GFS - Sample Calculation for NO_x Emission

Helicopter Emission = Emission of Approach Mode + Emission of Taxi-in Mode + Emission of Taxi-out Mode + Emission of Take-off Mode +Emission of Cruising Mode
Emission of Each Mode = Time-in-mode (s) X Fuel Flow Rate (kg/s) X Emission Index (g/kg fuel) X Number of Engine

Table 1: Sample of LTO Record of GFS Aircraft and Helicopter Summary

Serial No.	Date	Time	Model	Type	Route	Departure	Arrival
932610	01 Jan 2031	0:55	Bombardier Challenger 605	Aircraft	CLK-ASTF-(1ASK C1)-CLK		Y
932810	01 Jan 2031	7:40	Bombardier Challenger 605	Aircraft	CLK-HKO-CLK	Y	
932810	01 Jan 2031	8:35	Bombardier Challenger 605	Aircraft	CLK-HKO-CLK		Y
953410	01 Jan 2031	11:30	Bombardier Challenger 605	Aircraft	CLK-OMAN HOLE CHK-CLK	Y	
92311	**02 Jun 2031**	**16:40**	**Eurocopter EC 155**	**Helicopter**	**CLK-CC04-HK24-CLK**	**Y**	
92311	**02 Jun 2031**	**17:20**	**Eurocopter EC 155**	**Helicopter**	**CLK-CC04-HK24-CLK**		**Y**

Sample Calculation

Table 2: Corrected Time-in-mode[1]

Parameter		Date and Time		
		02 Jun 2031 16:40	02 Jun 2031 17:20	
Arrival / Departure		Departure	Arrival	
Mixing Height (m)		955	955	
Unadjusted TIM (min)	Approach	---	5.50	**Since Mixing Height > Cruising Height (152.4 m), Corrected TIM = 5.50 x (152.4/914.4) = 0.92 min**
	Taxi-in	---	5.00	
	Taxi-out	5.00	---	
	Take off	3.00	---	**Since Mixing Height > Cruising Height (152.4 m), Corrected TIM = 3.00 x (152.4/914.4) + 1 = 1.50 min**
Adjusted TIM (min)	Approach	---	0.92	
	Taxi-in	---	5.00	
	Taxi-out	5.00	---	
	Take off	1.50	---	
	Cruising (Departure)[3]	1.90	---	**The destination location (CC04) is located at Cheung Chau and Route 4 will be used for cruising**
	Cruising (Approach)[3]	---	1.90	**The last location (HK24) is located at Pamela Youde Hospital and Route 4 will be used for cruising**

Note
[1] The detail correction method of TIM is shown in Appendix 5.3.5-4.
[2] The TIM of cruising of different route can be found in Appendix 5.3.5-4
[3] The arrival path will be assumed same as the departure path if the arrival path cannot be identified from the GFS provided information.

Table 3: Adjusted Fuel Flow of Eurocopter EC 155

Date	Time	Adjusted Fuel Flow (kg/s)[4]				
		Approach	Taxi-in	Taxi-out	Take off	Cruising
02 Jun 2031	16:40	---	---	0.0165	0.0516	0.0515
02 Jun 2031	17:20	0.0320	0.0141	---	---	0.0512

Note
[4] The Adjusted Fuel Flow is derived from EDMS with correction of meteorological data of corresponding hour by creating a user-created helicopter with fuel flow provided from FOCA

Table 4: Adjusted NO_x Emission Factor of Eurocopter EC 155

Date	Time	Adjusted NO_x Emission Factor (g/kg fuel)[4]				
		Approach	Taxi-in	Taxi-out	Take off	Cruising
02 Jun 2031	16:40	---	---	1.9425	7.6345	7.6345
02 Jun 2031	17:20	5.0610	1.6007	---	---	7.6127

Note
[4] The Adjusted NOx Emission Factor is derived from EDMS with correction of meteorological data of corresponding hour by creating a user-created helicopter with NOx Emission Factor provided from FOCA

Table 5: NO_x Emission of Eurocopter EC 155

Date	Time	NO_x Emission (kg)					
		Approach	Taxi-in	Taxi-out	Take off	Cruising	Total
02 Jun 2031	16:40	---	---	0.0192	0.0708	0.0897	0.1798
02 Jun 2031	17:20	0.0178	0.0135	---	---	0.0890	0.1203

Emission of Approach Mode = Time-in-mode X Fuel Flow Rate X Emission Index X Number of Engine (=2 for Eurocopter EC 155)

Emission at 07L = 0.0178 kg X 0.66 = 0.0117 kg ; Emission at 07R = 0.0178 kg X 0.34 = 0.0061 kg

Table 6: Runway Usage (3RS Scenario)

Date	Time	Runway Direction	Arrival / Departure	Runway usage fraction							
				07L	07C	07R	25L	25C	25R	25X[7]	25Y[7]
02 Jun 2031	16:40	07	Departure	0.00	0.55	0.45	0.00	0.00	0.00	N/A[8]	N/A[8]
02 Jun 2031	17:20	07	Arrival	0.66	0.00	0.34	0.00	0.00	0.00	0.0	0.0

Note
[5] Runway usage fraction is derived from the TAAM model of aircraf
[6] Runway fraction is applicable to GFS aircraft only. This sample calculation using GFS Helicopter is for demonstration purpose only.
[7] Flightaths 25X and 25Y correspond to flightpaths of aircrafts landing using Runways 25C and 25R during night time respecrively.
[8] N/A = Not applicable.

Emission at 07L = 0.0178 kg X 1.0 = 0.178kg

Table 7: Runway Usage (2RS Scenario)

Date	Time	Runway Direction	Arrival / Departure	Runway usage fraction			
				07L	07R	25L	25R
02 Jun 2031	16:40	07	Departure	0.00	1.00	0.00	0.00
02 Jun 2031	17:20	07	Arrival	1.00	0.00	0.00	0.00

Note
[9] Runway usage fraction is derived from the TAAM model of aircraf
[10] Runway fraction is applicable to GFS aircraft only. This sample calculation using GFS Helicopter is for demonstration purpose only.