

Annex C

Detailed Calculations of Operational Noise Levels

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

Date: 22 December 2009
Time: 16:14 - 17:32
Location: Seaview Commercial Building (roof level)
Weather Condition: Fine

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level at Seaview Comm. Bldg., dB(A)				Bkg. Level, dB(A)	Distance Attenuation, dB(A) ##	Calculated Noise Level at Ka On Bldg., dB(A)
						LAeq	LA10	LA90	LAMax			LAMax @
									(1A)			(2)
1	AW139	W	16:19	Approach	63	75.4	75.9	74.6	80.6	71.5	0.9	81
				Hovering	20	75.5	76.3	74.5	80.9	71.5	0.9	81
				Idling	727	71.9	72.2	71.5	76.7	71.5	0.9	76
		E	16:33	Take-off	67	72.8	73.0	72.3	75.9	71.5	0.9	75
2	AW139	W	16:49	Approach	60	74.9	75.4	74.1	79.0	71.9	0.9	79
				Hovering	20	71.9	72.2	71.3	76.5	71.9	0.9	76
				Idling	590	72.1	72.4	71.5	77.9	71.9	0.9	78
		E	17:00	Take-off	66	72.0	72.2	71.5	75.1	71.9	0.9	73
3	AW139	W	17:19	Approach	66	73.7	74.1	73.1	80.5	71.9	0.9	81
				Hovering	18	76.8	77.2	76.2	79.3	71.9	0.9	79
				Idling	600	72.0	72.3	71.5	79.7	71.9	0.9	80
		E	17:31	Take-off	70	71.9	72.1	71.5	74.3	71.9	0.9	71
Highest Lmax, dB(A):											81	

Remark:

* E - Flight approaches from or departs to the East; W - Flight approaches from or departs to the West.

Distance correction factor in accordance with Table 9, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

@ Calculated noise level (without background) with noise correction for shielding effect and distance attenuation in accordance with Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

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

Date: 22 December 2009
Time: 19:00 - 23:00
Location: Seaview Commercial Building (roof level)
Weather Condition: Fine

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level at Seaview Comm. Bldg., dB(A)			Bkg. Level, dB(A)	Distance Attenuation, dB(A) ##	Calculated Noise Level at Ka On Bldg.
						LAeq	LA10	LA90			LAeq @
						(1B)					=(1B)-(2)+(3)
1	AW139	W		Approach	60	**	**	**	**	**	**
				Hovering	19	**	**	**	**	**	**
				Idling	340	72.0	72.1	71.5	71.2	0.9	65
		E	19:04	Take-off	68	72.1	72.3	71.6	71.2	0.9	66
2	AW139	W	19:23	Approach	69	75.2	75.7	74.5	71.2	0.9	74
				Hovering	21	72.6	73.3	72.0	71.2	0.9	68
				Idling	310	72.0	72.5	71.3	71.2	0.9	65
		E	19:30	Take-off	75	71.5	71.7	71.0	71.2	0.9	61
3	AW139	W	19:52	Approach	69	73.9	74.3	73.2	70.6	0.9	72
				Hovering	20	75.5	76.2	74.6	70.6	0.9	75
				Idling	494	70.7	71.0	70.2	70.6	0.9	55
		E	20:02	Take-off	69	72.1	72.3	71.6	70.6	0.9	68
4	AW139	W	20:55	Approach	70	76.8	77.4	76.0	69.3	0.9	77
				Hovering	18	73.0	73.6	72.4	69.3	0.9	71
				Idling	563	69.6	69.9	69.1	69.3	0.9	59
		E	21:06	Take-off	64	69.9	70.3	69.3	69.3	0.9	62
5	AW139	W	21:17	Approach	63	73.7	74.1	73.0	69.3	0.9	73
				Hovering	17	72.6	73.1	71.9	69.3	0.9	71
				Idling	817	69.5	69.8	69.0	69.3	0.9	57
		E	21:32	Take-off	69	70.8	71.0	70.4	69.3	0.9	66
6	AW139	W	21:55	Approach	71	74.6	75.3	73.7	70.0	0.9	74
				Hovering	22	70.4	70.7	69.9	70.0	0.9	61
				Idling	829	70.1	70.4	69.6	70.0	0.9	55
		E	22:11	Take-off	71	70.5	71.1	69.7	70.0	0.9	62
7	AW139	W	22:19	Approach	68	75.4	75.9	74.4	69.7	0.9	75
				Hovering	20	71.9	72.2	71.3	69.7	0.9	69
				Idling	630	70.0	70.3	69.5	69.7	0.9	59
		E	22:31	Take-off	68	71.7	72.1	71.0	69.7	0.9	68
Leq(4-hrs), dB(A):										61	

