	Smoking Section	No-smoking Section				
		Boundary Rows	Middle Rows	Remote Rows	Rear Rows	Middle Rows
Particle-Phase Measurements						
Average RSP[2], $\mu g/m^3$	175.8	53.6	30.7	35.0	34.8	40.0
Peak RSP[3] (1 minute), $\mu g/m^3$	883.4	211.8	68.7	69.6		
Gas-Phase Measurements						
Average Nicotine, $\mu g/m^3$	13.43	0.26	0.04	0.05	0.00	0.08
Percent Nicotine Samples Below Minimum Detection	4.3	54.4	82.6	66.7	100.0	78.3
Average CO, ppm[4]	1.4	0.6	0.7	0.8	0.6	0.5
Peak CO (1 minute), ppm	3.4	1.4	1.7	1.6	1.3	0.9

[1] An average of 13.7 percent of the passengers were assigned to the coach smoking section on monitored smoking flights.

[2] Average of gravimetric and optical measurement results; micrograms per cubic meter ($\mu g/m^3$)

[3] Optical method measurements

[4] ppm: parts per million

EXHIBIT 2. AVERAGE CONCENTRATIONS OF SELECTED POLLUTANTS ON SMOKING AND NONSMOKING FLIGHTS

Parameter	Smoking Flights		Nonsmoking Flights
	Smoking Rows	Middle Rows	
Average CO_2, ppm[1]	1562	1568	1756
Percent CO_2 Samples ≥ 1,000 ppm	87.0	88.1	87.0
Average Ozone, ppm	0.01	0.01	0.02
Percent Ozone Samples ≥ 0.1 ppm	0.0	0.0	0.0
Average Bacteria[2], CFU/m^3	162.7	131.2	131.1
Average Fungi, CFU/m^3	5.9	5.0	9.0

[1]ppm: parts per million

[2]CFU/m^3: colony forming units per cubic meter

EXHIBIT 3. ESTIMATED LIFETIME RISKS OF PREMATURE LUNG CANCER DEATH ASCRIBABLE TO ETS ON SMOKING FLIGHTS PER 100,000 NONSMOKING CABIN OCCUPANTS

Type of Flight/ Risk Model	Cancer Risk per 100,000 Cabin Occupants		
	Cabin Crew Member[1]	Business Passenger[2]	Casual Passenger[3]
Domestic Flights			
Phenomenological Model	12.06	0.83	0.11
Multistage Model	14.86	0.27	0.08
International Flights			
Phenomenological Model	13.46	0.61	0.08
Multistage Model	16.59	0.20	0.06

[1]Assumed to fly 960 hours per year for 20 years, starting at age 25.

[2]Assumed to fly 480 hours per year for 30 years, starting at age 35.

[3]Assumed to fly 48 hours per year for 40 years, starting at age 25.

EXHIBIT 4. ESTIMATED LIFETIME RISKS OF PREMATURE CANCER DEATH ASCRIBABLE TO IN-FLIGHT COSMIC RADIATION EXPOSURE PER 100,000 FLYING CABIN OCCUPANTS

Type of Flight/Path	Cancer Risk per 100,000 Cabin Occupants	
	Cabin Crew Members Flying 960 Hours Per Year	Passengers Flying 480 Hours Per Year
Domestic Flights[1]		
East-West (≤2 hours)	18 to 42	9 to 21
East-West (>3 hours)	59 to 61	29 to 30
North-South (≤2 hours)	5 to 31	3 to 16
North-South (>3 hours)	49	25
International Flights[2]		
Long, circumpolar (13 hours)	30	15
Medium, non-circumpolar (7 - 9 hours)	23 to 29	11 to 14
Short, non-circumpolar (≤3 hours)	13 to 17	7 to 9

[1]Assuming 20 years of flying.

[2]Assuming 10 years of flying.