

and it follows that the density is changed accordingly. This means that to ascertain the weight of the gas lying above, at any level, we must add the weights of a series of units of gas each a little lighter than the unit below it. The rate of decrease in weight of these units can be roughly described as logarithmic and this determines the shape of the curve drawn through the atmospheric pressure values at different altitudes. Figure 1⁸ shows this relation when the proper corrections are included for the known average temperature of the air at the various altitudes and for other factors of real but minor importance.

From Figure 1 it can be seen that the atmospheric pressure is reduced to one half at about 17,500 feet, to one quarter at about 33,500 feet, and so on. Actually some 99 per cent of the atmosphere is contained in the lower 18 to 19

TABLE 1

Altitude-Pressure-Temperature Table for 500-Foot Intervals Ranging from -1000 to 80,000 Feet

Altitude, ft.	Pressure		Temperature, °C.	Mean temperature, °C.	Altitude, ft.	Pressure		Temperature, °C.	Mean temperature, °C.
	in. Hg	mm. Hg				in. Hg	mm. Hg		
-1,000	31.02	787.9	17.0	16.0	15,500	16.54	420.2	-15.7	-16.0
-500	30.47	773.8	16.0	15.5	16,000	16.21	411.8	-16.7	-16.2
0	29.921	760.0	15.0	15.0	16,500	15.89	403.5	-17.7	-16.7
500	29.38	746.4	14.0	14.5	17,000	15.56	395.3	-18.7	-17.7
1,000	28.86	732.9	13.0	14.0	17,500	15.25	387.3	-19.7	-18.7
1,500	28.33	719.7	12.0	13.5	18,000	14.94	379.4	-20.7	-19.7
2,000	27.82	706.6	11.0	13.0	18,500	14.63	371.7	-21.7	-20.7
2,500	27.31	693.8	10.0	12.5	19,000	14.33	364.0	-22.6	-21.7
3,000	26.81	681.1	9.1	12.0	19,500	14.04	356.5	-23.6	-22.6
3,500	26.32	668.6	8.1	11.5	20,000	13.75	349.1	-24.6	-23.6
4,000	25.84	656.3	7.1	11.0	20,500	13.46	341.9	-25.6	-24.6
4,500	25.36	644.2	6.1	10.5	21,000	13.18	334.7	-26.6	-25.6
5,000	24.89	632.3	5.1	10.0	21,500	12.90	327.7	-27.6	-26.6
5,500	24.43	620.6	4.1	9.5	22,000	12.63	320.8	-28.6	-27.6
6,000	23.98	609.0	3.1	9.0	22,500	12.36	314.1	-29.6	-28.6
6,500	23.53	597.6	2.1	8.5	23,000	12.10	307.4	-30.6	-29.6
7,000	23.09	586.4	1.1	8.0	23,500	11.84	300.9	-31.6	-30.6
7,500	22.65	575.3	0.1	7.5	24,000	11.59	294.4	-32.5	-31.6
8,000	22.22	564.4	-0.8	7.0	24,500	11.34	288.1	-33.5	-32.5
8,500	21.80	553.7	-1.8	6.5	25,000	11.10	281.9	-34.5	-33.5
9,000	21.38	543.2	-2.8	6.0	25,500	10.86	275.8	-35.5	-34.5
9,500	20.98	532.8	-3.8	5.5	26,000	10.62	269.8	-36.5	-35.5
10,000	20.58	522.6	-4.8	5.0	26,500	10.39	263.9	-37.5	-36.5
10,500	20.18	512.5	-5.8	4.5	27,000	10.16	258.1	-38.5	-37.5
11,000	19.79	502.6	-6.8	4.0	27,500	9.94	252.5	-39.5	-38.5
11,500	19.40	492.8	-7.8	3.5	28,000	9.72	246.9	-40.5	-39.5
12,000	19.03	483.3	-8.8	2.9	28,500	9.50	241.4	-41.5	-40.5
12,500	18.65	473.8	-9.8	2.4	29,000	9.29	236.0	-42.5	-41.5
13,000	18.29	464.5	-10.8	1.9	29,500	9.08	230.7	-43.4	-42.5
13,500	17.93	455.4	-11.7	1.4	30,000	8.88	225.6	-44.4	-43.4
14,000	17.57	446.4	-12.7	0.9	30,500	8.68	220.5	-45.4	-44.4
14,500	17.22	437.5	-13.7	0.4	31,000	8.48	215.5	-46.4	-45.4
15,000	16.88	428.8	-14.7	-0.1	31,500	8.29	210.6	-47.4	-46.4