Remark:

* E - Flight approaches from or departs to the East; W - Flight approaches from or departs to the West.

Distance correction factor in accordance with Table 9, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

@ Calculated noise level (without background) with noise correction for shielding effect and distance attenuation in accordance with Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

** Evening-time 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 December 2009
Time: 14:18 - 15:31
Location: Wayson Commercial Building (roof level)
Weather Condition: Fine

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level at Wayson Comm. Bldg., dB(A)				Corrected Façade Noise Level After Correction for Shielding Effect at Talon Tower, dB(A) #				Bkg. Level, dB(A)	Distance Attenuation, dB(A) ##	Calculated Noise Level at Talon Tower, dB(A)
						LAeq	LA10	LA90	LAMax	LAeq	LA10	LA90	LAMax			
										(1A)	(2)	(3)	=(1A)-(2)+(3)			
1	AW139	W	14:19	Approach	40	74.8	75.2	74.1	79.1	74.8	75.2	74.1	79.1	72.2	-0.6	78
				Hovering	19	76.1	76.5	75.4	78.1	76.1	76.5	75.4	78.1	72.2	-0.6	76
				Idling	583	73.3	73.5	72.7	80.4	73.3	73.5	72.7	80.4	72.2	-0.6	79
		E	14:30	Take-off	66	73.2	73.4	72.7	75.3	74.4	74.6	73.9	79.6	72.2	-0.6	78
2	AW139	W	14:46	Approach	71	76.2	76.7	75.5	82.1	76.2	76.7	75.5	82.1	73.2	-0.6	81
				Hovering	17	75.4	75.9	74.7	79.9	75.4	75.9	74.7	79.9	73.2	-0.6	78
				Idling	715	73.4	73.6	72.9	78.0	73.4	73.6	72.9	78.0	73.2	-0.6	76
		E	15:00	Take-off	72	74.2	74.5	73.6	77.6	75.5	75.8	74.9	80.8	73.2	-0.6	79
3	AW139	W	15:20	Approach	71	76.0	76.5	75.2	81.7	76.0	76.5	75.2	81.7	73.1	-0.6	80
				Hovering	20	75.8	76.3	75.2	79.6	75.8	76.3	75.2	79.6	73.1	-0.6	78
				Idling	473	73.5	73.8	73.0	78.0	73.5	73.8	73.0	78.0	73.1	-0.6	76
		E	15:30	Take-off	60	72.8	73.0	72.4	76.6	74.3	74.5	73.9	79.6	73.1	-0.6	78
Highest Lmax, dB(A):															81	

Remark:

* E - Flight approaches from or departs to the East; W - Flight approaches from or departs to the West.

Corrected noise level after correction for shielding effect (+5dB(A) to the concerned noise data) in accordance with Table 10, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

Distance correction factor in accordance with Table 9, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

@ Calculated noise level (without background) with noise correction for shielding effect and distance attenuation in accordance with Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

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

Date: 23 December 2009
 Time: 19:00 - 23:00
 Location: Wayson Commercial Building (roof level)
 Weather Condition: Fine

