

Annex C

Detailed Calculations of Operational Noise Levels

Expansion of Heliport Facilities at Macau Ferry Terminal - Operational Phase Noise Monitoring (Day-time)

Date: 17 September 2009
Time: 15:14 - 16:33
Location: Wayson Commercial Building (roof level)
Weather Condition: Sunny

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level, dB(A)				Other Noise Sources #
						LAeq	LA10	LA90	LAMax	
(A). Measured Helicopter Noise Data (with background)										
1	AW139	EW	15:17	Approach	71	74	74	73	80	
		-		Hovering	26	74	75	74	77	
		-		Idling	1015	73	73	72	80	
		EW	15:36	Take-off	72	74	75	74	81	
2	AW139	EW	15:50	Approach	70	73	73	72	78	
		-		Hovering	29	74	74	73	77	
		-		Idling	433	73	73	73	81	
		EW	15:59	Take-off	67	74	74	73	78	
3	AW139	EW	16:19	Approach	76	72.8	73	72	76	
		-		Hovering	22	73.0	73	72	75	
		-		Idling	695	72.8	73	72	79	
		EW	16:32	Take-off	62	73.3	74	73	77	

Remark: # Non-project related noise sources, those peak noise levels significantly mask that recorded due to operation of the new helipad.
 * EW - Flight direction from East to West; WE - Flight direction from West to East.

(B). Measured Background level, dB(A)

Corresponding Flight Ref. No.	Background Level, LAeq, dB(A)	Major Noise Sources
1	72	Road traffic noise, and noise due to airplane passing-by, and TurboJet arrival/ departure at HK-Macau Ferry Terminal
2	72	
3	73	

(C). Calculated Helicopter Noise Level (without background)

Flight Ref. No.	Flight Model	Flight Direction ##	Approx. Time	Flight Event	Duration of Flight Event, s	LAMax
1	AW139	EW	15:17	Approach	71	79
		-		Hovering	26	75
		-		Idling	1015	79
		EW	15:36	Take-off	72	81
2	AW139	EW	15:50	Approach	70	77
		-		Hovering	29	75
		-		Idling	433	80
		EW	15:59	Take-off	67	76
3	AW139	EW	16:19	Approach	76	73
		-		Hovering	22	72
		-		Idling	695	78
		EW	16:32	Take-off	62	75

Highest Lmax level, dB(A): 81

Remark: ## EW - Flight direction from East to West; WE - Flight direction from West to East.

Expansion of Heliport Facilities at Macau Ferry Terminal - Operational Phase Noise Monitoring (Evening-time)

Date: 18 September 2009
 Time: 19:00 - 23:00
 Location: Wayson Commercial Building (roof level)
 Weather Condition: Cloudy

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level, dB(A)			Other Noise Sources #
						LAeq	LA10	LA90	
(A). Measured Helicopter Noise Data (with background)									
1	AW139	-	19:04	Approach **					
		-		Hovering **					
		-		Idling	262	72	72	72	
		EW		Take-off	75	73	73	72	
2	AW139	EW	19:27	Approach	71	72	72	72	
		-		Hovering	25	72	72	72	
		-	19:35	Idling	358	72	72	72	
		EW		Take-off	79	74	74	73	
3	AW139	WE	19:52	Approach	71	76	77	76	
		-		Hovering	24	73	74	73	
		-	20:05	Idling	710	72	72	71	
		EW		Take-off	70	73	73	72	
4	AW139	WE	20:22	Approach	76	75	75	74	
		-		Hovering	22	77	77	76	
		-	20:32	Idling	505	72	72	71	
		EW		Take-off	72	73	74	72	
5	AW139	WE	20:57	Approach	68	76	77	76	
		-		Hovering	24	72	72	71	
		-	21:05	Idling	376	71	71	71	
		EW		Take-off	67	72	72	71	
6	AW139	EW	21:25	Approach	67	70	71	70	
		-		Hovering	23	71	72	71	
		-	21:34	Idling	455	71	71	70	
		EW		Take-off	64	73	73	72	
7	AW139	EW	21:50	Approach	71	71	72	71	
		-		Hovering	28	72	72	71	
		-	21:58	Idling	382	71	71	70	
		EW		Take-off	72	71	72	71	
8	AW139	EW	22:20	Approach	75	71	71	71	
		-		Hovering	23	72	73	72	
		-	22:30	Idling	510	71	71	70	
		EW		Take-off	71	71	71	70	
9	AW139	WE	22:48	Approach	67	75	76	74	
		-		Hovering	22	77	79	75	
		-	22:55	Idling	317	71	71	70	
		EW		Take-off	65	73	73	72	

