

## **Annex C**

### **Detailed Calculations of Operational Noise Levels**

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

Date: 12 Jan 2010  
 Time: 16:42 - 17:57  
 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	16:47	Approach	65	75.8	76.4	75.0	79.3	72.2	0.9	79
				Hovering	19	74.1	74.4	73.5	77.0	72.2	0.9	76
				Idling	663	72.8	73.1	72.2	81.7	72.2	0.9	82
		E	17:00	Take-off	68	74.9	75.4	74.3	78.6	72.2	0.9	78
2	AW139	W	17:17	Approach	68	75.5	75.9	74.8	80.9	71.7	0.9	81
				Hovering	19	74.4	74.8	73.7	78.7	71.7	0.9	79
				Idling	1132	72.0	72.3	71.5	77.8	71.7	0.9	77
		E	17:38	Take-off	66	73.0	73.3	72.5	77.4	71.7	0.9	77
3	AW139	W	17:49	Approach	64	74.9	75.2	74.4	79.0	72.0	0.9	79
				Hovering	21	72.6	72.9	72.0	76.2	72.0	0.9	75
				Idling	360	72.0	72.2	71.5	75.2	72.0	0.9	73
		W	17:56	Take-off	68	72.7	73.1	71.9	78.6	72.0	0.9	78
<b>Highest Lmax, dB(A):</b>											<b>82</b>	

**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:** 12 Jan 2010  
**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			Approach	**	**	**	**	**	**	**
				Hovering	**	**	**	**	**	**	**
				Idling	326	72.2	72.4	71.6	71.8	0.9	63
		W	19:05	Take-off	74	75.1	75.5	74.4	71.8	0.9	73
2	AW139	W	19:21	Approach	80	75.7	76.1	75.0	71.7	0.9	74
				Hovering	19	74.1	74.8	73.4	71.7	0.9	71
				Idling	407	71.8	72.1	71.3	71.7	0.9	56
		E	19:29	Take-off	68	72.7	73.1	72.0	71.7	0.9	67
3	AW139	E	19:54	Approach	73	72.0	72.3	71.5	71.1	0.9	66
				Hovering	18	72.3	72.5	71.8	71.1	0.9	67
				Idling	604	71.3	71.6	70.8	71.1	0.9	59
		E	20:06	Take-off	67	72.1	72.4	71.5	71.1	0.9	66
4	AW139	W	20:56	Approach	75	76.3	76.9	75.5	70.2	0.9	76
				Hovering	21	72.9	73.3	72.2	70.2	0.9	70
				Idling	271	71.1	71.4	70.5	70.2	0.9	65
		E	21:02	Take-off	68	71.1	71.4	70.6	70.2	0.9	65
5	AW139	W	21:29	Approach	67	74.7	75.3	73.6	70.6	0.9	73
				Hovering	18	74.6	75.1	74.0	70.6	0.9	73
				Idling	337	72.8	73.1	72.2	70.6	0.9	70
		E	21:36	Take-off	71	71.4	71.9	70.8	70.6	0.9	65
6	AW139	W	21:52	Approach	66	74.0	74.5	73.3	70.0	0.9	73
				Hovering	18	72.7	73.1	72.1	70.0	0.9	70
				Idling	458	70.1	70.4	69.5	70.0	0.9	55
		E	22:01	Take-off	68	70.9	71.3	70.4	70.0	0.9	65
7	AW139	W	22:24	Approach	72	76.3	76.9	75.4	69.1	0.9	76
				Hovering	19	71.4	72.7	70.4	69.1	0.9	68
				Idling	366	70.3	70.6	69.7	69.1	0.9	65
		E	22:32	Take-off	70	71.0	71.9	70.0	69.1	0.9	67
8	AW139	W	22:48	Approach	72	75.4	76.0	74.4	69.0	0.9	75
				Hovering	19	73.4	74.0	72.5	69.0	0.9	72
				Idling	351	70.1	70.6	69.5	69.0	0.9	64
		E	22:56	Take-off	69	70.0	70.3	69.3	69.0	0.9	64
<b>Leq(4-hrs), dB(A):</b>										<b>62</b>	

