1976 U.S. Standard Atmosphere - Below Tropopause [<11 Km]

		Po = 14.696	Po = 2116.22807	Po = 101325	Po = 29.92126		ρo = .0023769	ρo = 1.225		To = 288.15	To = 15	To = 518.67	To = 59
		Ambient Air Pressure (P a)					Amb. Air Density (ρa)			Ambient Air Temperature (Ta)			
Hp [ft]	δ (=Pa/Po)	[psi]	[psf]	[Pa]	[in Hg]	σ (= ρa/ρo)	[slg/ft3]	[kg/m3]	θ (=Ta/To)	[K]	[deg C]	[R]	[deg F]
-1000	1.036670	15.23490	2193.8300	105040.58	31.01847	1.029591	0.0024472	1.261249	1.00688	290.131	16.98	522.24	62.57
0	1.000000	14.69600	2116.2281	101325.00	29.92126	1.000000	0.0023769	1.225000	1.00000	288.150	15.00	518.67	59.00
1000	0.964388	14.17264	2040.8640	97716.57	28.85569	0.971064	0.0023081	1.189554	0.99312	286.169	13.02	515.10	55.43
2000	0.929809	13.66447	1967.6881	94212.91	27.82106	0.942773	0.0022409	1.154897	0.98625	284.188	11.04	511.54	51.87
3000	0.896241	13.17116	1896.6514	90811.67	26.81668	0.915117	0.0021751	1.121019	0.97937	282.206	9.06	507.97	48.30
4000	0.863662	12.69238	1827.7057	87510.55	25.84185	0.888086	0.0021109	1.087906	0.97250	280.225	7.08	504.41	44.74
5000	0.832048	12.22778	1760.8036	84307.27	24.89593	0.861671	0.0020481	1.055546	0.96562	278.244	5.09	500.84	41.17
6000	0.801378	11.77705	1695.8984	81199.62	23.97824	0.835860	0.0019868	1.023929	0.95875	276.263	3.11	497.27	37.60
7000	0.771630	11.33987	1632.9442	78185.37	23.08813	0.810645	0.0019268	0.993040	0.95187	274.282	1.13	493.71	34.04
8000	0.742782	10.91592	1571.8959	75262.38	22.22497	0.786016	0.0018683	0.962870	0.94500	272.300	-0.85	490.14	30.47
9000	0.714814	10.50490	1512.7089	72428.50	21.38813	0.761964	0.0018111	0.933406	0.93812	270.319	-2.83	486.57	26.90
10000	0.687705	10.10651	1455.3396	69681.66	20.57699	0.738479	0.0017553	0.904637	0.93124	268.338	-4.81	483.01	23.34
11000	0.661434	9.72043	1399.7449	67019.78	19.79093	0.715552	0.0017008	0.876551	0.92437	266.357	-6.79	479.44	19.77
12000	0.635982	9.34639	1345.8825	64440.85	19.02938	0.693173	0.0016476	0.849137	0.91749	264.376	-8.77	475.88	16.21
13000	0.611329	8.98409	1293.7108	61942.87	18.29172	0.671334	0.0015957	0.822384	0.91062	262.394	-10.76	472.31	12.64
14000	0.587455	8.63324	1243.1889	59523.88	17.57740	0.650025	0.0015450	0.796281	0.90374	260.413	-12.74	468.74	9.07
15000	0.564342	8.29357	1194.2766	57181.96	16.88583	0.629238	0.0014956	0.770816	0.89687	258.432	-14.72	465.18	5.51
16000	0.541971	7.96481	1146.9344	54915.22	16.21646	0.608963	0.0014474	0.745979	0.88999	256.451	-16.70	461.61	1.94
17000	0.520324	7.64668	1101.1234	52721.79	15.56874	0.589191	0.0014004	0.721759	0.88312	254.470	-18.68	458.05	-1.62
18000	0.499382	7.33891	1056.8054	50599.84	14.94213	0.569915	0.0013546	0.698145	0.87624	252.488	-20.66	454.48	-5.19
19000	0.479127	7.04126	1013.9430	48547.59	14.33610	0.551124	0.0013100	0.675127	0.86936	250.507	-22.64	450.91	-8.76
