

APPENDIX 5E

**Airport Operation
Information**

Project : HKBCF – Air Quality Assessment
Title : Air port Operational Information for 2020

<u>Parameters</u>	<u>Values</u>
Annual Aircraft Movement	: 420, 845
Annual Passenger	: 87 Millions
Runway Mode	: Mixed
Aircraft Fleet Mix	: See Table C2-2
Taxi Time	: See Table C2-3
Percentage Break-Down of LTOs	: See Table C2-4
Annual LTO	: 210,423
Departure Queue Length	: See Table C2-5
GSE Assignment	: See Table C3-1
Aircraft Hourly Operational Profile	: See Table C7-1
Aircraft Daily Operational Profile	: See Table C7-2

Table C2-2 Aircraft Fleet Mix

Aircraft Category	Aircraft type	Year 2000		Year 2020	
		Percentage of Total	Percentage of Category	Percentage of Total	Percentage of Category
747	B747-400		68.8		65.8
	B747-200F		15.7		13.1
	B747-400F		6.6		5.5
	B747-200C		6.3		13.1
	B747-100		1.9		1.8
	Others		0.7		0.7
	Total		30.8		30.9
Other Wide Body	A330		22.6		25.0
	A340-300		17.5		15.4
	A300-600		13.9		1.4
	B777-200		13.5		20.9
	B777-300		9.9		15.4
	B767-300ER		7.5		3.5
	MD-11		4.2		4.0
	MD-11-11F		3.5		3.4
	A330-300		2.4		2.7
	DC10-40		1.3		0
	A310-300		0.9		4.1
	B767-200ER		0.8		0.4
	A310		0.6		2.5
	Others		1.4		1.3
Total		44.7		51.9	
Narrow Body	A320		34.1		43.1
	B757-200		16.4		19.6
	B737-300		10.7		5.2
	B737-800		9.5		4.6
	MD-90-30		7.5		11.4
	A320-100		7.4		9.4
	B737-500		5.8		2.8
	MD-80-82		2.4		0
	B737-400		2.1		1.0
	B737-100		0.8		0.4
	Gulfstream II/III		0.7		0.6
	B757-200F		0.5		0.6
	Others		2.1		1.3
Total		24.5		12.5	
New Large Aircraft	A380			4.7	

a The percentage of LTOs of this category over annual LTOs of all aircraft

b The percentage of LTOs of this aircraft type over LTOs of the entire category

Table C2-3 Taxi Time

Scenario	Taxi Time (min)
Year 2000 ^a	21.0
Year 2020	27.8

a. Derived from the "chock on/off" data, which contains the time of landing, chock on (arrive at a gate), chock off (depart from a gate) and takeoff. Thus actual queue time is included.

Taxi time is calculated using the following equation:

Taxi-in Time = TimeChock on - TimeLanding

Taxi-out Time = TimeTakeoff - TimeChock off

Taxi Time = Taxi-in Time + Taxi-out Time

Taxi Time is calculated for each aircraft for 5 days selected from the chock on/off dataset, and an average is calculated, which is 21.0 as shown in this table.

Table C2-4 Percentage Break-Down of LTOs Based on Routes (Runway-Taxiway Combinations)^{a, b}

Year	Arrival Runway				Departure Runway	
	07L	07R	25L	25R	07L	07R
Year 2000	30.0	30.0	20.0	20.0	60.0	40.0
Year 2020	14.4	9.6	9.6	6.4	30.0	30.0
Year 2020	21.6	14.4	14.4	9.6	20.0	20.0

a. A "route" is a combination of arrival runway, taxiways and departure runway, which from the model point of view, represents a series of area sources (segments of runways and taxiways). For example, route "07L-NG1-07R" represents the route of an aircraft which arrives at runway 07L, stops at the gate NG1 (on the north side of the existing passenger terminal building), and departs at the runway 07R.

b. The notation for each route is as following:

Runways - 07R/25L, 07L/25R

Gate Areas: NG1 - all gates at the north side of the existing passenger terminal building

SG1 - all gates at the south side of the existing passenger terminal building

CG - the cargo gate

NG2 - all gates at the north side of the proposed midfield terminal building

SG2 - all gates at the south side of the proposed midfield terminal building

Table C2-5 Departure Queue Length

Scenario	Peak Queue Time (minutes)	Peak Queue Length (meters)
Year 2000	16 ^a	740 ^b
Year 2020	29 ^c	1,628 ^d