**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:** 14 Jan., 2009  
**Time:** 13:47 - 15:01  
**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	13:50	Approach	67	75.8	76.5	74.9	80.6	75.8	76.5	74.9	80.6	72.5	-0.6	79
				Hovering	21	75.9	76.6	74.9	81.4	75.9	76.6	74.9	81.4	72.5	-0.6	80
				Idling	432	72.7	73.0	72.1	78.9	72.7	73.0	72.1	78.9	72.5	-0.6	77
		E	13:59	Take-off	60	74.0	74.6	73.1	82.5	75.2	75.8	74.4	82.5	72.5	-0.6	81
2	AW139	W	14:16	Approach	70	75.0	75.6	74.1	79.2	75.0	75.6	74.1	79.2	73.3	-0.6	77
				Hovering	18	76.0	76.7	75.1	80.2	76.0	76.7	75.1	80.2	73.3	-0.6	79
				Idling	806	73.2	73.7	72.5	81.1	73.2	73.7	72.5	81.1	73.3	-0.6	80
		E	14:31	Take-off	72	74.7	75.2	74.0	79.1	76.1	76.6	75.4	84.0	73.3	-0.6	83
3	AW139	W	14:50	Approach	68	76.8	77.7	75.8	82.1	76.8	77.7	75.8	82.1	73.4	-0.6	81
				Hovering	19	76.4	77.1	75.5	79.9	76.4	77.1	75.5	79.9	73.4	-0.6	78
				Idling	510	73.7	74.2	73.1	81.1	73.7	74.2	73.1	81.1	73.4	-0.6	80
		E	15:00	Take-off	66	75.0	75.6	74.1	82.6	76.4	77.1	75.5	84.2	73.4	-0.6	83
<b>Highest Lmax, dB(A):</b>															<b>83</b>	

**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: 14 Jan., 2010  
 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 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			
									(1B)					(2)
1	AW139	W	19:24	Approach	71	74.5	75.0	73.7	74.5	75.0	73.7	71.6	-0.6	71
				Hovering	20	74.8	75.3	74.1	74.8	75.3	74.1	71.6	-0.6	71
				Idling	351	72.5	72.8	71.9	72.5	72.8	71.9	71.6	-0.6	65
		E	19:31	Take-off	64	73.2	73.6	72.5	74.5	74.9	73.8	71.6	-0.6	71
2	AW139	W	19:54	Approach	68	76.1	76.7	75.2	76.1	76.7	75.2	71.6	-0.6	74
				Hovering	18	78.0	78.8	77.0	78.0	78.8	77.0	71.6	-0.6	76
				Idling	351	73.3	73.8	72.5	73.3	73.8	72.5	71.6	-0.6	68
		E	20:01	Take-off	71	74.6	75.1	73.8	76.0	76.5	75.2	71.6	-0.6	73
3	AW139	W	20:45	Approach	75	76.8	77.6	75.8	76.8	77.6	75.8	70.2	-0.6	75
				Hovering	22	75.6	76.6	74.1	75.6	76.6	74.1	70.2	-0.6	74
				Idling	707	71.3	71.7	70.6	71.3	71.7	70.6	70.2	-0.6	64
		E	20:58	Take-off	66	72.2	72.7	71.6	73.8	74.3	73.2	70.2	-0.6	71
4	AW139	W	21:21	Approach	68	76.0	76.7	74.9	76.0	76.7	74.9	70.3	-0.6	74
				Hovering	20	75.7	76.4	74.9	75.7	76.4	74.9	70.3	-0.6	74
				Idling	548	72.2	72.7	71.5	72.2	72.7	71.5	70.3	-0.6	67
		E	21:31	Take-off	69	73.0	73.3	72.4	74.6	75.0	74.0	70.3	-0.6	72
5	AW139	W	22:22	Approach	69	74.0	74.8	73.0	74.0	74.8	73.0	71.1	-0.6	70
				Hovering	19	74.6	75.5	73.5	74.6	75.5	73.5	71.1	-0.6	71
				Idling	376	71.7	72.2	71.1	71.7	72.2	71.1	71.1	-0.6	62
		E	22:30	Take-off	69	72.4	72.9	71.6	74.2	74.7	73.4	71.1	-0.6	71
6	AW139	W	22:49	Approach	69	74.3	74.9	73.4	74.3	74.9	73.4	70.1	-0.6	72
				Hovering	18	73.5	74.2	72.6	73.5	74.2	72.6	70.1	-0.6	70
				Idling	472	71.3	71.7	70.6	71.3	71.7	70.6	70.1	-0.6	65
		E	22:58	Take-off	71	73.4	74.3	72.4	74.3	75.0	73.3	70.1	-0.6	72
												<b>Leq(4-hrs), dB(A):</b>	<b>63</b>	

