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THE BASELINE DATA SETS FOR PHASE II OF THE COMBINED EXPERIMENT

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ABSTRACT

The National Renewable Energy Laboratory's "Combined Experiment" was initiated to provide an understanding of horizontal axis wind turbine aerodynamics and their effect on the turbine structure. To this end, aerodynamic and structural baseline data sets have been defined that examine turbine performance under certain conditions. These baseline results have been discussed thoroughly in several papers. This report is an addendum to those papers and supplies additional information about the data selected in creating the baseline data sets. Several appendices are included which contain the tape and cycle numbers of the selected data, along with the average and standard deviation values for the inflow conditions, velocity, and yaw.

INTRODUCTION

Wind turbines operate in a highly unsteady, three-dimensional environment that is radically different from the steady-state conditions of a wind tunnel. One of the primary objectives of the "Combined Experiment" is to understand the differences between the wind turbine blade's aerodynamic performance in the field and in steady-state wind tunnel tests. This understanding would significantly benefit wind turbine designers who currently rely upon two-dimensional wind tunnel tests to estimate aerodynamic performance.

As an initial step towards this goal, the aerodynamic and the structural performance of a field operating turbine was examined under the steadiest conditions possible. The baseline performance under relatively steady inflow conditions, yaw and velocity, was established for the Combined Experiment turbine and was compared to corresponding wind tunnel data. Off-nominal or anomalous responses of the turbine to unsteady inlet flow conditions could then be carefully identified and quantified.

Previous efforts by the authors focused on establishing aerodynamic and structural performance baselines (Shipley et al., 1994a; Robinson et al., 1994; and Young, 1994). This paper represents an addendum to these reports and presents additional information regarding the particular sequences of data used to establish the performance metrics.

DISCUSSION

Aerodynamic and structural effects are dependent upon the inflow conditions, velocity and yaw. Previous methods of examining the data included binning by average velocity, and yaw (Huyer, 1992). However, the stochastic distribution of the data suggests that binning and averaging over large portions of the data resulted in poor resolution for both velocity and yaw as well as for aerodynamic events (Young, 1994). Through examination of the wind turbine data, the authors concluded that the best means of analyzing the data was on a individual cycle basis, instead of binning. A cycle is defined as a single rotation of the instrumented blade from 0° azimuth, the blade straight up, to 360° azimuth. Therefore, the baseline data sets were established through averaging of single rotational cycles of data or small groups of cycles.

The aerodynamic baseline data set was established using normal and tangent force coefficients. The structural performance was examined using the root flapwise and edgewise bending moments, the low speed shaft torque, and generator power. This particular data was chosen due to the high reliability (Miller et al., 1994a).

The aerodynamic baseline data set is required to be as close to wind tunnel conditions as possible so that the comparison will be accurate. Yaw is the angle between the direction the turbine is facing and the direction the wind is blowing. At yaw angles other than 0°, the wind turbine blade's angle of attack variability in inflow conditions, the turbine yaw must be limited to values close to 0°. In addition, the wind turbine aerodynamics were checked for repeatability under similar conditions, as in steady-state wind tunnel tests. It was hypothesized that consistent inflow conditions should provide repeatable aerodynamic results. This hypothesis was examined using two methods. The first used consistent inflow conditions, the three cycle average method, and the second examined consistent aerodynamic data, the correlational method. The data from these two methods was then compared to prove the hypothesis.

These two methods and the results are discussed in-depth in Young (1994) and Robinson et al. (1994). The inflow data used for these methods is located in Appendix A and B for the three-cycle-average method and the correlational method, respectively. Figure 1 combines the normal force coefficient, C_n, data from both methods onto a single graph. The angle of attack values were derived using geometric relationships described in Shipley et al. (1994b).

Appendix A contains the three-cycle-averaged inflow and standard deviation values from the cycles used to create the consistent inflow conditions portion of the aerodynamic baseline data set. The three-cycle-average method averages together three consecutive cycles with consistent-inflow conditions, velocity, and yaw. The velocity was considered consistent if the standard deviation remained within ±5% of the mean velocity. The mean yaw values for the cycles included in the baseline were kept between -1.5° and 1.5° and the standard deviation values were maintained below ±2.5°.

Appendix B contains the inflow information from the cycles used to create the repeatable aerodynamic results part of the 0° yaw baseline data set. The correlational method was used to create this part of the baseline data set. This method used 50 consecutive cycle sets that had the most consistent inflow conditions at 0° yaw and at velocities of approximately 5, 8.5, 10, 15, and 20 meters per second (m/s). The program BESTCYC.F was used to determine which 50 consecutive cycle set were chosen (Miller et al., 1994b). Each cycle in a 50-cycle set was correlated to every other cycle in that particular set using Pearson's correlation coefficient. If the correlation coefficient was greater than 0.8, then the cycles were considered to be highly correlated and, thus, were included in the baseline data set. For more detailed information about the correlational method, refer to Young (1994).

The structural baseline data sets were created to examine aerodynamic effects on turbine structural loads and power generation. In addition, changes in aerodynamics due to operation at yaw angles other than 0° yaw were studied. Baselines were produced for -20°, -10°, 10°, and 20° yaw, and were compared to the 0° yaw baseline. The cycles used for these baselines were selected in a manner similar to that of the consistent inflow approach used for the 0° yaw baseline. However, due to the tendency of a downwind horizontal axis wind turbine to align itself with the local flow direction, it was not possible to compile a large enough sample set at yaws other than 0° using three-cycle groupings. Instead single rotational cycles that exhibited extremely consistent inflow conditions were used. The program CNCTMAX.F, discussed in Miller et al. (1994b), was used to create a list of cycles with the desired cycle-averaged values. The 50 cycles with the most consistent inflow conditions were selected from this list to be the baseline data. The results of the comparison are discussed in Shipley et al. (1994a) and the cycle averaged inflow and standard deviation values are located in Appendix C.

CONCLUSION

The different baselines created have proven useful in examining the Combined Experiment data. The 0° yaw baseline has allowed the differences between wind turbine and wind tunnel performance to be studied. These differences have highlighted the importance of unsteady responses in the wind turbine operating under field conditions. In addition, the 0° yaw baseline proved the author's hypothesis that consistent inflow condition yield repeatable aerodynamic results. The various baselines have also provided insight into the changes in aerodynamics and the effect of aerodynamic response on power generation and turbine structure due to changes in yaw angle.