- a. The queue time is estimated based on taxi-out time which already includes the queue time. Assuming that the longest taxi-out time is resulting from queuing, while the shortest taxi-out time is due to lack of queuing. The queue time is estimated as the difference between the highest accumulative 5% taxi-out time and the lowest accumulative 5% taxi-out time.
- b. The one-way runway capacity is 35 movements per hour, thus 1.7 minutes per aircraft. Therefore, the peak hour queue time of 16 minutes is equivalent to 10 aircraft waiting in line. Assuming all these aircraft are of the size of Boeing 747, which is 71 meters long, plus 3 meters cushion space, the total queue length is 740 meters.
- c. The peak queue time and queue length is derived based on the difference between the runway capacity and the peak hour aircraft movements. The two-way runway capacity is 75 aircraft movements per hour. The two-way peak hour aircraft movement is 97. The difference is 22 movements. Assuming all the difference is due to the departure, i.e. the queue consists 22 aircraft. According to the one-way capacity of runway, which is 45 aircraft movements, it takes 1.3 minutes for each aircraft to depart. Therefore, it will take 29 minutes for 22 aircraft in queue to takeoff, i.e., the peak queue time is 29 minutes.
- d. Assuming all of the 22 queuing aircraft are of the size of Boeing 747, which is 71 meters, and plus a cushion space of 3 meters, the peak hour queue length is 1628 meters.

Table C3-1 GSE Assignment – Commercial

A300-600	7	8	26	120	35	35	92	-	20	32	25	12	-	-
A300-600F	7	8	26	108	46	-	80	100	-	32	25	7	-	-
A300-B4	7	8	26	108	46	35	92	-	20	32	25	7	-	-
A310	7	8	26	108	46	35	92	-	20	32	25	7	-	-
A310-200	7	8	26	108	46	35	92	-	20	32	25	7	-	-
A310-200F	7	8	26	108	46	-	80	100	-	32	25	7	-	-
A310-300	7	8	26	108	46	35	92	-	20	32	25	7	-	-
A319	7	8	26	34.4	39.3	16.6	-	-	16.4	20	15	12	-	-
A320/320-100	7	8	26	75	48	20	-	-	15	12	15	12	-	-
A330/330-300	7	8	26	108	46	35	92	-	20	32	25	7	-	-
A340-300	7	8	26	108	46	35	92	-	20	32	25	7	-	-
A380	7	8	26	108	46	35	92	-	20	32	25	7	-	-
B707-300	7	8	26	34.4	39.3	16.6	-	-	-	20	15	12	-	-
B727-200/200F	7	8	26	45	45	20	-	-	15	12	15	12	-	-
B737-100	7	8	26	34.4	39.3	16.6	-	-	16.4	20	15	12	-	-
B737-200/200C	7	8	26	15.8	35	13.8	-	-	13.6	18.4	15	12	-	-
B737-300	7	8	26	68	48	20	-	-	10	12	15	12	-	-
B737-400	7	8	26	75	48	20	-	-	18	12	15	12	-	-
B737-500	7	8	26	15.8	35	13.8	-	-	13.6	18.4	15	12	-	-
B737-800	7	8	26	45	45	20	-	-	15	12	15	12	-	-
B747-100/100SR	7	8	26	108	46	35	92	-	20	32	25	7	-	-
B747-200C	7	8	26	108	46	35	92	100	20	32	25	7	-	-
B747-300	7	8	26	108	46	35	92	-	20	32	25	7	-	-
B747-400	7	8	26	108	46	35	92	-	20	32	25	7	-	-
B747-SP	7	8	26	108	46	35	80	-	20	32	25	7	-	-
B747-200F/400F	7	8	26	108	46	-	80	100	-	32	25	7	-	-
B757-200/200F	7	8	26	43	40.5	20.9	-	-	24	25	15	12	-	-
B767-200ER	7	8	26	108	46	35	80	-	20	32	25	7	-	-
B767-300ER	7	8	26	108	46	35	80	-	20	32	25	7	-	-
B777-200	7	8	26	108	46	35	80	-	20	32	25	7	-	-
B777-300	7	8	26	108	46	35	80	-	20	32	25	7	-	-
Beech King Air 200	-	-	-	35	-	-	-	-	-	-	-	-	10	40
Canadair reg 100	-	5	26	15.3	21.3	-	-	-	10	-	15	-	28	-
Citation V	-	5	-	-	-	-	-	-	-	-	-	-	20	40
CL-600	-	5	-	35	30	-	-	-	10	-	15	-	20	50
DC-10-30/40	7	8	26	108	46	35	80	-	20	32	25	7	-	-
DC-10F	7	8	26	108	46	-	80	100	-	32	25	7	-	-
DC-8/8-50F	7	8	26	34.4	39.3	16.6	-	-	16.4	20	15	12	-	-
DO328	-	5	26	35	30	10	-	-	10	-	15	-	20	-
F28-4000	-	5	26	75	48	-	-	-	15	-	15	12	20	-
Falcon 20/30	-	5	-	-	-	-	-	-	-	-	-	-	20	40
Fokker 100	7	8	26	75	41	20	-	-	10	13.2	15	7	-	-
Gulfstream II	-	5	-	35	30	-	-	-	10	-	15	-	20	50
Gulfstream IV	-	5	26	7	30	-	-	-	10	-	15	-	20	-
HS125	-	5	-	-	-	-	-	-	-	-	-	-	20	40
JLR6	7	8	26	108	46	35	80	-	20	32	15	7	-	-
L-100 HERCULES	-	8	26	-	-	-	-	-	-	20	-	-	-	-
L-1011-1	7	8	26	108	46	35	92	-	20	32	41.5	7	-	-
Leapjet 35/36	-	-	-	-	-	-	-	-	-	-	-	-	10	40
MD-11	7	8	26	108	46	35	92	-	20	32	41.5	7	-	-
MD-11-11F	7	8	26	108	46	-	80	100	-	32	40	7	-	-
MD-80-82/83	7	8	26	34.4	39.3	16.6	-	-	16.4	20	24.6	12	-	-
MD-80-30	7	8	26	34.4	39.3	16.6	-	-	16.4	20	24.6	12	-	-
Piper PA 28	-	-	-	-	-	-	-	-	-	-	-	-	10	-
Tu-154	7	8	26	75	48	-	-	-	15	12	15	-	10	-

