

## Supplemental Material

Table S1 shows the results from the circulation generator module (CGM) on the maximum possible circulations of wake vortex (WV) generated, in realistic scenarios, by all the aircraft for which the necessary data are available in the Base of Aircraft Data (BADA) version 4.1, which excludes the propeller-driven light aircraft SR20 and SR22. In this table,  $\Gamma_0$  is the initial circulation of the WV, and  $\Gamma_{Sarp}$  and  $\Gamma_{D2P}$  are the circulations of the WV as obtained from Sarpkaya's and the P2P/D2P decay models, respectively, at different horizontal separation distances  $d_{SEP}$  between the generator aircraft and follower aircraft. The table also shows the time separation  $t_{SEP}$  between aircraft for the given flight velocity  $U_\infty$ , and the WV sinking or descent in altitude  $h_{WV}$ , equivalent to the generator-follower vertical separation.

**Table S1.** Maximum circulations of the wake vortex generated by several aircraft, and flight conditions of the generator.

Generator	mass [t]	$U_\infty$ [m/s]	$M$ [-]	FL [-]	$r_c$ [m]	$b_0$ [m]	$\Gamma_0$ [m <sup>2</sup> /s]	$d_{SEP}$ [NM]	$\Gamma_{Sarp}$ [m <sup>2</sup> /s]	$\Gamma_{D2P}$ [m <sup>2</sup> /s]	$t_{SEP}$ [s]	$h_{WV}(t_{SEP})$ [ft]
A300B4-203	132	221.41	0.73	300	1.57	35.21	362.43	0.5	358.62	343.83	4.18	22
								3	340.14	326.84	25.09	130
								5	326.04	313.86	41.82	213
								30.2	191.45	206.44	252.3	1000
								135.6	20.55	n/a	1134.3	2000
A300B4-601	157	240.40	0.79	300	1.57	35.22	396.30	0.5	392.19	375.93	3.85	22
								3	372.28	357.23	23.11	131
								5	357.08	342.96	38.52	215
								29.7	213.50	226.59	228.6	1000
								122.9	30.61	n/a	946.5	2000
A300B4-622	112	233.35	0.79	400	1.57	35.22	441.79	0.5	436.67	418.45	3.97	26
								3	411.93	394.63	23.81	150
								5	393.15	376.64	39.68	245
								25.6	243.21	253.56	203.1	1000
								98.36	44.55	n/a	780.6	2000
A310-204	98	226.26	0.77	411	1.54	34.48	428.65	0.5	423.64	405.80	4.09	26
								3	398.44	381.71	24.56	153
								5	379.49	363.59	40.93	250
								25.3	231.69	243.13	206.7	1000
								103.1	34.80	n/a	843.6	2000
A310-222	90	227.82	0.77	411	1.54	34.48	393.36	0.5	388.93	372.80	4.06	24
								3	367.51	352.58	24.39	140
								5	351.22	337.25	40.65	228
								27.9	208.85	222.38	227.1	1000
								122.6	24.46	n/a	996.3	2000
A310-308	110	227.80	0.77	411	1.54	34.48	482.53	0.5	476.18	456.15	4.07	29
								3	445.65	425.97	24.39	171
								5	422.65	403.54	40.65	278
								22.4	266.78	274.78	181.8	1000
								84.6	51.20	n/a	688.2	2000
A310-322	98	231.35	0.78	411	1.54	34.48	419.22	0.5	414.34	397.08	4.00	25
								3	390.77	374.51	24.02	147
								5	372.89	357.46	40.03	239
								26.5	225.56	237.58	211.8	1000
								109.8	31.99	n/a	879.3	2000
A310-324	98	230.56	0.78	411	1.54	34.48	420.65	0.5	415.72	398.41	4.02	25
								3	391.94	375.60	24.10	148
								5	373.89	358.40	40.16	241
								26.3	226.57	238.47	210.9	1000
								108.8	32.42	n/a	873.6	2000
A318-112	54	221.21	0.75	398	1.19	26.78	295.85	0.5	291.63	279.51	4.19	24
								3	271.42	260.19	25.12	139
								5	256.26	245.90	41.86	224