Remark: # Non-project related noise sources, those peak noise levels significantly mask that recorded due to operation of the new helipad.
 * EW - Flight direction from East to West; WE - Flight direction from West to East.
 ** Noise measurement was commenced at 19:00. Thus, noise data before this time is not available.

(B). Measured Background level, dB(A)

Corresponding Flight Ref. No.	Background Level, LAeq, dB(A)	Major Noise Sources
1 *	72	Road traffic noise, and noise due to airplane passing-by, and TurboJet arrival/ departure at HK-Macau Ferry Terminal
2	72	
3	72	
4	71	
5	70	
6	70	
7	71	
8	70	
9	70	

Remark: * Based on background noise level recorded before the second flight.

(C). Calculated Helicopter Noise Level (without background)

Flight Ref. No.	Flight Model	Flight Direction ##	Approx. Time	Flight Event	Duration of Flight Event, s	LAeq
1	AW139	-	19:04	Approach **		
		-		Hovering **		
		-		Idling	262	62
		EW		Take-off	75	67
2	AW139	EW	19:27	Approach	71	63
		-		Hovering	25	62
		-		Idling	358	63
		EW		Take-off	79	69
3	AW139	WE	19:52	Approach	71	75
		-		Hovering	24	69
		-		Idling	710	60
		EW		Take-off	70	67
4	AW139	WE	20:22	Approach	76	72
		-		Hovering	22	75
		-		Idling	505	63
		EW		Take-off	72	69
5	AW139	WE	20:57	Approach	68	75
		-		Hovering	24	66
		-		Idling	376	63
		EW		Take-off	67	67
6	AW139	EW	21:25	Approach	67	59
		-		Hovering	23	64
		-		Idling	455	64
		EW		Take-off	64	69
7	AW139	EW	21:50	Approach	71	61
		-		Hovering	28	63
		-		Idling	382	61
		EW		Take-off	72	63
8	AW139	EW	22:20	Approach	75	64
		-		Hovering	23	69
		-		Idling	510	62
		EW		Take-off	71	63
9	AW139	WE	22:48	Approach	67	73
		-		Hovering	22	76
		-		Idling	317	65
		EW		Take-off	65	69

Average Noise Level (4 hrs), dB(A): 61

Remark:

EW - Flight direction from East to West; WE - Flight direction from West to East.

** Noise measurement was commenced at 19:00. Thus, noise data before this time is not available.

Expansion of Heliport Facilities at Macau Ferry Terminal - Operational Phase Noise Monitoring (Day-time)

Date: 18 September 2009
Time: 16:18-17:36
Location: Seaview Commercial Building (roof level)
Weather Condition: Sunny

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level, dB(A)				Other Noise Sources #
						LAeq	LA10	LA90	LAMax	
(A). Measured Helicopter Noise Data (with background)										
1	AW139	WE	16:23	Approach	77	71	71	71	73	
		-		Hovering	24	72	72	72	74	
		-		Idling	546	72	72	71	75	
		EW	16:34	Take-off	70	74	74	73	81	
2	AW139	WE	16:50	Approach	75	71	72	71	74	
		-		Hovering	24	73	73	72	76	
		-		Idling	619	72	72	71	77	
		EW	17:01	Take-off	70	72	73	72	79	
3	AW139	WE	17:18	Approach	73	72	72	72	75	
		-		Hovering	26	72	72	72	73	
		-		Idling	932	72	72	72	78	
		EW	17:35	Take-off	71	73	73	73	78	

Remark: # Non-project related noise sources, those peak noise levels significantly mask that recorded due to operation of the new helipad.
 * EW - Flight direction from East to West; WE - Flight direction from West to East.

