AP Calculus Final Project

Joshua Morin-Baxter, Alan Zhu, Nathan Wiley, and George Hong

Abstract

This is an analysis of data taken from the GOSH Flight Path Predictor^{TM}. Four separate sets of data were analyzed: temperature vs. density, wind velocity vs. pressure, wind angle vs. wind velocity, and wind velocity vs. altitude. Each is discussed in more depth in subsequent parts.

Part I. Wind Velocity Vs. Altitude

This data has several interesting patterns. Most notably, there appears to be an absolute maximum slightly after 1000 feet, as can be seen in Figure I. At this point the wind speed is nearly $40\frac{\text{m}}{\text{s}}$. Wind speed increases as it approaches this maximum, though it increases at a slower and slower rate. After the maximum, the wind speed begins to decrease at an increasing rate. The question generated by this feature is, of course, what atmospheric feature is responsible for this pattern? A numerical analysis reveals more specific information:

Part II. Temperature Vs. Density

Part III. Wind Velocity vs. Pressure

Part IV. Wind Angle vs. Wind Velocity

Tab. 1: My caption

altitude (m)	wind speed (m/s)	first derivative	second	f is	concave
947.84	5.90581712				
985.55	6.1990502	0.007776003		+	
1023.37	6.39453892	0.005168924	-6.89E-05	+	DOWN
1061.3	6.49228328	0.002576967	-6.83E-05	+	DOWN
1101.25	6.49228328	0	-6.45E-05	-	DOWN
1141.34	6.49228328	0	0	-	DOWN
1182.52	6.59002764	0.002373588	5.76E-05	+	UP
1224.81	6.59002764	0	-5.61E-05	-	DOWN
1268.21	6.59002764	0	0	-	DOWN
1313.71	6.59002764	0	0	-	DOWN
1361.33	6.59002764	0	0	-	DOWN
1411.1	6.59002764	0	0	-	DOWN
1463.04	6.49228328	-0.001881871	-3.62E-05	-	DOWN
1518.18	6.49228328	0	3.41E-05	-	UP
1575.56	6.47684996	-0.000268967	-4.69E-06	-	DOWN
1639.2	6.47684996	0	4.23E-06	-	UP
1710.22	6.3791056	-0.001376293	-1.94E-05	-	DOWN
1792.78	6.3791056	0	1.67E-05	-	UP
1889.17	6.26592792	-0.001174164	-1.22E-05	-	DOWN
2000.74	6.26592792	0	1.05E-05	-	UP
2130.05	6.15275024	-0.000875243	-6.77E-06	-	DOWN
2277.72	5.41709532	-0.004981749	-2.78E-05	-	DOWN
2447.89	3.54451916	-0.01100415	-3.54E-05	-	DOWN
2641.95	2.81400868	-0.003764354	3.73E-05	-	UP
2861.54	5.82350608	0.013705075	7.96E-05	+	UP
3107.44	9.14681432	0.013514877	-7.73E-07	+	DOWN
3381.51	15.16066468	0.021942753	3.08E-05	+	UP
3681.25	18.38622856	0.010761206	-3.73E-05	+	DOWN
4002.43	18.86980592	0.001505627	-2.88E-05	+	DOWN
4344.09	18.91610588	0.000135515	-4.01E-06	+	DOWN
4706.73	19.2144834	0.000822793	1.90E-06	+	UP
5089.27	20.63434884	0.003711678	7.55E-06	+	UP
5491.59	22.02849208	0.00346526	-6.12E-07	+	DOWN
5913.8	21.9153144	-0.00026806	-8.84E-06	-	DOWN
6358.13	23.72615728	0.004075446	9.78E-06	+	UP
6822.71	26.43213272	0.005824563	3.76E-06	+	UP
7313.41	24.72932308	-0.003470164	-1.89E-05	-	DOWN
7830.24	26.751088	0.003911857	1.43E-05	+	UP
8382.36	29.10209708	0.004258149	6.27E-07	+	UP
8972.84	33.18678244	0.006917568	4.50E-06	+	UP
9591.32	36.33003528	0.005082222	-2.97E-06	+	DOWN
10215.39	37.811634	0.002374091	-4.34E-06	+	DOWN
10824.28	39.2006328	0.002281198	-1.53E-07	+	DOWN
11416.76	39.18519948	-2.60E-05	-3.89E-06	-	DOWN
11995.67	36.77760156	-0.004158847	-7.14E-06	-	DOWN
12565.71	30.64028464	-0.010766467	-1.16E-05	-	DOWN
13130.59	28.41788656	-0.003934284	1.21E-05	-	UP
13704.45	27.4970318	-0.001604668	4.06E-06	-	UP
14307.19	22.40918064	-0.008441204	-1.13E-05	-	DOWN
14949.59	16.31301924	-0.009489666	-1.63E-06	-	DOWN
15626.44	21.2722594	0.007326941	2.48E-05	+	UP
16364.28	22.4040362	0.001533905	-7.85E-06	+	DOWN
17178.71	9.42461408	-0.015936817	-3.15E-05	-	DOWN

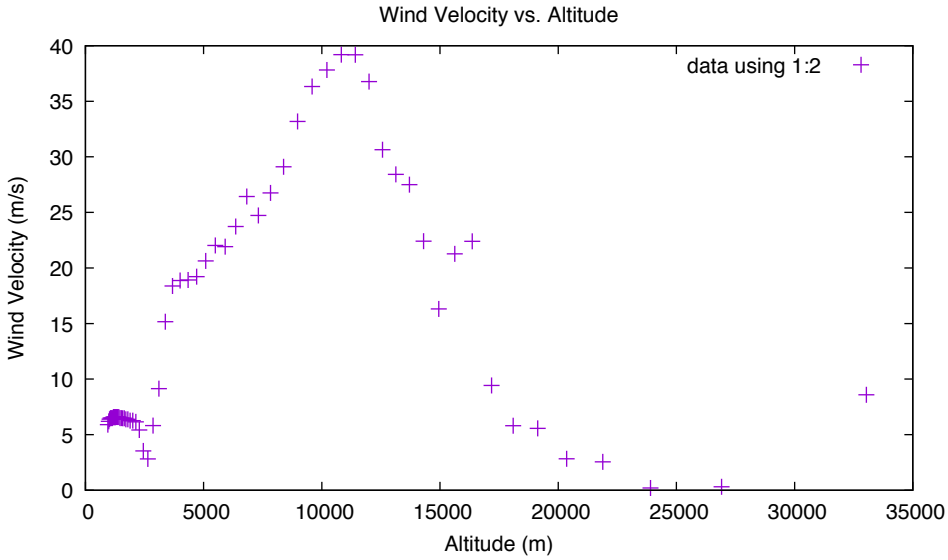
Wind Velocity vs. Altitude
data using 1:2
Wind Velocity (m/s)
Altitude (m)
0
5
10
15
20
25
30
35
40
0
5000
10000
15000
20000
25000
30000
35000

Fig. 1: Test