A319-114	56	223.18	0.76	398	1.19	26.78	301.86	31.6	119.43	n/a	264.3	1000
								n/a	n/a	n/a	n/a	2000
								0.5	297.53	285.13	4.15	24
								3	276.77	265.21	24.89	140
								5	261.22	250.49	41.49	227
A319-131	56	223.15	0.76	398	1.19	26.78	301.91	31.1	122.70	n/a	258.3	1000
								n/a	n/a	n/a	n/a	2000
								0.5	297.57	285.18	4.15	24
								3	276.81	265.25	24.90	140
								5	261.25	250.52	41.50	227
A320-212	50	221.0	0.75	398	1.19	26.78	272.50	31.1	122.83	n/a	258.0	1000
								n/a	n/a	n/a	n/a	2000
								0.5	268.84	257.73	4.19	22
								3	251.28	241.26	25.14	128
								5	238.06	228.96	41.91	208
A320-214	50	220.68	0.75	411	1.19	26.78	290.43	34.7	106.77	n/a	290.6	1000
								n/a	n/a	n/a	n/a	2000
								0.5	286.34	274.45	4.20	24
								3	266.71	255.77	25.18	136
								5	251.99	241.93	41.96	220
A320-231	50	219.51	0.74	398	1.19	26.78	274.30	32.2	116.47	n/a	270.0	1000
								n/a	n/a	n/a	n/a	2000
								0.5	270.58	259.39	4.22	22
								3	252.70	242.60	25.31	130
								5	239.26	230.08	42.19	210
A320-232	51	223.09	0.76	411	1.19	26.78	291.04	34.2	107.77	n/a	288.3	1000
								n/a	n/a	n/a	n/a	2000
								0.5	286.97	275.05	4.15	23
								3	265.48	256.49	24.91	135
								5	249.90	242.72	41.51	219
A321-111	54	220.65	0.75	398	1.20	26.82	293.71	32.5	116.78	n/a	269.4	1000
								n/a	n/a	n/a	n/a	2000
								0.5	289.55	277.51	4.20	24
								3	269.58	258.47	25.18	138
								5	254.61	244.38	41.97	223
A321-131	54	219.67	0.74	398	1.20	26.82	295.03	31.8	118.45	n/a	266.7	1000
								n/a	n/a	n/a	n/a	2000
								0.5	290.82	278.73	4.22	24
								3	270.61	259.44	25.29	139
								5	255.46	245.17	42.16	225
A330-203	151	231.11	0.78	415	2.11	47.36	483.76	31.5	119.23	n/a	265.2	1000
								n/a	n/a	n/a	n/a	2000
								0.5	480.06	460.27	4.01	21
								3	461.97	444.12	24.04	125
								5	448.00	431.54	40.07	205
A330-223	150	233.57	0.79	415	2.11	47.36	472.49	29.1	309.63	316.59	232.8	1000
								82.9	135.36	n/a	664.5	2000
								0.5	468.97	449.66	3.96	21
								3	451.79	434.41	23.79	121
								5	438.50	422.51	39.65	199
A330-243	150	231.73	0.79	415	2.11	47.36	476.24	30.1	301.35	309.02	238.8	1000
								86.3	130.15	n/a	684.6	2000
								0.5	472.65	453.18	4.00	21
								3	455.09	437.56	23.98	123
								5	441.52	425.39	39.96	202
A330-301	138	225.50	0.76	415	2.11	47.36	451.10	29.6	304.15	311.57	236.7	1000
								84.8	131.90	n/a	677.7	2000
								0.5	447.74	429.34	4.11	20
								3	431.32	414.93	24.64	120
								5	418.62	403.69	41.06	196
								30.6	285.71	294.70	251.0	1000
								88.4	120.34	n/a	726.2	2000