(B). Measured Background level, dB(A)

Corresponding Flight Ref. No.	Background Level, LAeq, dB(A)	Major Noise Sources
1	71	Road traffic noise, and noise due to airplane passing-by, and TurboJet arrival/ departure at HK-Macau Ferry Terminal
2	71	
3	72	

(C). Calculated Helicopter Noise Level (without background)

Flight Ref. No.	Flight Model	Flight Direction ##	Approx. Time	Flight Event	Duration of Flight Event, s	LAMax
1	AW139	WE	16:23	Approach	77	68
		-		Hovering	24	71
		-		Idling	546	72
		EW	16:34	Take-off	70	80
2	AW139	WE	16:50	Approach	75	71
		-		Hovering	24	73
		-		Idling	619	76
		EW	17:01	Take-off	70	78
3	AW139	WE	17:18	Approach	73	72
		-		Hovering	26	69
		-		Idling	932	77
		EW	17:35	Take-off	71	76

Highest Lmax level, dB(A): 80

Remark: ## EW - Flight direction from East to West; WE - Flight direction from West to East.

Expansion of Heliport Facilities at Macau Ferry Terminal - Operational Phase Noise Monitoring (Evening-time)

Date: 18 September 2009
 Time: 19:00 - 23:00
 Location: Seaview Commercial Building (roof level)
 Weather Condition: Cloudy

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level, dB(A)			Other Noise Sources #
						LAeq	LA10	LA90	
(A). Measured Helicopter Noise Data (with background)									
1	AW139	-	19:04	Approach **					
		-		Hovering **					
		-		Idling	262	72	72	71	
		EW		Take-off	75	72	73	72	
2	AW139	EW	19:27	Approach	71	71	71	71	
		-		Hovering	25	71	71	71	
		-	19:35	Idling	358	71	72	71	
		EW		Take-off	79	73	73	72	
3	AW139	WE	19:52	Approach	71	76	77	76	
		-		Hovering	24	73	73	72	
		-	20:05	Idling	710	71	71	71	
		EW		Take-off	70	71	71	71	
4	AW139	WE	20:22	Approach	76	74	75	74	
		-		Hovering	22	73	73	72	
		-	20:32	Idling	505	71	71	70	
		EW		Take-off	72	72	73	72	
5	AW139	WE	20:57	Approach	68	76	76	75	
		-		Hovering	24	74	74	73	
		-	21:05	Idling	376	70	71	70	
		EW		Take-off	67	71	71	70	
6	AW139	EW	21:25	Approach	67	70	70	70	
		-		Hovering	23	70	71	70	
		-	21:34	Idling	455	70	71	70	
		EW		Take-off	64	72	72	71	
7	AW139	EW	21:50	Approach	71	70	71	70	
		-		Hovering	28	71	71	71	
		-	21:58	Idling	382	70	70	70	
		EW		Take-off	72	71	71	70	
8	AW139	EW	22:20	Approach	75	70	71	70	
		-		Hovering	23	71	71	71	
		-	22:30	Idling	510	70	70	70	
		EW		Take-off	71	71	72	71	
9	AW139	WE	22:48	Approach	67	73	74	73	
		-		Hovering	22	77	78	76	
		-	22:55	Idling	317	70	70	70	
		EW		Take-off	65	73	73	72	

Remark: # Non-project related noise sources, those peak noise levels significantly mask that recorded due to operation of the new helipad.
 * EW - Flight direction from East to West; WE - Flight direction from West to East.
 ** Noise measurement was commenced at 19:00. Thus, noise data before this time is not available.

(B). Measured Background level, dB(A)

Corresponding Flight Ref. No.	Background Level, LAeq, dB(A)	Major Noise Sources
1 *	71	Road traffic noise, and noise due to airplane passing-by, and TurboJet arrival/ departure at HK-Macau Ferry Terminal
2	71	
3	71	
4	71	
5	70	
6	70	
7	70	
8	70	
9	70	

Remark: * Based on background noise level recorded before the second flight.

