

## **Annex C**

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

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

**Date:** 16 March 2010  
**Time:** 15:45 - 17:03  
**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	15:49	Approach	70	73.8	74.4	73.0	81.6	73.8	74.4	73.0	81.6	72.7	-0.6	80
				Hovering	19	75.2	75.5	74.3	77.3	75.2	75.5	74.3	77.3	72.7	-0.6	75
				Idling	826	73.1	73.3	72.5	77.9	73.1	73.3	72.5	77.9	72.7	-0.6	76
		E	16:04	Take-off	68	74.3	74.5	73.7	78.1	75.8	76.0	75.3	81.7	72.7	-0.6	81
2	AW139	W	16:32	Approach	69	76.3	76.7	75.6	82.0	76.3	76.7	75.6	82.0	72.8	-0.6	81
				Hovering	17	77.7	78.2	76.9	82.2	77.7	78.2	76.9	82.2	72.8	-0.6	81
				Idling	325	73.4	73.7	72.9	78.3	73.4	73.7	72.9	78.3	72.8	-0.6	76
		E	16:39	Take-off	67	73.7	74.0	73.1	78.4	75.1	75.4	74.6	80.9	72.8	-0.6	80
3	AW139	E	16:56	Approach	68	74.8	75.2	74.0	79.5	76.6	77.1	75.9	84.3	72.5	-0.6	83
				Hovering	20	75.3	75.9	74.6	78.7	75.3	75.9	74.6	78.7	72.5	-0.6	77
				Idling	313	72.9	73.2	72.4	77.2	72.9	73.2	72.4	77.2	72.5	-0.6	75
		E	17:02	Take-off	68	73.6	74.0	73.0	78.8	75.2	75.6	74.7	81.2	72.5	-0.6	80
<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:** 16 March 2010  
**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	198	73.6	73.9	73.0	73.6	73.9	73.0	71.7	-0.6	68
				Take-off	71	73.4	73.6	72.8	74.6	74.8	74.1	71.7	-0.6	71
2	AW139	W	19:27	Approach	69	75.4	75.9	74.5	75.4	75.9	74.5	71.7	-0.6	72
				Hovering	19	75.1	75.6	74.4	75.1	75.6	74.4	71.7	-0.6	72
				Idling	401	72.7	73.0	72.1	72.7	73.0	72.1	71.7	-0.6	65
				Take-off	70	73.1	73.5	72.4	74.5	74.9	73.9	71.7	-0.6	71
3	AW139	W	19:50	Approach	72	74.6	75.1	73.7	74.6	75.1	73.7	71.7	-0.6	71
				Hovering	21	75.5	76.1	74.7	75.5	76.1	74.7	71.7	-0.6	73
				Idling	689	72.8	73.2	72.1	72.8	73.2	72.1	71.7	-0.6	66
				Take-off	68	72.5	73.0	71.9	74.1	74.6	73.5	71.7	-0.6	70
4	AW139	W	20:23	Approach	68	73.8	74.5	72.9	73.8	74.5	72.9	70.4	-0.6	71
				Hovering	18	74.9	75.5	73.9	74.9	75.5	73.9	70.4	-0.6	72
				Idling	429	72.2	72.5	71.5	72.2	72.5	71.5	70.4	-0.6	67
				Take-off	72	71.7	72.2	71.1	73.6	74.0	72.9	70.4	-0.6	70
5	AW139	W	20:53	Approach	70	74.4	75.1	73.5	74.4	75.1	73.5	70.4	-0.6	72
				Hovering	20	74.1	74.6	73.4	74.1	74.6	73.4	70.4	-0.6	71
				Idling	430	71.5	71.9	70.8	71.5	71.9	70.8	70.4	-0.6	64
				Take-off	66	71.1	71.7	70.3	72.7	73.2	72.0	70.4	-0.6	68
6	AW139	W	21:18	Approach	71	74.0	74.6	73.1	74.0	74.6	73.1	71.0	-0.6	70
				Hovering	17	74.3	74.9	73.4	74.3	74.9	73.4	71.0	-0.6	71
				Idling	535	71.1	71.5	70.4	71.1	71.5	70.4	71.0	-0.6	54
				Take-off	68	72.8	73.3	72.1	74.4	74.9	73.7	71.0	-0.6	71
7	AW139	W	21:52	Approach	68	75.9	76.5	75.0	75.9	76.5	75.0	71.1	-0.6	74
				Hovering	18	76.0	76.5	75.2	76.0	76.5	75.2	71.1	-0.6	74
				Idling	401	72.1	72.5	71.4	72.1	72.5	71.4	71.1	-0.6	65
				Take-off	68	72.9	73.3	72.2	74.3	74.7	73.6	71.1	-0.6	71
8	AW139	W	22:24	Approach	67	74.1	74.7	73.2	74.1	74.7	73.2	70.1	-0.6	71
				Hovering	18	76.3	76.9	75.4	76.3	76.9	75.4	70.1	-0.6	75
				Idling	418	72.0	72.4	71.3	72.0	72.4	71.3	70.1	-0.6	67
				Take-off	68	72.8	73.4	72.0	74.7	75.3	73.8	70.1	-0.6	72
9	AW139	W	22:49	Approach	71	74.5	75.1	73.7	74.5	75.1	73.7	70.3	-0.6	72
				Hovering	19	77.0	77.6	76.0	77.0	77.6	76.0	70.3	-0.6	75
				Idling	326	71.4	71.8	70.7	71.4	71.8	70.7	70.3	-0.6	64
				Take-off	70	71.8	72.3	71.2	73.1	73.6	72.5	70.3	-0.6	69
												<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:** 18 March 2010  
**Time:** 15:17 - 16:09  
**Location:** Seaview Commercial Building (roof level)  
**Weather Condition:** Sunny Periods