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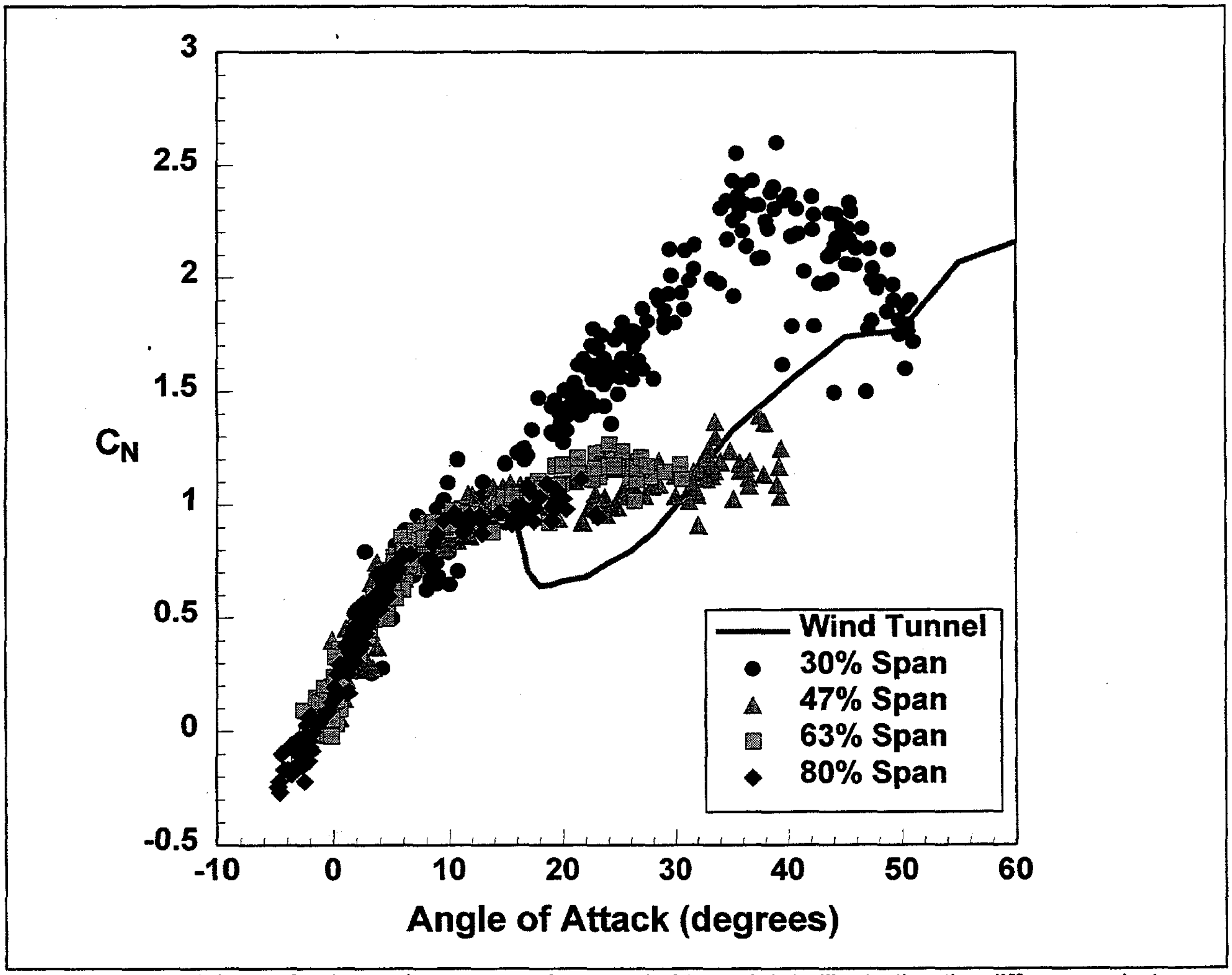

Figure 1. Comparison of independent approaches to wind tunnel data illustrating the differences between wind turbine and wind tunnel aerodynamic performance of normal force coefficient vs. angle-of-attack.

Appendix A

This appendix contains the inflow conditions, average, and standard deviation values, for the three cycle average data set. The data in the table was obtained by running the BESTCYC.F program (Miller et al., 1994b). To save time, the program uses the inflow conditions database instead of averaging every single point in the three cycle set. Thus, the average and standard deviation values in the table are occasionally different from those obtained if every single point is averaged together. This difference is very small, usually one hundredth separates the two values.

THREE-CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES FOR THE CYCLES USED IN THE 0° YAW BASELINE DATA SET.

Note: The 80% span data could not be used for cycles with a * next to the tape number due to errors in the data.

Tape	Cycles	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d066022	294 to 296	8.94	0.19	-0.30	0.53
d066031	235 to 237	12.78	0.12	-0.17	1.56
d067011	75 to 77	10.91	0.14	0.06	0.59
d067011	76 to 78	10.90	0.16	0.18	0.71
d067011	166 to 168	11.03	0.31	0.86	1.13
d067011	167 to 169	10.74	0.25	-0.31	0.54
d067011	223 to 225	8.87	0.13	0.34	0.18
d067011	224 to 226	8.75	0.18	0.65	0.34
d067011	225 to 227	8.53	0.15	0.66	0.33
d067012	110 to 112	10.11	0.13	-0.18	0.54
d067012	111 to 113	9.94	0.14	-0.02	0.36
d067012	112 to 114	9.83	0.09	-0.55	0.40
d067012.	113 to 115	9.84	0.09	-0.15	0.86
d067021	326 to 328	6.43	0.03	-0.38	0.44
d067031	209 to 211	11.45	0.10	-0.75	1.10
d068011	56 to 58	18.18	0.22	1.13	1.02
d068011	120 to 122	14.87	0.39	-0.02	1.37
d068012	151 to 153	16.85	0.73	-0.44	1.16
d068021	120 to 122	18.14	0.21	0.81	0.51
d068022	66 to 68	13.29	0.08	0.62	1.05
d069022	183 to 185	10.13	0.12	0.43	0.26
d070011	150 to 152	8.60	0.09	0.51	0.59
d070011	152 to 154	8.49	0.19	0.15	0.94
d070012	32 to 34	7.16	0.05	-0.01	0.42
d070022	240 to 242	8.23	0.12	-0.48	1.07
d070031	171 to 173	5.82	0.02	-0.10	0.35
d070032	220 to 222	6.89	0.04	-0.50	1.08
d070032	231 to 233	6.41	0.11	0.22	1.01
d071012	291 to 293	11.87	0.13	-0.13	1.63
d071021	229 to 231	17.60	0.21	0.03	0.99
d071021	230 to 232	17.76	0.03	-0.49	1.55
d071021	258 to 260	19.30	0.32	-0.73	0.29
d071021	306 to 308	18.98	0.62	-0.40	0.80