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level at Wayson Comm. Bldg., dB(A)			Corrected Façade Noise Level After Correction for Shielding Effect at Talon Tower, dB(A) #			Bkg. Level, dB(A)	Distance Attenuation, dB(A) ##	Calculated Noise Level at Talon Tower
						LAeq	LA10	LA90	LAeq	LA10	LA90			LAeq @
									(1B)					=(1B)-(2)+(3)
1	AW139	-	19:03	Approach	**	**	**	**	**	**	**	**	**	**
				Hovering	**	**	**	**	**	**	**	**	**	**
				Idling	451	73.3	73.6	72.8	73.3	73.6	72.8	71.7	-0.6	68
E	Take-off	69	73.3	73.7	72.7	75.2	75.7	74.5	71.7	-0.6	72			
2	AW139	W	19:21	Approach	80	77.2	77.8	76.3	77.2	77.8	76.3	72.3	-0.6	75
				Hovering	23	73.4	74.3	72.6	73.4	74.3	72.6	72.3	-0.6	66
				Idling	499	72.3	72.7	71.7	72.3	72.7	71.7	72.3	-0.6	62
E	Take-off	73	74.7	75.1	74.1	76.0	76.5	75.4	72.3	-0.6	73			
3	AW139	W	19:56	Approach	71	75.5	76.2	74.7	75.5	76.2	74.7	71.7	-0.6	73
				Hovering	19	72.6	73	71.9	72.6	73.0	71.9	71.7	-0.6	65
				Idling	280	73.3	73.7	72.6	73.3	73.7	72.6	71.7	-0.6	68
E	Take-off	65	72.9	73.4	72.2	74.5	75.0	73.8	71.7	-0.6	71			
4	AW139	W	20:26	Approach	66	74.1	74.7	73.3	74.1	74.7	73.3	70.6	-0.6	71
				Hovering	18	74.4	74.5	74	74.4	74.5	74.0	70.6	-0.6	71
				Idling	351	72.9	73.4	72.1	72.9	73.4	72.1	70.6	-0.6	68
E	Take-off	68	73.2	73.6	72.5	74.7	75.1	74.1	70.6	-0.6	72			
5	AW139	W	20:50	Approach	66	73	73.7	72.1	73.0	73.7	72.1	70.6	-0.6	69
				Hovering	18	76.1	76.7	75.2	76.1	76.7	75.2	70.6	-0.6	74
				Idling	478	72.6	73.2	71.8	72.6	73.2	71.8	70.6	-0.6	68
E	Take-off	71	71.9	72.3	71.4	73.3	73.6	72.7	70.6	-0.6	69			
6	AW139	W	21:22	Approach	78	76.6	77.5	75.4	76.6	77.5	75.4	70.7	-0.6	75
				Hovering	22	73.1	73.6	72.4	73.1	73.6	72.4	70.7	-0.6	69
				Idling	491	72.6	73.1	71.9	72.6	73.1	71.9	70.7	-0.6	67
E	Take-off	68	71.9	72.3	71.2	73.6	74.1	72.9	70.7	-0.6	70			
7	AW139	W	21:49	Approach	70	75	75.6	74.1	75.0	75.6	74.1	70.9	-0.6	72
				Hovering	19	74.7	75.3	73.9	74.7	75.3	73.9	70.9	-0.6	72
				Idling	756	72.7	73.2	71.9	72.7	73.2	71.9	70.9	-0.6	67
E	Take-off	71	71.5	71.8	70.9	72.9	73.1	72.3	70.9	-0.6	68			
8	AW139	W	22:22	Approach	72	75.2	75.9	74.3	75.2	75.9	74.3	71.2	-0.6	72
				Hovering	19	73	74	72.1	73.0	74.0	72.1	71.2	-0.6	68
				Idling	446	71.6	72	71	71.6	72.0	71.0	71.2	-0.6	60
E	Take-off	74	72.1	72.3	71.6	73.5	73.7	73.0	71.2	-0.6	69			
9	AW139	W	22:49	Approach	69	74.9	75.5	74	74.9	75.5	74.0	71.2	-0.6	72
				Hovering	22	75.9	76.4	75.1	75.9	76.4	75.1	71.2	-0.6	73
				Idling	449	72.4	72.9	71.6	72.4	72.9	71.6	71.2	-0.6	66
E	Take-off	70	72.4	73.1	71.5	74.3	75.0	73.2	71.2	-0.6	71			
												Leq(4-hrs), dB(A):	64	

Remark:

* E - Flight approaches from or departs to the East; W - Flight approaches from or departs to the West.

