

## **Annex C**

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

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

**Date:** 07 June 2010  
**Time:** 15:57 - 17:08  
**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	15:57	Approach	67	74.7	75.3	73.9	78.8	71.8	0.9	79
				Hovering	18	74.1	74.5	73.4	79.8	71.8	0.9	80
				Idling	350	71.5	71.7	70.9	75.4	71.8	0.9	74
		E	16:04	Take-off	69	72.5	72.9	71.9	75.8	71.8	0.9	74
2	AW139	W	16:18	Approach	72	75.6	76.1	74.6	80.4	71.8	0.9	81
				Hovering	20	76.3	77.1	75.1	82.8	71.8	0.9	83
				Idling	696	71.9	72.2	71.4	78.1	71.8	0.9	78
		E	16:31	Take-off	73	73.0	73.2	72.4	76.1	71.8	0.9	75
3	AW139	W	16:53	Approach	66	75.4	75.9	74.7	79.9	71.5	0.9	80
				Hovering	20	75.3	76.1	74.4	80.5	71.5	0.9	81
				Idling	466	71.5	71.8	71.0	76.4	71.5	0.9	76
		E	17:02	Take-off	72	71.5	71.6	71.0	73.4	71.5	0.9	70
<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.

## 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:** 07 June 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			
						(1B)					(2)
1	AW139	**		Approach	**	**	**	**	**	**	**
				Hovering	**	**	**	**	**	**	
				Idling	**	**	**	**	**	**	
		E	19:00	Take-off	65	72.0	72.2	71.5	71.7	0.9	61
2	AW139	W	19:26	Approach	67	74.8	75.3	73.9	70.7	0.9	74
				Hovering	21	75.4	76.0	74.7	70.7	0.9	75
				Idling	355	70.8	71.0	70.3	70.7	0.9	55
		E	19:34	Take-off	68	71.3	71.4	70.8	70.7	0.9	63
3	AW139	W	19:53	Approach	68	74.6	75.3	73.6	70.4	0.9	73
				Hovering	19	76.1	76.9	75.1	70.4	0.9	76
				Idling	373	70.4	70.6	69.8	70.4	0.9	61
		E	20:01	Take-off	67	70.4	70.7	69.9	70.4	0.9	61
4	AW139	W	20:18	Approach	70	73.6	74.1	72.7	70.3	0.9	72
				Hovering	25	72.1	72.3	71.5	70.3	0.9	68
				Idling	585	70.0	70.2	69.4	70.3	0.9	61
		E	20:30	Take-off	70	70.4	70.7	69.8	70.3	0.9	55
5	AW139	W	20:46	Approach	74	73.9	74.6	72.9	69.3	0.9	73
				Hovering	22	72.4	72.7	72.0	69.3	0.9	70
				Idling	1128	69.4	69.6	68.9	69.3	0.9	54
		E	21:06	Take-off	66	70.9	71.2	70.3	69.3	0.9	67
6	AW139	W	21:20	Approach	67	74.8	75.2	74.0	69.1	0.9	74
				Hovering	19	72.9	74.0	71.5	69.1	0.9	71
				Idling	459	70.0	70.3	69.4	69.1	0.9	64
		E	21:30	Take-off	69	71.2	71.5	70.7	69.1	0.9	68
7	AW139	W	22:12	Approach	67	73.0	73.5	72.2	69.2	0.9	72
				Hovering	22	72.3	72.8	71.6	69.2	0.9	70
				Idling	733	69.4	69.6	68.9	69.2	0.9	57
		E	22:26	Take-off	74	69.6	69.8	69.1	69.2	0.9	60
8	AW139	W	22:52	Approach	37	76.5	77.0	75.7	69.3	0.9	76
				Hovering	22	75.8	76.3	74.8	69.3	0.9	76
				Idling	156	68.8	69.0	68.2	69.3	0.9	60
		E	22:55	Take-off	62	69.9	70.2	69.4	69.3	0.9	62
<b>Leq(4-hrs), dB(A):</b>										<b>61</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 June 2010  
**Time:** 17:15 - 18:40  
**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	E	17:20	Approach	75	72.8	73.7	72.9	78.4	72.8	75.4	74.4	83.2	72.8	-0.6	82
				Hovering	23	72.8	74.8	73.7	76.9	72.8	74.8	73.7	76.9	72.8	-0.6	74
				Idling	527	72.8	73.1	72.4	77.2	72.8	73.1	72.4	77.2	72.8	-0.6	75
		W	17:30	Take-off	71	72.8	75.2	73.9	81.4	72.8	75.2	73.9	81.4	72.8	-0.6	80
2	AW139	E	17:51	Approach	67	72.6	73.6	72.8	78.5	72.6	74.8	74.0	78.8	72.6	-0.6	77
				Hovering	21	72.6	76.6	74.8	81.3	72.6	76.6	74.8	81.3	72.6	-0.6	80
				Idling	594	72.6	73.6	72.9	79.6	72.6	73.6	72.9	79.6	72.6	-0.6	78
		W	18:03	Take-off	71	72.6	75.7	74.1	82.8	72.6	75.7	74.1	82.8	72.6	-0.6	82
3	AW139	W	18:29	Approach	71	68.9	76.4	74.8	82.6	68.9	76.4	74.8	82.6	72.0	-0.6	82
				Hovering	22	68.9	73.8	72.8	76.4	68.9	73.8	72.8	76.4	72.0	-0.6	74
				Idling	474	68.9	72.2	71.4	76.5	68.9	72.2	71.4	76.5	72.0	-0.6	74
		W	18:39	Take-off	65	68.9	72.5	71.0	80.0	68.9	72.5	71.0	80.0	72.0	-0.6	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.