(C). Calculated Helicopter Noise Level (without background)

Flight Ref. No.	Flight Model	Flight Direction ##	Approx. Time	Flight Event	Duration of Flight Event, s	LAeq
1	AW139	-	19:04	Approach **		
		-		Hovering **		
		-		Idling	262	61
		EW		Take-off	75	66
2	AW139	EW	19:27	Approach	71	61
		-		Hovering	25	61
		-	19:35	Idling	358	58
		EW		Take-off	79	67
3	AW139	WE	19:52	Approach	71	75
		-		Hovering	24	68
		-	20:05	Idling	710	61
		EW		Take-off	70	61
4	AW139	WE	20:22	Approach	76	72
		-		Hovering	22	69
		-	20:32	Idling	505	59
		EW		Take-off	72	68
5	AW139	WE	20:57	Approach	68	74
		-		Hovering	24	71
		-	21:05	Idling	376	57
		EW		Take-off	67	62
6	AW139	EW	21:25	Approach	67	58
		-		Hovering	23	61
		-	21:34	Idling	455	61
		EW		Take-off	64	68
7	AW139	EW	21:50	Approach	71	59
		-		Hovering	28	64
		-	21:58	Idling	382	60
		EW		Take-off	72	64
8	AW139	EW	22:20	Approach	75	61
		-		Hovering	23	65
		-	22:30	Idling	510	58
		EW		Take-off	71	66
9	AW139	WE	22:48	Approach	67	70
		-		Hovering	22	77
		-	22:55	Idling	317	58
		EW		Take-off	65	69

Average Noise Level (4 hrs), dB(A): 60

Remark:

EW - Flight direction from East to West; WE - Flight direction from West to East.

** Noise measurement was commenced at 19:00. Thus, noise data before this time is not available.

Expansion of Heliport Facilities at Macau Ferry Terminal - Operational Phase Noise Monitoring (Day-time)

Date: 22 September 2009
Time: 15:45 - 17:01
Location: Wing On Centre (roof level)
Weather Condition: Sunny

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level, dB(A)				Other Noise Sources #
						LAeq	LA10	LA90	LAMax	
(A). Measured Helicopter Noise Data (with background)										
1	AW139	WE	15:48	Approach	65	70	71	70	78	
		-		Hovering	25	72	71	75		
		-		Idling	637	68	68	74		
		EW	16:00	Take-off	67	71	71	70	78	
2	AW139	WE	16:20	Approach	73	70	70	70	74	
		-		Hovering	25	70	70	72		
		-		Idling	597	69	69	73		
		EW	16:32	Take-off	63	71	72	70	80	
3	AW139	WE	16:49	Approach	62	71	71	70	75	
		-		Hovering	22	70	70	69	72	
		-		Idling	536	68	69	68	73	
		EW	17:00	Take-off	70	69	69	68	77	

Remark: # Non-project related noise sources, those peak noise levels significantly mask that recorded due to operation of the new helipad.
 * EW - Flight direction from East to West; WE - Flight direction from West to East.

(B). Measured Background level, dB(A)

Corresponding Flight Ref. No.	Background Level, LAeq, dB(A)	Major Noise Sources
1	67	Road traffic noise, and noise due to airplane passing-by, and TurboJet arrival/
2	67	departure at HK-Macau Ferry Terminal
3	68	

(C). Calculated Helicopter Noise Level (without background)

Flight Ref. No.	Flight Model	Flight Direction ##	Approx. Time	Flight Event	Duration of Flight Event, s	LAMax
1	AW139	WE	15:48	Approach	65	78
		-		Hovering	25	74
		-		Idling	637	72
		EW	16:00	Take-off	67	78
2	AW139	WE	16:20	Approach	73	73
		-		Hovering	25	70
		-		Idling	597	72
		EW	16:32	Take-off	63	79
3	AW139	WE	16:49	Approach	62	74
		-		Hovering	22	69
		-		Idling	536	72
		EW	17:00	Take-off	70	76

Highest Lmax level, dB(A): 79

Remark: ## EW - Flight direction from East to West; WE - Flight direction from West to East.