Tape	Cycles	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d071032	51 to 53	18.52	0.15	0.22	2.02
d071032	52 to 54	18.53	0.16	-1.26	0.08
d071032	53 to 55	18.83	0.32	0.02	1.88
d071032	110 to 112	17.97	0.11	0.50	0.93
d071032	111 to 113	18.04	0.08	0.54	0.88
d071042	46 to 48	20.45	0.35	-1.07	1.23
d071042	238 to 240	20.80	0.25	-0.74	1.04
d072011	27 to 29	15.74	0.25	-0.83	1.21
d072011	40 to 42	13.66	0.23	0.44	1.65
d072012	21 to 23	13.30	0.34	-0.98	0.25
d072012	22 to 24	13.07	0.08	-0.56	0.36
d072012	61 to 63	14.65	0.14	-0.35	0.79
d072012	241 to 243	18.53	0.32	-0.70	1.67
d072012	276 to 278	15.05	0.11	0.00	1.05
d072021	10 to 12	18.79	0.54	-1.34	1.04
d072021	11 to 13	18.20	0.56	-0.29	0.61
d072021	12 to 14	17.82	0.19	-0.13	0.42
d072042	231 to 233	10.24	0.16	-0.42	0.65
d073011*	59 to 61	16.07	0.41	-1.00	1.60
d073011*	84 to 86	13.66	0.13	0.41	0.56
d073011*	152 to 154	16.87	0.38	0.99	0.87
d073012*	18 to 20	10.66	0.26	0.50	0.13
d073012*	243 to 245	11.11	0.04	-0.17	1.28
d073012*	244 to 246	11.07	0.06	-0.06	1.44
d073012*	336 to 338	11.57	0.40	0.73	0.75
d073012*	352 to 354	13.52	0.09	-0.61	0.32
d073012*	353 to 355	13.52	0.09	0.38	1.63
d073012*	354 to 356	13.49	0.07	0.72	1.38
d073012*	355 to 357	13.74	0.39	0.84	1.29
d073021*	183 to 185	11.90	0.16	1.09	0.41
d073021*	241 to 243	10.90	0.10	0.15	0.68
d075011	259 to 261	9.76	0.13	-0.28	0.42
d075011	260 to 262	9.64	0.08	-0.39	0.38
d075011	270 to 272	9.21	0.14	-0.86	0.74
d075011	271 to 273	9.28	0.06	-0.62	0.48
d075011	272 to 274	9.16	0.20	-0.06	0.74
d075011	345 to 347	7.30	0.10	-0.05	0.25
d075011	346 to 348	7.36	0.02	-0.04	0.26
d075011	347 to 349	7.29	0.10	0.04	0.26
d075012	325 to 327	8.20	0.13	-0.18	0.17
d075021	155 to 157	8.17	0.07	0.29	0.57
d075022	72 to 74	5.55	0.02	-0.01	0.39

Appendix B

INFLOW AVERAGE AND STANDARD DEVIATION VALUES FOR THE 50-CONSECUTIVE-CYCLE SETS.

Tape	Cycles	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	36 to 85	5.13	0.57	0.24	9.06
d075021	5 to 54	8.53	0.58	-0.16	4.47
d067031	210 to 259	10.02	0.68	0.31	3.99
d073011	52 to 101	14.50	1.61	-0.14	6.66
d071021	307 to 356	19.93	2.66	-0.69	10.10

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES AT 30% SPAN FOR THE HIGHLY CORRELATED CYCLES (> 0.8) FROM THE 50-CYCLE SETS.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	36	5.45	0.08	11.45	0.30
d067022	37	5.80	0.10	10.63	0.50
d067022	38	5.95	0.04	11.53	0.93
d067022	39	5.78	0.04	12.98	0.63
d067022	40	5.56	0.10	11.15	3.54
d067022	41	5.21	0.08	4.12	0.29
d067022	42	4.98	0.02	2.44	1.29
d067022	43	4.99	0.03	-3.01	3.05
d067022	44	5.15	0.04	-8.87	0.38
d067022	45	5.37	0.05	-7.73	2.12
d067022	46	5.43	0.00	-13.76	1.96
d067022	48	5.57	0.01	-2.06	0.48
d067022	49	5.65	0.05	-2.59	2.56
d067022	50	5.72	0.01	2.34	0.81
d067022	51	5.77	0.05	3.61	3.06
d067022	52	5.91	0.03	-1.58	1.55
d067022	53	6.02	0.04	2.20	1.73
d067022	54	6.10	0.02	6.64	0.93
d067022	55	5.94	0.07	5.30	2.02
d067022	56	5.75	0.04	4.99	1.40
d067022	57	5.67	0.06	0.26	2.58
d067022	58	5.33	0.10	9.28	7.00
d067022	59	5.05	0.05	9.35	1.77
d067022	60	4.97	0.02	5.47	3.16
d067022	61	5.15	0.12	2.28	3.56
d067022	62	5.58	0.08	4.64	4.03
d067022	63	5.55	0.07	3.64	4.03
d067022	64	5.50	0.02	11.17	2.32
d067022	65	5.34	0.10	14.26	1.72
d067022	66	4.83	0.19	19.86	1.25
d067022	67	4.31	0.08	15.88	1.30
d067022	68	4.17	0.03	5.35	4.52

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	69	4.42	0.07	5.73	2.66
d067022	71	4.76	0.09	1.12	1.23
d067022	78	4.45	0.03	-10.61	2.31
d067022	79	4.40	0.01	-7.31	1.14
d067022	80	4.34	0.05	-13.65	2.06
d067022	81	4.19	0.03	-10.21	2.60
d067022	82	4.14	0.01	-7.81	2.07
d067022	85	4.60	0.09	-12.65	1.66
d075021	5	8.67	0.03	-3.05	0.35
d075021	6	8.51	0.04	0.46	1.86
d075021	7	8.39	0.03	-1.85	1.16
d075021	8	8.44	0.03	-2.96	1.23
d075021	9	8.54	0.08	-2.29	1.28
d075021	15	8.64	0.06	6.70	0.86
d075021	16	8.70	0.01	2.65	0.48
d075021	17	8.56	0.07	4.09	1.44
d075021	18	8.78	0.09	5.25	1.73
d075021	20	9.00	0.08	6.43	1.43
d075021	21	8.90	0.05	0.77	0.80
d075021	22	8.89	0.04	0.93	2.38
d075021	23	9.19	0.12	-0.02	1.40
d075021	24	9.55	0.10	2.64	2.31
d075021	25	9.80	0.08	-3.89	1.96
d075021	26	9.94	0.03	-5.41	3.01
d075021	28	9.59	0.15	-5.35	0.88
d075021	29	9.11	0.11	-4.18	0.62
d075021	30	9.00	0.07	-5.56	1.39
d075021	31	9.17	0.03	-6.67	0.91
d075021	32	8.86	0.14	-6.16	0.81
d075021	33	8.65	0.01	-4.00	0.58
d075021	34	8.52	0.06	-5.16	1.71
d075021	35	8.38	0.05	-6.02	0.78
d075021	36	8.25	0.01	-7.10	0.72
d075021	37	8.21	0.05	-8.12	0.76
d075021	38	8.23	0.06	-4.35	2.74
d075021	39	8.47	0.04	-0.69	1.11
d075021	41	8.28	0.08	1.51	0.62
d075021	42	8.07	0.07	3.79	1.10
d075021	43	7.90	0.03	2.93	0.48
d075021	44	7.89	0.02	1.80	0.49
d075021	45	7.93	0.05	2.10	0.57
d075021	46	8.15	0.03	0.01	1.45
d075021	47	8.11	0.04	-0.12	0.44
d075021	48	8.10	0.05	4.49	2.04
d075021	49	8.16	0.01	0.76	2.41
d075021	50	8.08	0.03	0.47	0.43