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			
									(1A)			(2)
1	AW139	E	15:17	Approach	68	72.2	72.3	71.7	73.5	71.1	0.9	71
				Hovering	16	72.5	72.7	72.1	73.7	71.1	0.9	71
				Idling	537	71.2	71.5	70.6	79.6	71.1	0.9	80
		E	15:27	Take-off	67	71.6	71.8	71.1	74.4	71.1	0.9	73
2	AW139	W	15:46	Approach	75	75.4	75.6	74.8	81.8	71.3	0.9	82
				Hovering	18	72.7	73.7	71.9	81.8	71.3	0.9	82
				Idling	931	71.6	71.9	71.2	79.2	71.3	0.9	79
		W	16:03	Take-off	69	74.0	74.3	73.5	79.2	71.3	0.9	79
<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:** 18 March 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			L <sub>Aeq</sub> @
						(1B)					=(1B)-(2)+(3)
1	AW139	W		Approach	**	**	**	**	**	**	**
				Hovering	**	**	**	**	**	**	
				Idling	352	71.4	71.6	70.9	70.8	0.9	63
		E	19:05	Take-off	64	73.9	74.3	73.2	70.8	0.9	72
2	AW139	W	19:54	Approach	70	75.0	75.4	74.3	70.8	0.9	74
				Hovering	18	73.8	74.5	73.1	70.8	0.9	72
				Idling	329	70.9	71.2	70.4	70.8	0.9	55
		E	20:01	Take-off	69	70.8	71.1	70.2	70.8	0.9	62
3	AW139	W	20:19	Approach	67	73.4	73.7	72.7	70.0	0.9	72
				Hovering	22	72.7	72.9	72.2	70.0	0.9	70
				Idling	498	69.9	70.2	69.4	70.0	0.9	61
		E	20:28	Take-off	71	70.4	70.6	69.9	70.0	0.9	61
4	AW139	W	20:49	Approach	68	73.8	74.4	72.9	69.2	0.9	73
				Hovering	21	77.1	77.9	76.2	69.2	0.9	77
				Idling	420	69.6	69.9	69.0	69.2	0.9	60
		E	20:58	Take-off	72	71.3	71.7	70.6	69.2	0.9	68
5	AW139	W	21:19	Approach	69	74.4	74.9	73.7	70.1	0.9	73
				Hovering	19	73.9	74.4	73.3	70.1	0.9	72
				Idling	466	70.3	70.7	69.7	70.1	0.9	58
		E	21:28	Take-off	73	70.5	70.7	70.0	70.1	0.9	61
6	AW139	W	21:47	Approach	71	75.2	75.7	74.5	69.8	0.9	75
				Hovering	18	73.7	74.0	73.1	69.8	0.9	72
				Idling	680	70.0	70.3	69.5	69.8	0.9	57
		E	22:00	Take-off	72	70.3	70.6	69.8	69.8	0.9	62
7	AW139	W	22:20	Approach	68	73.9	74.3	73.1	69.7	0.9	73
				Hovering	22	73.4	73.9	72.7	69.7	0.9	72
				Idling	515	69.8	70.1	69.3	69.7	0.9	54
		E	22:30	Take-off	67	69.9	70.2	69.3	69.7	0.9	57
8	AW139	W	22:51	Approach	69	77.1	77.6	76.2	68.7	0.9	77
				Hovering	25	73.4	74.3	72.3	68.7	0.9	73
				Idling	304	69.6	69.8	69.0	68.7	0.9	63
		E	22:58	Take-off	70	69.7	69.9	69.1	68.7	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: 18 March 2010  
 Time: 17:56 - 18:28  
 Location: Wing On Centre (roof level)  
 Weather Condition: Sunny periods