Expansion of Heliport Facilities at Macau Ferry Terminal - Operational Phase Noise Monitoring (Evening-time)

Date: 17 September 2009
 Time: 19:00 - 23:00
 Location: Wing On Centre (roof level)
 Weather Condition: Sunny

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level, dB(A)			Other Noise Sources #
						LAeq	LA10	LA90	
(A). Measured Helicopter Noise Data (with background)									
1	AW139	-	19:03	Approach **					
		-		Hovering **					
		-		Idling	182	69	69	68	
		EW		Take-off	74	74	74	73	
2	AW139	WE	19:23	Approach	54	68	69	68	
		-		Hovering	20	72	72	72	
		-		Idling	599	68	68	67	
		EW	19:34	Take-off	56	69	69	69	
3	AW139	WE	19:52	Approach	59	70	70	69	
		-		Hovering	23	72	73	71	
		-		Idling	342	70	70	69	
		EW	19:58	Take-off	72	71	72	70	
4	AW139	WE	20:19	Approach	62	68	69	68	
		-		Hovering	20	72	72	71	
		-		Idling	537	67	68	67	
		EW	20:29	Take-off	73	71	71	70	
5	AW139	WE	20:51	Approach	61	69	70	69	
		-		Hovering	23	72	73	71	
		-		Idling	614	68	68	68	
		EW	21:02	Take-off	65	71	71	70	
6	AW139	WE	21:20	Approach	66	69	69	68	
		-		Hovering	21	70	71	70	
		-		Idling	277	67	68	67	
		EW	21:26	Take-off	66	69	69	68	
7	AW139	WE	21:47	Approach	69	73	73	72	
		-		Hovering	30	75	75	74	
		-		Idling	597	69	69	69	
		EW	21:59	Take-off	74	70	71	70	
8	AW139	WE	22:21	Approach	71	70	70	69	
		-		Hovering	21	69	70	69	
		-		Idling	562	67	67	67	
		EW	22:32	Take-off	73	71	72	70	
9	AW139	WE	22:52	Approach	68	70	70	69	
		-		Hovering	22	69	70	69	
		-		Idling	175	67	67	67	
		EW	22:57	Take-off	69	67	68	67	

Remark: # Non-project related noise sources, those peak noise levels significantly mask that recorded due to operation of the new helipad.
 * EW - Flight direction from East to West; WE - Flight direction from West to East.
 ** Noise measurement was commenced at 19:00. Thus, noise data before this time is not available.

(B). Measured Background level, dB(A)

Corresponding Flight Ref. No.	Background Level, LAeq, dB(A)	Major Noise Sources
1 *	68	Road traffic noise, and noise due to airplane passing-by, and TurboJet arrival/ departure at HK-Macau Ferry Terminal
2	68	
3	69	
4	67	
5	66	
6	66	
7	66	
8	66	
9	65	

Remark: * Based on background noise level recorded before the second flight.

(C). Calculated Helicopter Noise Level (without background)

Flight Ref. No.	Flight Model	Flight Direction ##	Approx. Time	Flight Event	Duration of Flight Event, s	LAeq
1	AW139	-	19:03	Approach **		
		-		Hovering **		
		-		Idling	182	63
		EW		Take-off	74	72
2	AW139	WE	19:23	Approach	54	59
		-		Hovering	20	70
		-		Idling	599	56
		EW		Take-off	56	64
3	AW139	WE	19:52	Approach	59	62
		-		Hovering	23	69
		-		Idling	342	61
		EW		Take-off	72	67
4	AW139	WE	20:19	Approach	62	61
		-		Hovering	20	70
		-		Idling	537	57
		EW		Take-off	73	68
5	AW139	WE	20:51	Approach	61	66
		-		Hovering	23	71
		-		Idling	614	64
		EW		Take-off	65	69
6	AW139	WE	21:20	Approach	66	66
		-		Hovering	21	68
		-		Idling	277	62
		EW		Take-off	66	65
7	AW139	WE	21:47	Approach	69	72
		-		Hovering	30	74
		-		Idling	597	66
		EW		Take-off	74	68
8	AW139	WE	22:21	Approach	71	68
		-		Hovering	21	66
		-		Idling	562	60
		EW		Take-off	73	69
9	AW139	WE	22:52	Approach	68	68
		-		Hovering	22	67
		-		Idling	175	62
		EW		Take-off	69	63

Average Noise Level (4 hrs), dB(A): 60

Remark:

EW - Flight direction from East to West; WE - Flight direction from West to East.

** Noise measurement was commenced at 19:00. Thus, noise data before this time is not available.