A330-321	138	229.38	0.78	415	2.11	47.36	443.47	0.5	440.27	422.18	4.04	20
								3	424.59	408.48	24.22	116
								5	412.45	397.78	40.37	190
								31.7	280.17	289.62	255.6	1000
								91.9	116.88	n/a	742.2	2000
A330-341	170	233.68	0.79	411	2.11	47.36	525.57	0.5	521.34	499.79	3.96	23
								3	500.69	480.96	23.78	134
								5	484.76	466.34	39.63	220
								26.9	340.17	344.46	213.3	1000
								75.6	154.88	n/a	599.1	2000
A340-213	167	234.54	0.79	415	2.11	47.36	525.78	0.5	521.56	500.01	3.95	23
								3	500.97	481.23	23.69	134
								5	485.09	466.65	39.48	219
								27.0	340.27	344.55	213.3	1000
								75.8	154.98	n/a	598.8	2000
A340-313	167	233.63	0.79	415	2.11	47.36	527.83	0.5	523.57	501.93	3.96	23
								3	502.76	482.93	23.78	135
								5	486.72	468.19	39.64	221
								26.8	341.79	345.93	212.4	1000
								75.2	155.88	n/a	596.1	2000
A340-541	242	241.07	0.82	415	2.22	49.83	703.74	0.5	697.45	668.35	3.84	28
								3	666.84	638.89	23.05	165
								5	643.32	616.21	38.41	270
								21.3	480.27	472.32	163.5	1000
								56.2	256.81	n/a	431.4	2000
A340-642	247	241.65	0.82	415	2.22	49.83	717.13	0.5	710.64	680.96	3.83	29
								3	679.09	650.46	22.99	167
								5	654.86	627.00	38.32	275
								20.9	490.52	481.53	160.2	1000
								55.0	263.83	n/a	421.8	2000
A380-841	541	247.60	0.82	315	2.79	62.64	790.25	0.5	785.13	752.57	3.74	25
								3	760.02	729.52	22.44	145
								5	740.51	711.47	37.40	238
								23.6	581.26	571.10	176.7	1000
								57.9	372.37	263.04	432.9	2000
A380-861	370	247.07	0.84	431	2.79	62.64	902.39	0.5	895.92	858.60	3.75	28
								3	864.22	828.54	22.49	165
								5	839.67	805.13	37.48	271
								20.5	671.45	653.16	153.9	1000
								49.8	440.42	332.44	373.3	2000
B737W24	56	225.33	0.76	410	1.25	28.11	302.13	0.5	298.16	285.80	4.11	23
								3	279.10	267.76	24.66	133
								5	264.73	254.28	41.10	216
								32.3	128.67	13.69	265.5	1000
								n/a	n/a	n/a	n/a	2000
B738W26	51	221.89	0.75	410	1.25	28.11	281.07	0.5	277.52	266.07	4.17	22
								3	260.44	250.18	25.04	126
								5	247.54	238.24	41.73	204
								34.5	116.87	8.47	288.3	1000
								n/a	n/a	n/a	n/a	2000
B739ERW26	55	224.75	0.76	410	1.25	28.11	298.99	0.5	295.09	282.86	4.12	23
								3	276.32	265.15	24.72	132
								5	262.17	251.90	41.20	214
								32.6	126.97	13.18	268.5	1000
								n/a	n/a	n/a	n/a	2000
B742RR	298	248.65	0.83	325	2.09	46.84	601.38	0.5	596.25	571.46	3.72	25
								3	571.25	547.81	22.34	146
								5	552.01	529.55	37.24	239
								24.6	394.47	393.47	183.3	1000
								67.9	187.85	n/a	505.8	2000
B743PW	302	251.00	0.84	325	2.09	46.84	605.19	0.5	600.05	575.09	3.69	25
								3	575.00	551.37	22.14	145