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d075021	51	8.16	0.01	1.29	1.03
d075021	52	7.97	0.11	0.78	2.56
d075021	53	7.61	0.09	0.75	2.51
d075021	54	7.46	0.03	-3.01	1.89
d067031	213	11.24	0.10	-0.75	3.34
d067031	223	10.57	0.04	-1.29	1.32
d067031	224	10.37	0.14	-0.19	1.12
d067031	226	9.45	0.17	9.35	3.77
d067031	228	10.04	0.06	-0.04	1.66
d067031	229	9.67	0.24	-0.01	0.82
d067031	230	9.25	0.03	-2.38	2.08
d067031	231	9.36	0.02	0.75	3.57
d067031	233	9.45	0.02	5.10	1.88
d067031	234	9.53	0.02	6.11	4.64
d067031	235	9.61	0.07	9.65	3.07
d067031	236	9.98	0.13	1.06	1.21
d067031	237	10.26	0.06	1.52	0.78
d067031	243	10.24	0.02	2.40	0.53
d067031	247	9.99	0.11	3.03	2.79
d073011	55	16.95	0.31	5.12	0.71
d073011	65	16.13	0.06	6.87	1.23
d073011	66	15.71	0.24	10.62	4.33
d073011	70	15.00	0.19	4.14	1.36
d073011	74	14.20	0.09	0.48	0.84
d073011	77	15.49	0.20	-5.03	1.93
d073011	78	15.02	0.09	-0.43	1.97
d073011	80	14.33	0.16	2.68	0.61
d073011	83	14.08	0.32	1.34	3.73
d073011	85	13.84	0.07	0.73	0.73
d073011	87	13.42	0.07	-8.95	1.55
d073011	88	13.05	0.15	-13.99	3.83
d073011	90	12.50	0.49	-13.92	2.80
d073011	93	11.56	0.07	-8.43	4.87
d073011	95	11.72	0.26	5.71	2.81
d073011	97	12.82	0.14	0.93	1.63
d073011	99	13.31	0.03	-5.63	1.61
d071021	308	18.64	0.05	0.51	2.53
d071021	309	18.25	0.33	-2.45	1.68
d071021	310	17.55	0.09	2.86	2.11
d071021	311	17.93	0.11	10.05	1.24
d071021	312	17.25	0.16	5.87	3.17
d071021	313	16.45	0.35	0.16	5.29
d071021	314	15.14	0.25	-7.93	0.98
d071021	315	14.52	0.15	-14.39	7.36

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d071021	316	15.42	0.27	-22.47	2.99
d071021	317	15.86	0.23	-32.01	4.43
d071021	318	14.28	0.51	-13.00	3.94
d071021	319	14.73	0.74	-1.63	6.92
d071021	320	15.82	0.08	-2.48	5.74
d071021	321	16.98	0.63	6.41	4.51
d071021	322	18.08	0.41	13.55	4.96
d071021	323	20.06	1.19	22.32	3.65
d071021	324	23.02	0.14	13.11	4.42
d071021	325	21.65	1.02	8.20	1.52
d071021	326	18.98	0.32	-2.85	6.75
d071021	327	18.94	0.08	-16.08	1.49
d071021	330	19.77	0.78	-6.54	11.64
d071021	331	21.05	0.15	-2.54	2.83
d071021	333	23.40	0.45	2.48	1.39
d071021	337	20.59	0.66	-0.04	3.51
d071021	338	19.71	0.44	-1.21	3.44
d071021	339	19.00	0.49	-9.72	3.70
d071021	342	20.46	0.12	-5.71	4.60
d071021	343	21.01	0.16	0.08	3.08
d071021	344	21.97	0.48	5.48	0.94
d071021	346	22.94	0.28	7.82	1.47
d071021	347	23.18	0.17	4.74	1.74
d071021	348	23.15	0.09	6.78	0.86
d071021	349	22.51	0.25	7.01	1.23
d071021	353	19.86	0.55	1.44	1.88
d071021	355	20.17	0.36	-1.85	4.56
d071021	356	20.19	0.55	-0.83	3.48

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES AT 47% SPAN FOR THE HIGHLY CORRELATED CYCLES (> 0.8) FROM THE 50-CYCLE SETS.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	36	5.45	0.08	11.45	0.30
d067022	37	5.80	0.10	10.63	0.50
d067022	38	5.95	0.04	11.53	0.93
d067022	39	5.78	0.04	12.98	0.63
d067022	40	5.56	0.10	11.15	3.54
d067022	41	5.21	0.08	4.12	0.29
d067022	42	4.98	0.02	2.44	1.29
d067022	43	4.99	0.03	-3.01	3.05
d067022	44	5.15	0.04	-8.87	0.38
d067022	45	5.37	0.05	-7.73	2.12
d067022	46	5.43	0.00	-13.76	1.96
d067022	47	5.49	0.03	-4.87	1.44
d067022	48	5.57	0.01	-2.06	0.48
d067022	49	5.65	0.05	-2.59	2.56

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	50	5.72	0.01	2.34	0.81
d067022	51	5.77	0.05	3.61	3.06
d067022	53	6.02	0.04	2.20	1.73
d067022	54	6.10	0.02	6.64	0.93
d067022	55	5.94	0.07	5.30	2.02
d067022	56	5.75	0.04	4.99	1.40
d067022	57	5.67	0.06	0.26	2.58
d067022	60	4.97	0.02	5.47	3.16
d067022	61	5.15	0.12	2.28	3.56
d067022	63	5.55	0.07	3.64	4.03
d067022	65	5.34	0.10	14.26	1.72
d067022	66	4.83	0.19	19.86	1.25
d067022	67	4.31	0.08	15.88	1.30
d067022	68	4.17	0.03	5.35	4.52
d067022	71	4.76	0.09	1.12	1.23
d067022	76	4.83	0.02	-5.47	1.19
d067022	77	4.65	0.08	-10.67	4.82
d067022	78	4.45	0.03	-10.61	2.31
d067022	79	4.40	0.01	-7.31	1.14
d067022	80	4.34	0.05	-13.65	2.06
d067022	81	4.19	0.03	-10.21	2.60
d067022	82	4.14	0.01	-7.81	2.07
d067022	83	4.13	0.01	-12.77	0.49
d067022	84	4.22	0.08	-13.68	1.42
d067022	85	4.60	0.09	-12.65	1.66
d075021	5	8.67	0.03	-3.05	0.35
d075021	6	8.51	0.04	0.46	1.86
d075021	7	8.39	0.03	-1.85	1.16
d075021	8	8.44	0.03	-2.96	1.23
d075021	9	8.54	0.08	-2.29	1.28
d075021	12	8.01	0.13	8.66	3.16
d075021	15	8.64	0.06	6.70	0.86
d075021	16	8.70	0.01	2.65	0.48
d075021	17	8.56	0.07	4.09	1.44
d075021	18	8.78	0.09	5.25	1.73
d075021	20	9.00	0.08	6.43	1.43
d075021	21	8.90	0.05	0.77	0.80
d075021	23	9.19	0.12	-0.02	1.40
d075021	25	9.80	0.08	-3.89	1.96
d075021	26	9.94	0.03	-5.41	3.01
d075021	27	9.84	0.02	-5.13	2.75
d075021	30	9.00	0.07	-5.56	1.39
d075021	32	8.86	0.14	-6.16	0.81
d075021	33	8.65	0.01	-4.00	0.58
d075021	34	8.52	0.06	-5.16	1.71
d075021	35	8.38	0.05	-6.02	0.78