Corrected noise level after correction for shielding effect (+5dB(A) to the concerned noise data) in accordance with Table 10, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

Distance correction factor in accordance with Table 9, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

@ Calculated noise level (without background) with noise correction for shielding effect and distance attenuation in accordance with Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

** Evening-time 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: 23 December 2009
 Time: 16:11 - 17:34
 Location: Wing On Centre (roof level)
 Weather Condition: Fine

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level at Wing On Centre, dB(A)				Corrected Façade Noise Level After Correction for Shielding Effect at The Bauhinia, dB(A) #				Bkg. Level, dB(A)	Distance Attenuation, dB(A) ##	Calculated Noise Level at The Bauhinia, dB(A)
						LAeq	LA10	LA90	LAMax	LAeq	LA10	LA90	LAMax			LAMax @
										(1A)	(2)	(3)	=(1A)-(2)+(3)			
1	AW139	W	16:18	Approach	72	70.6	71.1	69.8	77.9	70.6	71.1	69.8	77.9	67.6	0.4	78
				Hovering	18	72.2	72.5	71.7	75.5	72.2	72.5	71.7	75.5	67.6	0.4	75
				Idling	719	68.9	69.1	68.4	74.2	68.9	69.1	68.4	74.2	67.6	0.4	74
		E	16:32	Take-off	62	70	70.5	69.2	79.4	68.4	68.8	67.8	74.4	67.6	0.4	74
2	AW139	W	16:51	Approach	64	70.4	71.2	69.2	79.8	70.4	71.2	69.2	79.8	68.5	0.4	80
				Hovering	22	72.1	72.3	71.7	74.6	72.1	72.3	71.7	74.6	68.5	0.4	74
				Idling	719	68.7	69	68.2	78	68.7	69.0	68.2	78.0	68.5	0.4	78
		E	17:04	Take-off	71	69.8	70.4	69	79.3	68.7	69.1	68.0	74.3	68.5	0.4	73
3	AW139	W	17:24	Approach	59	71.2	71.6	70.6	77.6	71.2	71.6	70.6	77.6	68.4	0.4	77
				Hovering	22	72	72.2	71.5	74.7	72.0	72.2	71.5	74.7	68.4	0.4	74
				Idling	452	69.8	70	69.3	73.6	69.8	70.0	69.3	73.6	68.4	0.4	72
		E	17:33	Take-off	69	70.3	70.8	69.4	79.6	69.5	69.9	68.6	78.7	68.4	0.4	79
Highest Lmax, dB(A):														80		

Remark:

* E - Flight approaches from or departs to the East; W - Flight approaches from or departs to the West.

Corrected noise level after correction for shielding effect (-5dB(A) to the concerned noise data) in accordance with Table 10, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

Distance correction factor in accordance with Table 9, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

@ Calculated noise level (without background) with noise correction for shielding effect and distance attenuation in accordance with Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

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

Date: 23 December 2009
 Time: 19:00 - 23:00
 Location: Wing On Centre (roof level)
 Weather Condition: Fine