								5	555.72	533.04	36.89	238
								24.6	397.54	396.21	181.8	1000
								68.0	189.69	n/a	501.9	2000
B744ERGE	330	246.93	0.82	325	2.27	50.99	617.37	0.5	612.67	587.27	3.75	24
								3	589.73	566.04	22.50	139
								5	572.00	549.53	37.50	228
								25.5	418.17	416.79	191.4	1000
								67.9	219.03	n/a	509.1	2000
B744GE	377	250.45	0.84	325	2.27	50.99	695.03	0.5	689.33	660.62	3.70	26
								3	661.53	634.14	22.18	154
								5	640.10	613.65	36.97	252
								22.8	477.15	470.15	168.9	1000
								59.9	259.27	n/a	442.8	2000
B748F	287	244.70	0.83	421	2.39	53.72	786.94	0.5	780.29	747.71	3.78	29
								3	747.87	716.44	22.71	169
								5	722.91	692.30	37.84	277
								20.5	555.78	542.69	155.1	1000
								52.2	324.69	n/a	394.8	2000
B752WRR40	75	226.16	0.77	420	1.33	29.89	398.32	0.5	392.52	376.00	4.09	28
								3	364.76	348.58	24.57	163
								5	343.98	328.42	40.94	265
								24.7	192.82	102.05	202.5	1000
								n/a	n/a	n/a	n/a	2000
B753RR	80	227.12	0.77	420	1.33	29.89	419.92	0.5	413.58	396.10	4.08	30
								3	383.30	365.84	24.46	171
								5	360.68	343.75	40.77	277
								23.4	205.87	112.62	191.1	1000
								n/a	n/a	n/a	n/a	2000
B762ERPW56	116	228.65	0.77	431	1.67	37.36	514.73	0.5	508.54	487.22	4.05	29
								3	478.66	457.96	24.30	168
								5	456.02	435.98	40.50	274
								22.3	300.21	305.25	180.3	1000
								73.9	85.96	n/a	598.5	2000
B762GE50	93	227.02	0.77	431	1.67	37.36	413.43	0.5	409.19	392.25	4.08	23
								3	388.61	373.10	24.47	137
								5	372.89	358.46	40.79	223
								28.0	232.02	243.60	228.3	1000
								101.8	50.61	n/a	830.1	2000
B763ERGE61	121	227.41	0.77	431	1.67	37.36	539.82	0.5	533.04	510.63	4.07	30
								3	500.42	478.34	24.43	177
								5	475.76	454.21	40.72	288
								21.0	317.30	320.56	171.3	1000
								68.8	94.99	n/a	560.1	2000
B763PW60	103	229.42	0.78	431	1.67	37.36	454.57	0.5	449.61	430.91	4.04	25
								3	425.60	408.06	24.22	149
								5	407.32	390.70	40.36	242
								25.5	259.55	268.60	206.1	1000
								88.8	64.70	n/a	717.0	2000
B764ER	194	233.40	0.78	315	1.82	40.78	461.93	0.5	457.59	438.65	3.97	23
								3	434.52	419.07	23.81	137
								5	420.36	404.02	39.68	224
								27.3	275.87	284.07	216.9	1000
								86.7	90.01	n/a	688.2	2000
B772LR	330	246.62	0.82	315	2.20	49.43	613.86	0.5	608.96	583.68	3.75	24
								3	585.04	561.34	22.53	142
								5	566.58	544.02	37.55	234
								25.0	411.29	409.85	187.6	1000
								67.2	208.88	n/a	505.0	2000
B772RR92	186	243.43	0.82	431	2.13	47.85	604.45	0.5	599.35	574.45	3.80	25
								3	574.48	551.06	22.82	146
								5	555.33	532.98	38.04	240
								24.4	399.92	398.82	185.4	1000