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d075021	36	8.25	0.01	-7.10	0.72
d075021	37	8.21	0.05	-8.12	0.76
d075021	38	8.23	0.06	-4.35	2.74
d075021	39	8.47	0.04	-0.69	1.11
d075021	40	8.39	0.02	2.78	1.35
d075021	41	8.28	0.08	1.51	0.62
d075021	42	8.07	0.07	3.79	1.10
d075021	43	7.90	0.03	2.93	0.48
d075021	44	7.89	0.02	1.80	0.49
d075021	45	7.93	0.05	2.10	0.57
d075021	46	8.15	0.03	0.01	1.45
d075021	47	8.11	0.04	-0.12	0.44
d075021	48	8.10	0.05	4.49	2.04
d075021	49	8.16	0.01	0.76	2.41
d075021	50	8.08	0.03	0.47	0.43
d075021	51	8.16	0.01	1.29	1.03
d075021	52	7.97	0.11	0.78	2.56
d075021	53	7.61	0.09	0.75	2.51
d075021	54	7.46	0.03	-3.01	1.89
d067031	211	11.33	0.12	-1.43	0.78
d067031	214	11.07	0.21	-4.34	0.77
d067031	215	10.57	0.06	-1.44	3.91
d067031	216	10.53	0.09	1.32	2.15
d067031	221	10.18	0.12	-4.10	1.74
d067031	229	9.67	0.24	-0.01	0.82
d067031	231	9.36	0.02	0.75	3.57
d067031	233	9.45	0.02	5.10	1.88
d067031	237	10.26	0.06	1.52	0.78
d067031	238	10.29	0.02	0.13	0.91
d067031	240	10.40	0.03	-0.97	1.59
d067031	243	10.24	0.02	2.40	0.53
d067031	245	10.62	0.05	6.00	0.83
d067031	247	9.99	0.11	3.03	2.79
d067031	248	9.86	0.05	3.42	5.19
d067031	250	9.44	0.05	-4.53	2.55
d073011	64	16.06	0.11	5.59	1.08
d073011	70	15.00	0.19	4.14	1.36
d073011	71	14.43	0.14	7.73	2.10
d073011	74	14.20	0.09	0.48	0.84
d073011	83	14.08	0.32	1.34	3.73
d073011	90	12.50	0.49	-13.92	2.80
d073011	92	12.01	0.32	-17.02	2.21
d073011	93	11.56	0.07	-8.43	4.87
d073011	97	12.82	0.14	0.93	1.63

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d071021	311	17.93	0.11	10.05	1.24
d071021	313	16.45	0.35	0.16	5.29
d071021	314	15.14	0.25	-7.93	0.98
d071021	315	14.52	0.15	-14.39	7.36
d071021	320	15.82	0.08	-2.48	5.74
d071021	321	16.98	0.63	6.41	4.51
d071021	322	18.08	0.41	13.55	4.96
d071021	323	20.06	1.19	22.32	3.65
d071021	324	23.02	0.14	13.11	4.42
d071021	325	21.65	1.02	8.20	1.52
d071021	326	18.98	0.32	-2.85	6.75
d071021	327	18.94	0.08	-16.08	1.49
d071021	328	21.00	1.15	-17.63	1.73
d071021	333	23.40	0.45	2.48	1.39
d071021	336	22.00	0.44	5.50	1.16
d071021	339	19.00	0.49	-9.72	3.70
d071021	340	19.06	0.43	-12.65	2.28
d071021	341	20.29	0.32	-13.02	2.40
d071021	345	23.66	0.28	7.32	3.12
d071021	350	23.24	0.34	4.33	0.78
d071021	352	21.58	0.41	0.83	1.95
d071021	354	19.74	0.20	2.75	2.53

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES AT 63% SPAN FOR THE HIGHLY CORRELATED CYCLES (> 0.8) FROM THE 50-CYCLE SETS.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	36	5.45	0.08	11.45	0.30
d067022	37	5.80	0.10	10.63	0.50
d067022	38	5.95	0.04	11.53	0.93
d067022	39	5.78	0.04	12.98	0.63
d067022	40	5.56	0.10	11.15	3.54
d067022	41	5.21	0.08	4.12	0.29
d067022	42	4.98	0.02	2.44	1.29
d067022	43	4.99	0.03	-3.01	3.05
d067022	44	5.15	0.04	-8.87	0.38
d067022	45	5.37	0.05	-7.73	2.12
d067022	47	5.49	0.03	-4.87	1.44
d067022	48	5.57	0.01	-2.06	0.48
d067022	50	5.72	0.01	2.34	0.81
d067022	53	6.02	0.04	2.20	1.73
d067022	54	6.10	0.02	6.64	0.93
d067022	55	5.94	0.07	5.30	2.02
d067022	56	5.75	0.04	4.99	1.40
d067022	57	5.67	0.06	0.26	2.58
d067022	60	4.97	0.02	5.47	3.16
d067022	63	5.55	0.07	3.64	4.03

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	65	5.34	0.10	14.26	1.72
d067022	66	4.83	0.19	19.86	1.25
d067022	67	4.31	0.08	15.88	1.30
d067022	75	4.89	0.01	-5.79	0.42
d067022	76	4.83	0.02	-5.47	1.19
d067022	77	4.65	0.08	-10.67	4.82
d067022	78	4.45	0.03	-10.61	2.31
d067022	81	4.19	0.03	-10.21	2.60
d067022	82	4.14	0.01	-7.81	2.07
d067022	83	4.13	0.01	-12.77	0.49
d067022	84	4.22	0.08	-13.68	1.42
d075021	6	8.51	0.04	0.46	1.86
d075021	7	8.39	0.03	-1.85	1.16
d075021	8	8.44	0.03	-2.96	1.23
d075021	16	8.70	0.01	2.65	0.48
d075021	17	8.56	0.07	4.09	1.44
d075021	19	9.04	0.08	6.53	1.85
d075021	22	8.89	0.04	0.93	2.38
d075021	23	9.19	0.12	-0.02	1.40
d075021	25	9.80	0.08	-3.89	1.96
d075021	26	9.94	0.03	-5.41	3.01
d075021	27	9.84	0.02	-5.13	2.75
d075021	30	9.00	0.07	-5.56	1.39
d075021	31	9.17	0.03	-6.67	0.91
d075021	32	8.86	0.14	-6.16	0.81
d075021	33	8.65	0.01	-4.00	0.58
d075021	34	8.52	0.06	-5.16	1.71
d075021	35	8.38	0.05	-6.02	0.78
d075021	36	8.25	0.01	-7.10	0.72
d075021	37	8.21	0.05	-8.12	0.76
d075021	38	8.23	0.06	-4.35	2.74
d075021	39	8.47	0.04	-0.69	1.11
d075021	40	8.39	0.02	2.78	1.35
d075021	41	8.28	0.08	1.51	0.62
d075021	42	8.07	0.07	3.79	1.10
d075021	43	7.90	0.03	2.93	0.48
d075021	44	7.89	0.02	1.80	0.49
d075021	45	7.93	0.05	2.10	0.57
d075021	46	8.15	0.03	0.01	1.45
d075021	47	8.11	0.04	-0.12	0.44
d075021	48	8.10	0.05	4.49	2.04
d075021	49	8.16	0.01	0.76	2.41
d075021	50	8.08	0.03	0.47	0.43
d075021	51	8.16	0.01	1.29	1.03
d075021	53	7.61	0.09	0.75	2.51