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	18:01	Approach	65	70.8	71.2	70.1	79	70.8	71.2	70.1	79.0	68.1	0.4	79
				Hovering	18	73.7	74.7	72.7	82.8	73.7	74.7	72.7	82.8	68.1	0.4	83
				Idling	390	69.1	69.4	68.7	76.4	69.1	69.4	68.7	76.4	68.1	0.4	76
		E	18:09	Take-off	71	71.5	71.9	70.8	81.2	70.0	70.3	69.4	77.5	68.1	0.4	77
2	AW139	W	18:19	Approach	67	69.2	69.5	68.6	75.8	69.2	69.5	68.6	75.8	67.9	0.4	75
				Hovering	18	72.2	72.5	71.7	76.3	72.2	72.5	71.7	76.3	67.9	0.4	76
				Idling	386	68.7	68.9	68.3	72.2	68.7	68.9	68.3	72.2	67.9	0.4	71
		E	18:27	Take-off	58	72.1	72.4	71.5	78.7	71.6	71.9	71.0	78.7	67.9	0.4	79
<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: 16 March 2010  
 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	-	-	Approach	**	**	**	**	**	**	**	**	**	**
				Hovering	**	**	**	**	**	**	**	**	**	**
				Idling	198	70.6	70.9	69.9	70.6	70.9	69.9	66.8	0.4	69
E	19:03	Take-off	71	71.7	72.0	71.0	71.5	71.8	70.8	66.8	0.4	70		
2	AW139	W	19:27	Approach	69	69.0	69.4	68.3	69.0	69.4	68.3	66.8	0.4	65
				Hovering	19	72.2	72.4	71.7	72.2	72.4	71.7	66.8	0.4	71
				Idling	401	68.8	69.0	68.3	68.8	69.0	68.3	66.8	0.4	65
E	19:35	Take-off	70	70.6	70.9	70.0	70.3	70.7	69.7	66.8	0.4	68		
3	AW139	W	19:50	Approach	72	71.0	71.4	70.2	71.0	71.4	70.2	67.8	0.4	69
				Hovering	21	71.4	71.6	70.8	71.4	71.6	70.8	67.8	0.4	69
				Idling	689	69.9	70.4	69.1	69.9	70.4	69.1	67.8	0.4	66
E	20:03	Take-off	68	71.5	71.8	70.8	71.3	71.6	70.5	67.8	0.4	69		
4	AW139	W	20:23	Approach	68	66.8	67.2	66.1	66.8	67.2	66.1	66.4	0.4	57
				Hovering	18	71.2	71.3	70.7	71.2	71.3	70.7	66.4	0.4	70
				Idling	429	68.0	68.2	67.4	68.0	68.2	67.4	66.4	0.4	63
E	20:32	Take-off	72	71.7	72.0	71.0	71.5	71.8	70.7	66.4	0.4	70		
5	AW139	W	20:53	Approach	70	67.5	67.8	66.8	67.5	67.8	66.8	65.4	0.4	64
				Hovering	20	71.8	71.9	71.1	71.8	71.9	71.1	65.4	0.4	71
				Idling	430	67.9	68.1	67.3	67.9	68.1	67.3	65.4	0.4	65
E	21:02	Take-off	66	70.8	71.3	70.0	70.6	71.1	69.7	65.4	0.4	69		
6	AW139	W	21:18	Approach	71	68.2	68.7	67.3	68.2	68.7	67.3	65.2	0.4	66
				Hovering	17	71.6	71.8	71.0	71.6	71.8	71.0	65.2	0.4	71
				Idling	535	67.3	67.5	66.7	67.3	67.5	66.7	65.2	0.4	64
E	21:29	Take-off	68	71.6	71.9	70.8	71.3	71.7	70.5	65.2	0.4	70		
7	AW139	W	21:52	Approach	68	69.4	69.9	68.6	69.4	69.9	68.6	67.5	0.4	65
				Hovering	18	72.4	72.5	71.9	72.4	72.5	71.9	67.5	0.4	71
				Idling	401	68.0	68.4	67.2	68.0	68.4	67.2	67.5	0.4	59
E	22:00	Take-off	68	70.8	71.2	70.0	70.6	71.0	69.8	67.5	0.4	68		
8	AW139	W	22:24	Approach	67	67.5	67.9	66.8	67.5	67.9	66.8	66.7	0.4	60
				Hovering	18	68.2	68.4	67.7	68.2	68.4	67.7	66.7	0.4	63
				Idling	418	67.7	67.9	67.1	67.7	67.9	67.1	66.7	0.4	61
E	22:32	Take-off	68	71.1	71.7	70.1	70.9	71.5	69.9	66.7	0.4	69		
9	AW139	W	22:49	Approach	71	67.8	68.3	67.0	67.8	68.3	67.0	65.8	0.4	64
				Hovering	19	70.4	70.7	69.8	70.4	70.7	69.8	65.8	0.4	69
				Idling	326	67.8	68.1	67.3	67.8	68.1	67.3	65.8	0.4	64
E	22:56	Take-off	70	70.5	70.9	69.6	70.3	70.8	69.4	65.8	0.4	69		
											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.