B773ERGE115B	334	248.21	0.82	315	2.27	50.89	599.37	66.6	195.35	n/a	507.0	2000
								0.5	594.92	570.28	3.73	23
								3	573.17	550.29	22.38	134
								5	556.35	534.71	37.31	221
								26.4	404.37	404.21	197.1	1000
B773RR92	284	248.57	0.83	315	2.13	47.85	542.07	70.6	209.35	n/a	526.8	2000
								0.5	537.95	515.69	3.73	22
								3	517.77	497.22	22.35	129
								5	502.18	482.85	37.25	212
								27.9	353.62	356.87	208.2	1000
B788RR	148	240.32	0.81	431	2.10	47.22	492.97	77.7	165.24	n/a	579.0	2000
								0.5	489.27	469.09	3.85	21
								3	471.20	452.86	23.12	123
								5	457.22	440.21	38.53	202
								29.5	315.95	322.32	227.7	1000
B73215	42	206.50	0.70	370	0.99	22.27	256.71	84.1	138.91	n/a	648.3	2000
								0.5	251.92	241.34	4.48	27
								3	229.26	219.22	26.91	153
								5	212.60	203.52	44.84	246
								31.9	77.06	n/a	286.2	1000
B73320	49	213.53	0.72	370	1.01	22.68	284.86	n/a	n/a	n/a	n/a	2000
								0.5	279.45	267.62	4.34	28
								3	251.94	242.31	26.02	161
								5	235.22	224.45	43.37	258
								29.3	92.65	n/a	254.4	1000
B73423	54	214.85	0.73	370	1.01	22.68	314.57	n/a	n/a	n/a	n/a	2000
								0.5	308.17	294.96	4.31	31
								3	278.08	264.54	25.86	176
								5	256.14	243.43	43.10	282
								26.2	106.99	n/a	226.2	1000
B73518	48	211.92	0.72	370	1.01	22.68	283.83	n/a	n/a	n/a	n/a	2000
								0.5	278.42	266.64	4.37	28
								3	252.89	241.33	26.22	161
								5	234.16	223.48	43.70	259
								29.2	92.2	n/a	255.3	1000
B73622	52	224.65	0.76	410	1.20	26.96	295.56	n/a	n/a	n/a	n/a	2000
								0.5	291.46	279.34	4.12	24
								3	271.77	260.57	24.73	136
								5	256.99	246.64	41.22	220
								32.2	120.07	n/a	265.5	1000
F70-620	40	199.56	0.67	350	0.98	22.05	232.78	n/a	n/a	n/a	n/a	2000
								0.5	228.54	219.03	4.64	25
								3	208.46	199.78	27.84	145
								5	193.67	186.02	46.40	233
								34.7	64.97	n/a	321.9	1000
F100-620	37	195.08	0.66	350	0.98	22.05	220.13	n/a	n/a	n/a	n/a	2000
								0.5	216.20	207.25	4.75	25
								3	197.56	189.60	28.48	140
								5	183.81	176.91	47.47	226
								36.3	59.35	n/a	345.0	1000
F100-650	44	205.26	0.69	350	0.98	22.05	248.45	n/a	n/a	n/a	n/a	2000
								0.5	243.82	233.60	4.51	26
								3	221.95	212.35	27.07	150
								5	205.87	197.24	45.11	241
								32.9	72.07	n/a	297.0	1000
MD808120	51	218.17	0.74	370	1.15	25.80	254.18	n/a	n/a	n/a	n/a	2000
								0.5	250.69	240.35	4.24	22
								3	233.95	224.72	25.47	125
								5	221.37	213.08	42.44	204
								36.4	92.93	n/a	309.0	1000
MD808221	54	219.79	0.74	370	1.15	25.80	269.43	n/a	n/a	n/a	n/a	2000
								0.5	265.59	254.59	4.21	23

MD808321	69	220.64	0.72	285	1.15	25.80	245.39	3	247.22	237.20	25.28	132
								5	233.44	224.32	42.13	214
								34.2	100.89	n/a	288.6	1000
								n/a	n/a	n/a	n/a	2000
								0.5	242.14	232.17	4.20	21
								3	226.56	217.74	25.18	120
								5	214.81	206.94	41.97	195
								38.3	88.42	n/a	321.9	1000
								n/a	n/a	n/a	n/a	2000
								0.5	232.31	222.77	4.31	20
MD808720	64	214.90	0.70	285	1.15	25.80	235.41	3	217.43	209.13	25.85	118
								5	206.21	198.90	43.09	192
								39.2	83.28	n/a	338.1	1000
								n/a	n/a	n/a	n/a	2000
								0.5	265.59	254.59	4.21	23
MD808821	54	219.79	0.74	370	1.15	25.80	269.43	3	247.22	237.20	25.28	132
								5	233.44	224.32	42.13	214
								34.2	100.89	n/a	288.6	1000
								n/a	n/a	n/a	n/a	2000
								0.5	265.59	254.59	4.21	23

n/a (not applicable) means that the WV does not sink 1000 or 2000 ft, or  $\Gamma$  is null, with the corresponding sinking model.