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067031	210	11.45	0.03	-1.62	1.89
d067031	211	11.33	0.12	-1.43	0.78
d067031	213	11.24	0.10	-0.75	3.34
d067031	216	10.53	0.09	1.32	2.15
d067031	217	10.76	0.13	0.32	1.99
d067031	219	10.63	0.12	-1.35	1.06
d067031	220	10.49	0.06	-9.86	2.77
d067031	221	10.18	0.12	-4.10	1.74
d067031	226	9.45	0.17	9.35	3.77
d067031	229	9.67	0.24	-0.01	0.82
d067031	231	9.36	0.02	0.75	3.57
d067031	242	10.31	0.05	2.08	0.57
d067031	246	10.54	0.12	5.34	4.25
d067031	247	9.99	0.11	3.03	2.79
d067031	248	9.86	0.05	3.42	5.19
d067031	249	9.47	0.10	-0.25	7.29
d067031	254	8.96	0.06	-6.99	3.28
d073011	63	16.02	0.07	3.62	2.44
d073011	69	15.26	0.14	1.88	0.87
d071021	311	17.93	0.11	10.05	1.24
d071021	312	17.25	0.16	5.87	3.17
d071021	313	16.45	0.35	0.16	5.29
d071021	314	15.14	0.25	-7.93	0.98
d071021	315	14.52	0.15	-14.39	7.36
d071021	317	15.86	0.23	-32.01	4.43
d071021	320	15.82	0.08	-2.48	5.74
d071021	321	16.98	0.63	6.41	4.51
d071021	324	23.02	0.14	13.11	4.42
d071021	325	21.65	1.02	8.20	1.52
d071021	326	18.98	0.32	-2.85	6.75
d071021	327	18.94	0.08	-16.08	1.49
d071021	329	23.12	0.52	-18.45	1.37
d071021	337	20.59	0.66	-0.04	3.51
d071021	338	19.71	0.44	-1.21	3.44
d071021	339	19.00	0.49	-9.72	3.70
d071021	350	23.24	0.34	4.33	0.78
d071021	352	21.58	0.41	0.83	1.95
d071021	353	19.86	0.55	1.44	1.88

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES AT 80% SPAN FOR THE HIGHLY CORRELATED CYCLES (> 0.8) FROM THE 50-CYCLE SETS.

Note: The 80% span data could not be used for tape d073011 due to errors in the data.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067022	37	5.80	0.10	10.63	0.50
d067022	38	5.95	0.04	11.53	0.93
d067022	39	5.78	0.04	12.98	0.63
d067022	40	5.56	0.10	11.15	3.54
d067022	41	5.21	0.08	4.12	0.29
d067022	42	4.98	0.02	2.44	1.29
d067022	43	4.99	0.03	-3.01	3.05
d067022	44	5.15	0.04	-8.87	0.38
d067022	45	5.37	0.05	-7.73	2.12
d067022	46	5.43	0.00	-13.76	1.96
d067022	48	5.57	0.01	-2.06	0.48
d067022	52	5.91	0.03	-1.58	1.55
d067022	53	6.02	0.04	2.20	1.73
d067022	54	6.10	0.02	6.64	0.93
d067022	55	5.94	0.07	5.30	2.02
d067022	56	5.75	0.04	4.99	1.40
d067022	57	5.67	0.06	0.26	2.58
d067022	63	5.55	0.07	3.64	4.03
d067022	65	5.34	0.10	14.26	1.72
d067022	66	4.83	0.19	19.86	1.25
d067022	67	4.31	0.08	15.88	1.30
d067022	75	4.89	0.01	-5.79	0.42
d067022	76	4.83	0.02	-5.47	1.19
d067022	77	4.65	0.08	-10.67	4.82
d067022	78	4.45	0.03	-10.61	2.31
d067022	81	4.19	0.03	-10.21	2.60
d067022	83	4.13	0.01	-12.77	0.49
d067022	84	4.22	0.08	-13.68	1.42
d075021	5	8.67	0.03	-3.05	0.35
d075021	6	8.51	0.04	0.46	1.86
d075021	7	8.39	0.03	-1.85	1.16
d075021	8	8.44	0.03	-2.96	1.23
d075021	9	8.54	0.08	-2.29	1.28
d075021	10	8.78	0.06	-2.96	1.66
d075021	11	8.46	0.14	0.45	2.61
d075021	12	8.01	0.13	8.66	3.16
d075021	16	8.70	0.01	2.65	0.48
d075021	17	8.56	0.07	4.09	1.44
d075021	18	8.78	0.09	5.25	1.73
d075021	19	9.04	0.08	6.53	1.85
d075021	20	9.00	0.08	6.43	1.43
d075021	21	8.90	0.05	0.77	0.80

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d075021	22	8.89	0.04	0.93	2.38
d075021	23	9.19	0.12	-0.02	1.40
d075021	24	9.55	0.10	2.64	2.31
d075021	25	9.80	0.08	-3.89	1.96
d075021	26	9.94	0.03	-5.41	3.01
d075021	27	9.84	0.02	-5.13	2.75
d075021	29	9.11	0.11	-4.18	0.62
d075021	30	9.00	0.07	-5.56	1.39
d075021	31	9.17	0.03	-6.67	0.91
d075021	32	8.86	0.14	-6.16	0.81
d075021	33	8.65	0.01	-4.00	0.58
d075021	34	8.52	0.06	-5.16	1.71
d075021	35	8.38	0.05	-6.02	0.78
d075021	36	8.25	0.01	-7.10	0.72
d075021	37	8.21	0.05	-8.12	0.76
d075021	38	8.23	0.06	-4.35	2.74
d075021	39	8.47	0.04	-0.69	1.11
d075021	44	7.89	0.02	1.80	0.49
d075021	45	7.93	0.05	2.10	0.57
d075021	46	8.15	0.03	0.01	1.45
d075021	47	8.11	0.04	-0.12	0.44
d075021	48	8.10	0.05	4.49	2.04
d075021	49	8.16	0.01	0.76	2.41
d075021	50	8.08	0.03	0.47	0.43
d075021	51	8.16	0.01	1.29	1.03
d075021	52	7.97	0.11	0.78	2.56
d075021	53	7.61	0.09	0.75	2.51
d075021	54	7.46	0.03	-3.01	1.89
d067031	210	11.45	0.03	-1.62	1.89
d067031	211	11.33	0.12	-1.43	0.78
d067031	212	11.13	0.02	1.27	0.87
d067031	213	11.24	0.10	-0.75	3.34
d067031	216	10.53	0.09	1.32	2.15
d067031	217	10.76	0.13	0.32	1.99
d067031	218	10.89	0.03	-1.19	1.04
d067031	219	10.63	0.12	-1.35	1.06
d067031	220	10.49	0.06	-9.86	2.77
d067031	221	10.18	0.12	-4.10	1.74
d067031	223	10.57	0.04	-1.29	1.32
d067031	234	9.53	0.02	6.11	4.64
d067031	236	9.98	0.13	1.06	1.21
d067031	241	10.44	0.01	2.43	0.48
d067031	243	10.24	0.02	2.40	0.53
d067031	244	10.34	0.06	3.25	0.64
d067031	245	10.62	0.05	6.00	0.83
d067031	246	10.54	0.12	5.34	4.25