Table C3-1 GSE Assignment - Military

C-17A	10	20	10
G5-galaxy	10	120	10
KC-10A/135-R	10	120	10

Table C3-1 GSE Assignment Details						
AIR_NAME	ENG_NAME	GSE_NAME	OPERATION TIME (min)	HORSEPOWER	LOADFACTOR	REFERENCE
A310-200	JT9D-7R4E1	Air Start	7.00	425	0.9000	ACE 180
A310-200F	CF6-80A3	Air Start	7.00	425	0.9000	ACE 180
B727-200F	JT8D-15	Baggage Tractor	75.00	71	0.5500	
B727-200F	JT8D-15	Aircraft Tractor	8.00	88	0.8000	Stewart & Stevenson TUG GT-35, Douglas TBL-180
A300-600F	CF6-80C2A5F	Water Service	7.00	160	0.2000	
A300-600F	CF6-80C2A5F	Lavatory Truck	25.00	195	0.2500	Wollard TLS-770 / F350
A300-600F	CF6-80C2A5F	Cargo Loader	100.00	133	0.5000	FMC Commander 30
A300-600F	CF6-80C2A5F	Baggage Tractor	108.00	107	0.5500	
A300-600F	CF6-80C2A5F	Aircraft Tractor	8.00	340	0.8000	Stewart & Stevenson TUG T-750
A300-B4	CF6-80C2A5	Water Service	7.00	160	0.2000	
A300-B4	CF6-80C2A5	Lavatory Truck	25.00	195	0.2500	Wollard TLS-770 / F350
A300-B4	CF6-80C2A5	Hydrant Truck	32.00	235	0.7000	
A300-B4	CF6-80C2A5	Catering Truck	20.00	210	0.5300	Hi-Way F650
A300-B4	CF6-80C2A5	Belt Loader	46.00	107	0.5000	
A300-B4	CF6-80C2A5	Baggage Tractor	108.00	107	0.5500	
A300-B4	CF6-80C2A5	Aircraft Tractor	8.00	340	0.8000	Stewart & Stevenson TUG T-750
A310-200	JT9D-7R4E1	Lavatory Truck	25.00	195	0.2500	Wollard TLS-770 / F350
A310-200	JT9D-7R4E1	Hydrant Truck	32.00	235	0.7000	
A310-200	JT9D-7R4E1	Catering Truck	20.00	210	0.5300	Hi-Way F650
A310-200	JT9D-7R4E1	Belt Loader	46.00	107	0.5000	
A310-200	JT9D-7R4E1	Baggage Tractor	108.00	107	0.5500	
A310-200	JT9D-7R4E1	Aircraft Tractor	8.00	340	0.8000	Stewart & Stevenson TUG T-750
A310-200F	CF6-80A3	Lavatory Truck	25.00	195	0.2500	Wollard TLS-770 / F350
A310-200F	CF6-80A3	Hydrant Truck	32.00	235	0.7000	
A310-200F	CF6-80A3	Cargo Loader	80.00	80	0.5000	FMC Commander 15
A310-200F	CF6-80A3	Belt Loader	46.00	107	0.5000	
A310-200F	CF6-80A3	Baggage Tractor	108.00	107	0.5500	
A310-200F	CF6-80A3	Aircraft Tractor	8.00	340	0.8000	Stewart & Stevenson TUG T-750
A310-300	CF6-80C2A8	Lavatory Truck	25.00	195	0.2500	Wollard TLS-770 / F350