* W. G. Brombacher, Altitude-pressure tables Based on the United States Standard Atmosphere, *Natl. Advisory Comm. for Aeronaut. Rept. No. 538* (republished 1942)

TABLE 1 (continued)

Altitude, ft.	Pressure		Temperature, °C.	Mean temperature, °C.	Altitude, ft.	Pressure		Temperature, °C.	Mean temperature, °C.
	in. Hg	mm. Hg				in. Hg	mm. Hg		
32,000	8.10	205.8	-48.4	-18.0	49,000	3.605	91.57	-55.0	-31.9
32,500	7.91	201.0	-49.4	-18.6	49,500	3.520	89.41	-55.0	-32.2
33,000	7.73	196.4	-50.4	-19.1	50,000	3.436	87.30	-55.0	-32.4
33,500	7.55	191.8	-51.4	-19.6					
34,000	7.38	187.4	-52.4	-20.2	51,000	3.276	83.22	-55	—
34,500	7.20	183.0	-53.4	-20.7	52,000	3.124	79.34	-55	—
35,000					53,000	2.978	75.64	-55	—
35,500	7.04	178.7	-54.3	-21.3	54,000	2.839	72.12	-55	—
36,000	6.83	175.9	-55.0	-21.6	55,000	2.707	68.76	-55	—
36,500	6.67	174.5	-55.0	-21.8	56,000	2.581	65.55	-55	—
37,000	6.51	170.4	-55.0	-22.3	57,000	2.460	62.49	-55	—
37,500	6.35	166.4	-55.0	-22.8	58,000	2.346	59.58	-55	—
38,000	6.20	162.4	-55.0	-23.3	59,000	2.236	56.80	-55	—
38,500	6.04	158.6	-55.0	-23.8					
39,000	5.89	154.9	-55.0	-24.3	60,000	2.132	54.15	-55	—
39,500	5.75	151.2	-55.0	-24.8	61,000	2.033	51.63	-55	—
40,000	5.61	147.6	-55.0	-25.2	62,000	1.938	49.22	-55	—
40,500	5.48	144.1	-55.0	-25.6	63,000	1.847	46.92	-55	—
41,000	5.34	140.7	-55.0	-26.0	64,000	1.761	44.73	-55	—
41,500	5.21	137.4	-55.0	-26.4	65,000	1.679	42.65	-55	—
42,000	5.08	134.2	-55.0	-26.8	66,000	1.601	40.66	-55	—
42,500	4.96	131.0	-55.0	-27.2	67,000	1.528	38.78	-55	—
43,000	4.84	127.9	-55.0	-27.6	68,000	1.455	36.95	-55	—
43,500	4.72	124.9	-55.0	-28.0	69,000	1.387	35.23	-55	—
44,000	4.60	122.0	-55.0	-28.3					
44,500	4.49	119.1	-55.0	-28.6	70,000	1.322	33.59	-55	—
45,000	4.38	116.3	-55.0	-29.0	71,000	1.261	32.02	-55	—
45,500	4.27	113.5	-55.0	-29.3	72,000	1.202	30.53	-55	—
46,000	4.16	110.8	-55.0	-29.6	73,000	1.146	29.10	-55	—
46,500	4.06	108.2	-55.0	-29.9	74,000	1.093	27.75	-55	—
47,000	3.96	105.7	-55.0	-30.2	75,000	1.041	26.45	-55	—
47,500	3.86	103.2	-55.0	-30.5	76,000	0.993	25.22	-55	—
48,000	3.77	100.7	-55.0	-30.8	77,000	0.946	24.04	-55	—
48,500	3.67	98.38	-55.0	-31.1	78,000	0.902	22.92	-55	—
49,000	3.58	96.05	-55.0	-31.4	79,000	0.860	21.85	-55	—
49,500	3.49	93.79	-55.0	-31.7	80,000	0.820	20.83	-55	—

miles of the gaseous envelope of the earth, and only about the lower 2 miles of it are habitable without marked restrictions to warm-blooded animals.⁹

The pressure exerted by the weight of the atmosphere is exerted radially at any one point in proportion to the amount of overlying gas, as discussed above, and it is ordinarily measured by utilizing the fact that the atmosphere will support the weight of a column of fluid (oil, water, mercury, etc.) of a length inversely proportional to its specific gravity. Thus the standard atmosphere at sea level will support a column of mercury 760 mm. in length, and this is known to exert a pressure of 14.66 p.s.i. It is customary for the sake of convenience to use the height of such a barometer as a measure of atmospheric pressure.

It is apparent that the increased pressures in the open atmosphere follow extensions of the relations discussed above for conditions at altitude; in fact the altitudes shown in Table 1 are extended to -1000 feet to facilitate calculations