# 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: 18 June 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	E	19:22	Approach	76	73.4	73.9	72.8	75.3	75.8	74.5	71.6	-0.6	72
				Hovering	15	73.3	74.2	72.4	73.3	74.2	72.4	71.6	-0.6	68
				Idling	514	72.6	72.9	72.0	72.6	72.9	72.0	71.6	-0.6	65
		W	19:32	Take-off	71	73.5	73.8	72.9	73.5	73.8	72.9	71.6	-0.6	68
2	AW139	E	19:53	Approach	74	70.8	71.0	70.3	72.1	72.3	71.6	70.8	-0.6	66
				Hovering	21	72.7	73.3	72.0	72.7	73.3	72.0	70.8	-0.6	68
				Idling	585	71.3	71.5	70.7	71.3	71.5	70.7	70.8	-0.6	61
		W	20:04	Take-off	60	73.1	73.7	72.2	73.1	73.7	72.2	70.8	-0.6	69
3	AW139	E	20:17	Approach	76	74.5	75.0	73.8	75.7	76.1	75.0	71.0	-0.6	73
				Hovering	22	72.9	73.3	72.2	72.9	73.3	72.2	71.0	-0.6	68
				Idling	721	71.8	72.2	71.2	71.8	72.2	71.2	71.0	-0.6	63
		W	20:31	Take-off	75	73.1	73.6	72.5	73.1	73.6	72.5	71.0	-0.6	68
4	AW139	E	20:52	Approach	70	70.8	71.2	70.2	72.3	72.6	71.6	70.1	-0.6	68
				Hovering	25	72.6	73.1	71.8	72.6	73.1	71.8	70.1	-0.6	68
				Idling	531	70.5	70.9	69.9	70.5	70.9	69.9	70.1	-0.6	59
		W	21:02	Take-off	72	71.7	72.2	70.9	71.7	72.2	70.9	70.1	-0.6	66
5	AW139	E	21:17	Approach	84	71.3	71.6	70.7	72.9	73.2	72.3	70.1	-0.6	69
				Hovering	21	70.3	70.5	69.7	70.3	70.5	69.7	70.1	-0.6	56
				Idling	838	70.7	71.0	70.1	70.7	71.0	70.1	70.1	-0.6	61
		W	21:33	Take-off	76	71.7	72.3	71.0	71.7	72.3	71.0	70.1	-0.6	66
6	AW139	E	21:49	Approach	76	72.1	72.4	71.5	73.1	73.5	72.5	70.5	-0.6	69
				Hovering	24	72.5	73.0	71.9	72.5	73.0	71.9	70.5	-0.6	68
				Idling	653	70.9	71.2	70.3	70.9	71.2	70.3	70.5	-0.6	60
		W	22:02	Take-off	71	71.6	72.1	71.0	71.6	72.1	71.0	70.5	-0.6	64
7	AW139	E	22:15	Approach	85	71.9	72.3	71.3	72.7	73.1	72.1	70.4	-0.6	68
				Hovering	18	72.3	72.7	71.8	72.3	72.7	71.8	70.4	-0.6	67
				Idling	877	71.0	71.3	70.4	71.0	71.3	70.4	70.4	-0.6	62
		W	22:31	Take-off	70	71.0	71.4	70.3	71.0	71.4	70.3	70.4	-0.6	62
8	AW139	E	22:47	Approach	71	71.2	71.5	70.7	73.0	73.3	72.4	70.0	-0.6	69
				Hovering	20	71.8	72.1	71.4	71.8	72.1	71.4	70.0	-0.6	67
				Idling	599	71.4	71.7	70.8	71.4	71.7	70.8	70.0	-0.6	65
		W	22:59	Take-off	69	73.8	74.4	72.9	73.8	74.4	72.9	70.0	-0.6	71
<b>Leq(4-hrs), dB(A):</b>												<b>61</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 (Day-time)**