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:** 14 Jan., 2010  
**Time:** 15:51 - 17:03  
**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	15:56	Approach	68	70.0	70.5	69.2	75.2	70.0	70.5	69.2	75.2	67.1	0.4	75
				Hovering	19	73.3	73.6	72.7	77.1	73.3	73.6	72.7	77.1	67.1	0.4	77
				Idling	539	70.1	70.5	69.5	79.9	70.1	70.5	69.5	79.9	67.1	0.4	80
		E	16:06	Take-off	64	70.2	70.7	69.4	78.9	68.8	69.3	68.0	76.6	67.1	0.4	76
2	AW139	W	16:15	Approach	66	70.0	70.3	69.3	75.5	70.0	70.3	69.3	75.5	67.5	0.4	75
				Hovering	19	70.8	71.0	70.3	73.6	70.8	71.0	70.3	73.6	67.5	0.4	73
				Idling	894	68.1	68.4	67.6	73.2	68.1	68.4	67.6	73.2	67.5	0.4	72
		E	16:32	Take-off	66	69.7	70.4	68.9	78.6	68.5	69.0	67.8	77.6	67.5	0.4	78
3	AW139	W	16:51	Approach	66	71.2	71.5	70.5	75.0	71.2	71.5	70.5	75.0	68.4	0.4	74
				Hovering	20	70.8	71.0	70.3	73.0	70.8	71.0	70.3	73.0	68.4	0.4	72
				Idling	581	68.6	68.8	68.1	73.3	68.6	68.8	68.1	73.3	68.4	0.4	72
		E	17:02	Take-off	69	70.6	71.3	69.7	79.9	69.1	69.7	68.3	77.7	68.4	0.4	78
<b>Highest Lmax, dB(A):</b>														<b>80</b>		

**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: 14 Jan., 2010  
 Time: 19:00 - 23:00  
 Location: Wing On Centre (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 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	W	19:24	Approach	71	69.0	69.3	68.3	69.0	69.3	68.3	67.5	0.4	64
				Hovering	20	72.0	72.2	71.4	72.0	72.2	71.4	67.5	0.4	70
				Idling	351	68.3	68.4	67.7	68.3	68.4	67.7	67.5	0.4	61
		E	19:31	Take-off	64	70.8	71.3	70.0	70.6	71.1	69.8	67.5	0.4	68
2	AW139	W	19:54	Approach	68	70.8	71.3	70.0	70.8	71.3	70.0	68.3	0.4	68
				Hovering	18	74.0	74.2	73.2	74.0	74.2	73.2	68.3	0.4	73
				Idling	351	69.0	69.3	68.3	69.0	69.3	68.3	68.3	0.4	61
		E	20:01	Take-off	71	71.4	71.8	70.7	71.1	71.5	70.4	68.3	0.4	68
3	AW139	W	20:45	Approach	75	69.8	70.3	68.9	69.8	70.3	68.9	66.7	0.4	67
				Hovering	22	72.6	72.8	72.1	72.6	72.8	72.1	66.7	0.4	72
				Idling	707	67.5	67.6	66.9	67.5	67.6	66.9	66.7	0.4	60
		E	20:58	Take-off	66	70.4	70.8	69.6	70.1	70.6	69.3	66.7	0.4	68
4	AW139	W	21:21	Approach	68	68.1	68.5	67.4	68.1	68.5	67.4	65.8	0.4	65
				Hovering	20	71.2	71.4	70.7	71.2	71.4	70.7	65.8	0.4	70
				Idling	548	68.0	68.2	67.5	68.0	68.2	67.5	65.8	0.4	64
		E	21:31	Take-off	69	71.4	71.8	70.6	71.1	71.5	70.3	65.8	0.4	70
5	AW139	W	22:22	Approach	69	68.1	68.5	67.3	68.1	68.5	67.3	66.5	0.4	63
				Hovering	19	70.1	70.3	69.5	70.1	70.3	69.5	66.5	0.4	68
				Idling	376	67.8	68.0	67.2	67.8	68.0	67.2	66.5	0.4	62
		E	22:30	Take-off	69	71.9	72.5	71.0	71.7	72.3	70.8	66.5	0.4	71
6	AW139	W	22:49	Approach	69	69.1	69.7	68.2	69.1	69.7	68.2	66.7	0.4	66
				Hovering	18	70.3	70.5	69.7	70.3	70.5	69.7	66.7	0.4	68
				Idling	472	67.6	67.9	67.1	67.6	67.9	67.1	66.7	0.4	61
		E	22:58	Take-off	71	71.0	71.4	70.2	70.7	71.2	70.0	66.7	0.4	69
<b>Leq(4-hrs), dB(A):</b>												<b>59</b>		

**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.