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d067031	247	9.99	0.11	3.03	2.79
d067031	248	9.86	0.05	3.42	5.19
d067031	249	9.47	0.10	-0.25	7.29
d071021	311	17.93	0.11	10.05	1.24
d071021	312	17.25	0.16	5.87	3.17
d071021	314	15.14	0.25	-7.93	0.98
d071021	315	14.52	0.15	-14.39	7.36
d071021	316	15.42	0.27	-22.47	2.99
d071021	317	15.86	0.23	-32.01	4.43
d071021	320	15.82	0.08	-2.48	5.74
d071021	321	16.98	0.63	6.41	4.51
d071021	324	23.02	0.14	13.11	4.42
d071021	325	21.65	1.02	8.20	1.52
d071021	326	18.98	0.32	-2.85	6.75
d071021	327	18.94	0.08	-16.08	1.49
d071021	329	23.12	0.52	-18.45	1.37
d071021	338	19.71	0.44	-1.21	3.44
d071021	352	21.58	0.41	0.83	1.95
d071021	353	19.86	0.55	1.44	1.88
d071021	354	19.74	0.20	2.75	2.53

Appendix C

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES FOR THE 50 CYCLES USED IN THE -20° YAW PERFORMANCE BASELINE.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d065012	124	6.19	0.02	-20.28	0.66
d065022	14	4.77	0.01	-19.38	0.70
d066021	321	7.41	0.29	-20.71	0.57
d067011	124	9.78	0.32	-21.19	0.64
d067022	224	2.36	0.00	-20.36	0.48
d067022	263	3.43	0.04	-19.42	0.38
d067031	54	11.14	0.22	-19.20	0.88
d067031	307	10.56	0.13	-21.68	0.40
d068022	414	13.44	0.15	-19.16	0.81
d068022	415	13.54	0.18	-19.67	1.07
d069031	344	6.94	0.01	-21.67	0.52
d069032	245	5.24	0.02	-19.80	0.69
d069032	268	3.64	0.01	-21.00	0.26
d070021	342	6.93	0.01	-20.26	0.80
d070022	20	6.06	0.05	-21.02	0.39
d070031	204	5.00	0.15	-21.31	0.58
d070031	291	4.36	0.06	-21.14	0.18
d070032	51	5.24	0.06	-19.25	0.30
d071011	88	12.96	0.31	-19.46	0.67
d071012	121	15.37	0.15	-19.43	0.83
d071021	329	23.12	0.52	-18.45	1.37
d071041	296	11.45	0.42	-18.37	0.94
d071042	111	17.39	0.09	-19.59	0.79
d072011	351	14.87	0.30	-18.21	0.57
d072011	352	15.93	0.26	-19.73	0.59
d072012	3	12.29	0.14	-20.50	0.33
d072012	102	14.45	0.59	-21.11	0.74
d072012	347	19.53	0.45	-19.67	0.74
d072012	356	22.30	0.24	-18.20	1.59
d072022	345	20.09	0.20	-21.67	0.71
d072022	347	19.44	0.13	-18.57	0.72
d072022	348	19.22	0.04	-20.84	0.44
d072022	352	18.96	0.02	-21.46	0.71
d072031	57	18.56	0.13	-20.33	1.38
d072031	269	14.29	0.19	-21.35	0.42
d072031	322	9.46	0.08	-18.91	0.51
d072032	64	16.87	0.36	-19.17	0.61
d072032	67	18.25	0.19	-20.57	1.04
d072032	87	13.94	0.23	-18.47	0.73
d072041	94	9.03	0.10	-19.24	0.99
d072041	174	15.87	0.10	-20.91	0.60

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d072041	191	15.99	0.32	-19.12	0.88
d072042	42	9.78	0.08	-19.56	0.61
d072042	198	8.79	0.32	-18.94	0.94
d073021	193	10.65	0.09	-20.20	0.61
d073021	222	11.18	0.12	-20.87	0.79
d073031	163	9.24	0.03	-19.09	0.87
d073031	165	8.98	0.05	-21.03	0.66
d073031	168	8.01	0.02	-18.58	0.28
d075021	259	8.37	0.07	-19.86	0.29

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES FOR THE 50 CYCLES USED IN THE -10° YAW PERFORMANCE BASELINE.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d065011	24	8.40	0.04	-9.46	0.40
d065022	117	5.88	0.14	-10.75	0.46
d066021	269	10.48	0.01	-10.08	0.43
d066022	303	8.39	0.07	-9.68	0.32
d066031	292	13.90	0.34	-9.68	0.43
d066032	91	9.77	0.12	-9.87	0.54
d067021	211	9.09	0.06	-9.82	0.56
d067022	96	5.98	0.05	-9.50	0.46
d067022	132	4.65	0.02	-10.53	0.44
d067022	237	3.04	0.02	-10.06	0.33
d067032	324	14.13	0.10	-10.95	0.32
d068011	231	12.74	0.19	-10.56	0.39
d068012	160	17.00	0.12	-10.97	0.61
d068021	287	16.29	0.25	-9.09	0.23
d068021	301	17.54	0.06	-9.52	0.37
d069022	173	10.08	0.02	-10.58	0.47
d069031	29	8.07	0.05	-10.16	0.52
d069031	30	8.04	0.10	-10.42	0.39
d070021	229	7.80	0.04	-10.46	0.29
d070022	36	6.40	0.06	-10.05	0.43
d071011	42	17.34	0.33	-9.74	0.74
d071011	77	16.86	0.11	-9.54	0.55
d071011	78	16.35	0.09	-9.15	0.17
d071021	271	21.37	0.11	-10.45	0.55
d071031	145	15.35	0.18	-10.01	0.71
d071032	8	12.47	0.22	-10.02	0.42
d071032	182	22.19	0.13	-10.41	0.35
d071032	214	18.72	0.41	-9.04	0.98
d071042	180	18.53	0.58	-9.24	0.49
d071042	190	20.22	0.45	-10.31	0.81
d072012	87	11.88	0.17	-9.77	0.51
d072012	149	11.87	0.16	-10.40	0.40
d072012	334	15.20	0.11	-9.49	0.59