**Date:** 18 June 2010  
**Time:** 15:21 - 16:34  
**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	E	15:21	Approach	44	79.6	80.7	78.2	86.8	78.1	79.1	76.7	83.5	68.6	0.4	84
				Hovering	24	75.9	77.1	74.5	83.8	75.9	77.1	74.5	83.8	68.6	0.4	84
				Idling	676	68.2	68.7	67.6	82.5	68.2	68.7	67.6	82.5	68.6	0.4	83
		W	15:34	Take-off	65	73.1	74.4	71.5	84.3	73.1	74.4	71.5	84.3	68.6	0.4	85
2	AW139	E	15:55	Approach	73	76.7	78.0	74.9	87.8	75.5	76.8	73.7	85.0	67.9	0.4	85
				Hovering	28	73.0	73.7	72.1	78.9	73.0	73.7	72.1	78.9	67.9	0.4	79
				Idling	345	68.9	69.1	68.4	72.2	68.9	69.1	68.4	72.2	67.9	0.4	71
		W	16:02	Take-off	78	71.3	71.7	70.7	75.2	71.3	71.7	70.7	75.2	67.9	0.4	75
3	AW139	W	16:19	Approach	68	70.0	70.7	69.2	77.3	70.0	70.7	69.2	77.3	66.1	0.4	77
				Hovering	22	71.0	71.5	70.3	75.2	71.0	71.5	70.3	75.2	66.1	0.4	75
				Idling	752	69.5	70.2	68.7	81.7	69.5	70.1	68.7	81.7	66.1	0.4	82
		E	16:33	Take-off	56	72.9	74.2	71.4	83.8	70.9	72.1	69.4	83.4	66.1	0.4	84
														<b>Highest Lmax, dB(A):</b>	<b>85</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: 18 June 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			LAeq @
									(1B)					=(1B)-(2)+(3)
1	AW139	E	19:22	Approach	76	78.8	79.9	77.1	76.6	77.6	75.1	67.7	0.4	76
				Hovering	15	76.9	78.9	73.9	76.9	78.9	73.9	67.7	0.4	77
				Idling	514	67.8	68	67.3	67.8	68.0	67.3	67.7	0.4	52
		W	19:32	Take-off	71	70.3	70.7	69.7	70.3	70.7	69.7	67.7	0.4	67
2	AW139	E	19:53	Approach	74	74.6	75.4	73.4	73.1	74.0	71.8	67.5	0.4	72
				Hovering	21	78.5	79	77.3	78.5	79.0	77.3	67.5	0.4	79
				Idling	585	67.9	68	67.3	67.9	68.0	67.3	67.5	0.4	58
		W	20:04	Take-off	60	76.1	77.7	73.6	76.1	77.7	73.6	67.5	0.4	76
3	AW139	E	20:17	Approach	76	76.9	77.7	75.7	75.6	76.5	74.3	66.0	0.4	75
				Hovering	22	74.8	75.6	73.3	74.8	75.6	73.3	66.0	0.4	75
				Idling	721	67.5	67.8	66.9	67.5	67.8	66.9	66.0	0.4	63
		W	20:31	Take-off	75	69.8	70.1	69.1	69.8	70.1	69.1	66.0	0.4	68
4	AW139	E	20:52	Approach	70	77.5	78.1	76.5	75.8	76.5	74.7	65.4	0.4	76
				Hovering	25	76.7	77.5	75.6	76.7	77.5	75.6	65.4	0.4	77
				Idling	531	66.6	66.7	66.1	66.6	66.7	66.1	65.4	0.4	61
		W	21:02	Take-off	72	72.1	72.7	71.1	72.1	72.7	71.1	65.4	0.4	71
5	AW139	E	21:17	Approach	84	76.3	76.9	75.3	74.6	75.1	73.6	65.6	0.4	74
				Hovering	21	79.7	80.3	78.6	79.7	80.3	78.6	65.6	0.4	80
				Idling	838	67.3	67.5	66.7	67.3	67.5	66.7	65.6	0.4	63
		W	21:33	Take-off	76	68.4	68.7	67.8	68.4	68.7	67.8	65.6	0.4	66
6	AW139	E	21:49	Approach	76	71.5	72	70.5	70.0	70.5	69.1	65.5	0.4	68
				Hovering	24	79.8	80.7	78.6	79.8	80.7	78.6	65.5	0.4	80
				Idling	653	66.5	66.7	66.1	66.5	66.7	66.1	65.5	0.4	60
		W	22:02	Take-off	71	67.4	67.6	66.8	67.4	67.6	66.8	65.5	0.4	63
7	AW139	E	22:15	Approach	85	75.6	76.7	74.1	74.0	75.1	72.5	65.8	0.4	74
				Hovering	18	79.9	80.8	78.7	79.9	80.8	78.7	65.8	0.4	80
				Idling	877	67.3	67.5	66.7	67.3	67.5	66.7	65.8	0.4	62
		W	22:31	Take-off	70	67.6	67.8	67.1	67.6	67.8	67.1	65.8	0.4	63
8	AW139	E	22:47	Approach	71	77.8	78.3	76.9	75.6	76.2	74.6	65.3	0.4	76
				Hovering	20	77.6	78.2	76.8	77.6	78.2	76.8	65.3	0.4	78
				Idling	599	66.4	66.5	65.9	66.4	66.5	65.9	65.3	0.4	60
		W	22:59	Take-off	69	69	69.3	68.4	69.0	69.3	68.4	65.3	0.4	67
<b>Leq(4-hrs), dB(A):</b>												<b>65</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).