A310-300	CF6-80C2A8	Hydrant Truck	32.00	235	0.7000	
A310-300	CF6-80C2A8	Catering Truck	20.00	210	0.5300	Hi-Way F650
A310-300	CF6-80C2A8	Belt Loader	46.00	107	0.5000	
A310-300	CF6-80C2A8	Baggage Tractor	108.00	107	0.5500	
A310-300	CF6-80C2A8	Aircraft Tractor	8.00	340	0.8000	Stewart & Stevenson TUG T-750
A310-300	CF6-80C2A8	Air Start	7.00	620	0.9000	ACE 180
A319	CFM56-5B6/P	Lavatory Truck	15.00	160	0.2500	Wollard TLS-770 / F350
A319	CFM56-5B6/P	Hydrant Truck	20.00	235	0.7000	
A319	CFM56-5B6/P	Catering Truck	16.40	210	0.5300	Hi-Way F650
A319	CFM56-5B6/P	Belt Loader	39.30	107	0.5000	
A319	CFM56-5B6/P	Baggage Tractor	34.40	107	0.5500	
A319	CFM56-5B6/P	Aircraft Tractor	8.00	275	0.8000	Stewart & Stevenson TUG GT-50H
A320	V2500-A1	Lavatory Truck	15.00	160	0.2500	Wollard TLS-770 / F350
A320	V2500-A1	Hydrant Truck	12.00	235	0.7000	
A320	V2500-A1	Catering Truck	15.00	210	0.5300	Hi-Way F650
A320	V2500-A1	Belt Loader	48.00	107	0.5000	
A320	V2500-A1	Baggage Tractor	75.00	107	0.5500	
A320	V2500-A1	Aircraft Tractor	8.00	275	0.8000	Stewart & Stevenson TUG GT-50H

Table C7-1 Aircraft Hourly Operational Profiles

Hour	Weights of Aircraft		Weights of Flight	
	Year 2000	Year 2020	Year 2000	Year 2020
1	0.19	0.03	0.60	0.31
2	0.06	0.00	0.50	1.00
3	0.04	0.00	0.39	0.38
4	0.09	0.14	0.38	0.83
5	0.02	0.00	0.38	0.00
6	0.10	0.00	0.28	0.13
7	0.14	0.24	0.27	0.44
8	0.12	0.40	0.41	0.44
9	0.45	0.72	0.52	0.25
10	0.58	0.99	0.57	0.25
11	0.74	0.99	0.75	0.19
12	0.80	0.95	0.77	0.44
13	0.97	0.99	0.80	0.25
14	1.00	0.96	0.71	0.38
15	0.91	0.99	0.71	0.25
16	0.86	1.00	0.79	0.19
17	0.87	0.99	0.85	0.25
18	0.81	0.93	0.82	0.44
19	0.78	0.95	0.72	0.44
20	0.73	0.93	0.81	0.50
21	0.68	0.93	0.92	0.50
22	0.51	0.70	1.00	0.50
23	0.49	0.76	0.88	0.50
24	0.25	0.57	0.65	0.50

a. Derived from chock on/off data of year 2000 provided by AAHK.

Table C7-2 Aircraft Daily Operational Profile^a

Weights	0.89	0.87	0.94	0.99	0.98	1.00	0.95
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a. Derived from chock on/off data of year 2000. Same profile is used for the Year 2020.