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d072021	157	20.45	0.15	-10.49	0.98
d072041	292	9.50	0.09	-9.65	0.52
d072042	62	8.10	0.05	-10.03	0.34
d072042	72	6.93	0.02	-10.36	0.30
d073011	29	18.12	0.08	-10.43	0.72
d073011	131	14.56	0.05	-10.51	0.83
d073012	64	9.73	0.05	-10.36	0.55
d073021	2	10.91	0.04	-10.11	0.49
d073021	12	11.21	0.02	-9.17	0.44
d073021	119	11.86	0.37	-9.78	0.55
d073022	63	5.63	0.02	-9.45	0.68
d073032	141	7.17	0.01	-10.45	0.45
d073032	142	7.11	0.02	-9.75	0.34
d073041	24	3.85	0.04	-10.25	0.87
d075011	139	10.41	0.14	-10.57	0.40
d075012	248	7.67	0.03	-10.83	0.58
d075022	56	4.16	0.06	-9.55	0.43

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES FOR THE 50 CYCLES USED IN THE 10° YAW PERFORMANCE BASELINE.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d065011	140	10.99	0.27	9.60	1.19
d065021	126	7.28	0.02	9.88	0.61
d065021	213	7.33	0.04	10.64	0.64
d065022	190	4.35	0.05	9.00	0.53
d066032	18	11.03	0.06	9.04	0.84
d066032	32	11.96	0.06	9.65	1.49
d067021	185	8.87	0.08	10.93	0.56
d067022	37	5.80	0.10	10.63	0.50
d067022	179	3.59	0.01	10.77	0.19
d068021	205	16.37	0.05	10.56	0.92
d068022	111	15.82	0.08	9.72	0.79
d070021	155	8.80	0.04	10.43	0.48
d070021	221	7.85	0.11	10.16	0.62
d070022	142	7.48	0.12	9.50	0.47
d070031	158	6.66	0.07	10.49	0.24
d070032	318	9.77	0.05	10.73	0.59
d070032	345	6.71	0.02	9.91	0.64
d070041	57	6.51	0.03	9.53	0.50
d071021	311	17.93	0.11	10.05	1.24
d071031	74	18.11	0.34	10.03	0.93
d071031	106	19.79	0.36	10.87	1.40
d071032	97	19.88	0.51	9.14	0.84
d071032	308	13.07	0.23	9.67	0.93
d071041	159	18.21	0.49	9.37	0.95
d072012	180	9.02	0.09	9.64	0.44

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d072012	224	19.04	0.30	9.07	1.23
d072021	42	15.34	0.13	9.99	1.45
d072021	44	14.02	0.25	10.59	1.32
d072021	53	14.11	0.06	9.46	1.23
d072021	270	12.46	0.20	9.84	0.58
d072021	274	12.15	0.07	10.50	0.83
d072022	87	21.77	0.14	9.33	1.09
d072022	93	20.96	0.69	10.65	1.27
d072031	85	16.83	0.09	10.96	0.69
d072031	136	14.10	0.03	9.18	0.86
d073011	182	13.63	0.12	9.84	0.68
d073012	240	10.44	0.08	9.97	1.40
d073022	235	9.73	0.02	10.32	0.55
d073022	297	5.55	0.08	10.48	0.58
d073032	112	5.35	0.03	10.03	0.23
d073032	114	5.28	0.03	9.33	0.38
d073032	115	5.16	0.06	10.79	0.56
d073041	53	6.81	0.03	9.98	0.37
d073042	25	10.05	0.07	10.81	0.42
d073042	26	10.11	0.03	10.62	0.97
d073042	158	4.25	0.01	9.00	0.55
d075011	18	8.85	0.10	9.34	0.37
d075011	76	8.23	0.08	9.67	0.29
d075012	194	7.09	0.11	10.41	0.44
d075021	143	8.39	0.03	10.46	0.16

CYCLE-AVERAGED INFLOW AND STANDARD DEVIATION VALUES FOR THE 50 CYCLES USED IN THE 20° YAW PERFORMANCE BASELINE.

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d065011	111	6.99	0.06	18.67	0.86
d065012	78	5.34	0.04	21.37	0.37
d066022	62	10.32	0.11	18.65	1.92
d066031	352	10.87	0.43	20.66	1.06
d067012	295	8.95	0.06	21.91	0.91
d067012	298	8.95	0.06	21.78	0.65
d067022	190	3.31	0.01	19.52	0.48
d067022	191	3.31	0.01	18.34	0.60
d068012	109	17.48	0.31	19.53	1.35
d068021	60	16.39	0.05	20.89	2.01
d068021	155	12.33	0.05	18.97	0.98
d068022	23	11.72	0.09	19.46	1.51
d068022	334	16.10	0.18	19.15	2.41
d069022	140	11.62	0.08	19.50	1.14
d070011	183	7.15	0.03	21.46	0.70
d070022	85	6.35	0.04	20.05	0.92
d070032	20	5.41	0.02	19.71	0.50

Tape	Cycle	Avg. Vel.	Vel. Std. Dev.	Avg. Yaw	Yaw Std. Dev.
d070041	109	6.18	0.05	18.38	0.87
d070041	110	5.93	0.08	19.21	0.55
d070041	339	6.87	0.03	19.58	0.82
d070042	2	6.74	0.07	21.51	0.54
d070042	10	6.81	0.05	20.14	0.92
d070042	283	6.42	0.02	18.22	0.45
d071021	54	15.94	0.14	18.29	1.93
d071021	117	22.63	0.20	18.31	0.76
d071032	304	12.35	0.20	20.89	0.53
d071041	185	17.18	0.54	19.75	1.71
d071041	210	22.75	0.39	21.00	2.03
d072011	106	7.90	0.18	19.51	0.71
d072012	314	14.15	0.07	19.91	2.10
d072021	57	13.46	0.16	20.39	1.85
d072021	289	12.76	0.18	18.11	0.84
d072022	213	19.27	0.41	18.39	0.78
d072022	217	19.53	0.29	19.56	2.32
d072022	221	18.49	0.11	21.93	0.75
d072022	224	21.64	0.39	20.59	1.82
d072022	239	20.77	0.08	18.02	1.54
d072031	99	14.49	0.28	21.92	1.46
d072031	126	15.22	0.12	21.04	1.41
d072031	207	13.82	0.14	20.63	1.70
d072042	346	10.60	0.36	19.88	1.18
d073031	188	11.07	0.05	18.53	0.90
d073031	305	7.95	0.05	20.09	0.41
d073032	212	4.92	0.01	21.86	0.53
d073041	140	5.91	0.07	20.37	0.87
d073041	270	5.10	0.01	20.04	0.57
d073041	287	4.21	0.06	19.46	0.39
d075011	3	10.01	0.10	18.45	0.74
d075011	7	9.35	0.07	19.21	0.16
d075011	10	9.37	0.09	21.07	0.42

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13. ABSTRACT *(Maximum 200 words)*

The National Renewable Energy Laboratory's "Combined Experiment" was initiated to provide an understanding of horizontal axis wind turbine aerodynamics and their effect on the turbine structure. To this end, aerodynamic and structural baseline data sets have been defined that examine turbine performance under certain conditions. These baseline results have been discussed thoroughly in several papers. This report is an addendum to those papers and supplies additional information about the data selected in creating the baseline data sets. Several appendices are included which contain the tape and cycle numbers of the selected data, along with the average and standard deviation values for the inflow conditions, velocity, and yaw.

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