Flight Ref. No.	Flight Model	Flight Direction *	Approx. Time	Flight Event	Duration of Flight Event, s	Measured Façade Noise Level at Wing On Centre, dB(A)			Corrected Façade Noise Level After Correction for Shielding Effect at The Bauhinia, dB(A) #			Bkg. Level, dB(A)	Distance Attenuation, dB(A) ##	Calculated Noise Level at The Bauhinia
						LAeq	LA10	LA90	LAeq	LA10	LA90			
									(1B)					(2)
1	AW139	-	19:03	Approach	**	**	**	**	**	**	**	**	**	**
				Hovering	**	**	**	**	**	**	**	**	**	**
				Idling	451	67.5	67.7	66.9	67.5	67.7	66.9	0.0	0.4	68
E	Take-off	69	72.1	72.6	71.2	71.9	72.4	70.9	0.0	0.4	72			
2	AW139	W	19:21	Approach	80	69	69.4	68.3	69.0	69.4	68.3	66.7	0.4	65
				Hovering	23	68.9	69.2	68.3	68.9	69.2	68.3	66.7	0.4	65
				Idling	499	67.1	67.3	66.6	67.1	67.3	66.6	66.7	0.4	57
E	Take-off	73	69.2	69.4	68.7	69.0	69.2	68.5	66.7	0.4	65			
3	AW139	W	19:56	Approach	71	68.9	69.2	68.2	68.9	69.2	68.2	66.7	0.4	65
				Hovering	19	72.5	72.9	71.8	72.5	72.9	71.8	66.7	0.4	72
				Idling	280	67.9	68.3	67.3	67.9	68.3	67.3	66.7	0.4	62
E	Take-off	65	69.6	69.8	69.1	69.3	69.5	68.8	66.7	0.4	66			
4	AW139	W	20:26	Approach	66	65.8	66	65.2	65.8	66.0	65.2	65.7	0.4	50
				Hovering	18	71.2	71.6	70.3	71.2	71.6	70.3	65.7	0.4	70
				Idling	351	67.9	68.1	67.4	67.9	68.1	67.4	65.7	0.4	64
E	Take-off	68	71.4	71.7	70.8	71.0	71.4	70.4	65.7	0.4	70			
5	AW139	W	20:50	Approach	66	66.9	67.3	66.2	66.9	67.3	66.2	65.9	0.4	60
				Hovering	18	66.3	66.5	65.7	66.3	66.5	65.7	65.9	0.4	56
				Idling	478	67.3	67.5	66.8	67.3	67.5	66.8	65.9	0.4	62
E	Take-off	71	68.8	69	68.3	68.6	68.8	68.1	65.9	0.4	66			
6	AW139	W	21:22	Approach	78	65.1	65.3	64.6	65.1	65.3	64.6	65.0	0.4	49
				Hovering	22	69.9	70.4	69	69.9	70.4	69.0	65.0	0.4	69
				Idling	491	67	67.2	66.5	67.0	67.2	66.5	65.0	0.4	63
E	Take-off	68	68.7	68.9	68.2	68.5	68.7	68.0	65.0	0.4	66			
7	AW139	W	21:49	Approach	70	67.9	68.2	67.1	67.9	68.2	67.1	65.4	0.4	65
				Hovering	19	73.5	73.8	72.6	73.5	73.8	72.6	65.4	0.4	73
				Idling	756	68.7	69	68.2	68.7	69.0	68.2	65.4	0.4	66
E	Take-off	71	73.2	73.7	72.4	73.0	73.5	72.2	65.4	0.4	73			
8	AW139	W	22:22	Approach	72	67.3	67.7	66.6	67.3	67.7	66.6	65.5	0.4	63
				Hovering	19	71.6	72.1	70.6	71.6	72.1	70.6	65.5	0.4	71
				Idling	446	67.1	67.4	66.5	67.1	67.4	66.5	65.5	0.4	62
E	Take-off	74	68.4	68.5	67.9	68.2	68.4	67.7	65.5	0.4	65			
9	AW139	W	22:49	Approach	69	65.8	65.9	65.2	65.8	65.9	65.2	64.8	0.4	59
				Hovering	22	69.5	70	68.6	69.5	70.0	68.6	64.8	0.4	68
				Idling	449	67.3	67.5	66.8	67.3	67.5	66.8	64.8	0.4	64
E	Take-off	70	70.8	71.2	69.9	70.6	71.1	69.8	64.8	0.4	70			
											Leq(4-hrs), dB(A):	61		

Remark:

* E - Flight approaches from or departs to the East; W - Flight approaches from or departs to the West.

Corrected noise level after correction for shielding effect (-5dB(A) to the concerned noise data) in accordance with Table 10, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

Distance correction factor in accordance with Table 9, Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

@ Calculated noise level (without background) with noise correction for shielding effect and distance attenuation in accordance with Operational Phase Helicopter Noise Monitoring Methodology (Revision 3).

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