20000	0.459544	6.75345	972.4992	46563.26	13.75013	0.532812	0.0012664	0.652694	0.86249	248.526	-24.62	447.35	-12.32
21000	0.440613	6.47525	932.4379	44645.13	13.18370	0.514968	0.0012240	0.630836	0.85561	246.545	-26.61	443.78	-15.89
22000	0.422319	6.20640	893.7235	42791.48	12.63632	0.497585	0.0011827	0.609542	0.84874	244.564	-28.59	440.21	-19.46
23000	0.404645	5.94666	856.3211	41000.65	12.10749	0.480655	0.0011425	0.588802	0.84186	242.582	-30.57	436.65	-23.02
24000	0.387575	5.69580	820.1964	39271.00	11.59672	0.464169	0.0011033	0.568607	0.83499	240.601	-32.55	433.08	-26.59
25000	0.371092	5.45357	785.3157	37600.92	11.10355	0.448119	0.0010651	0.548946	0.82811	238.620	-34.53	429.52	-30.15
26000	0.355182	5.21975	751.6460	35988.81	10.62749	0.432497	0.0010280	0.529809	0.82123	236.639	-36.51	425.95	-33.72
27000	0.339829	4.99412	719.1548	34433.13	10.16810	0.417296	0.0009919	0.511187	0.81436	234.658	-38.49	422.38	-37.29
28000	0.325017	4.77645	687.8104	32932.36	9.72492	0.402506	0.0009567	0.493070	0.80748	232.676	-40.47	418.82	-40.85
29000	0.310733	4.56653	657.5815	31485.00	9.29752	0.388121	0.0009225	0.475448	0.80061	230.695	-42.45	415.25	-44.42
30000	0.296961	4.36414	628.4375	30089.59	8.88545	0.374133	0.0008893	0.458312	0.79373	228.714	-44.44	411.69	-47.98

31000	0.283688	4.16908	600.3483	28744.68	8.48830	0.360533	0.0008570	0.441653	0.78686	226.733	-46.42	408.12	-51.55
32000	0.270899	3.98113	573.2845	27448.86	8.10565	0.347315	0.0008255	0.425461	0.77998	224.752	-48.40	404.55	-55.12
33000	0.258581	3.80011	547.2172	26200.76	7.73708	0.334471	0.0007950	0.409727	0.77311	222.770	-50.38	400.99	-58.68
34000	0.246721	3.62581	522.1181	24999.01	7.38221	0.321993	0.0007653	0.394442	0.76623	220.789	-52.36	397.42	-62.25
35000	0.235305	3.45804	497.9594	23842.30	7.04063	0.309875	0.0007365	0.379597	0.75935	218.808	-54.34	393.85	-65.82
36000	0.224321	3.29662	474.7139	22729.30	6.71196	0.298109	0.0007086	0.365184	0.75248	216.827	-56.32	390.29	-69.38
36089.2	0.223361	3.28251	472.6828	22632.05	6.68324	0.297076	0.0007061	0.363918	0.75187	216.650	-56.50	389.97	-69.70
37000	0.213795	3.14192	452.438	21662.73	6.39700	0.284352	0.0006759	0.348331	0.75187	216.650	-56.50	389.97	-69.70
38000	0.203762	2.99449	431.207	20646.18	6.09681	0.271009	0.0006442	0.331986	0.75187	216.650	-56.50	389.97	-69.70
39000	0.194200	2.85397	410.972	19677.33	5.81071	0.258291	0.0006139	0.316407	0.75187	216.650	-56.50	389.97	-69.70
40000	0.185087	2.72004	391.686	18753.95	5.53804	0.246171	0.0005851	0.301559	0.75187	216.650	-56.50	389.97	-69.70
41000	0.176402	2.59240	373.306	17873.90	5.27816	0.234619	0.0005577	0.287408	0.75187	216.650	-56.50	389.97	-69.70
42000	0.168124	2.47075	355.788	17035.14	5.03048	0.223609	0.0005315	0.273921	0.75187	216.650	-56.50	389.97	-69.70
43000	0.160234	2.35480	339.092	16235.75	4.79441	0.213116	0.0005066	0.261067	0.75187	216.650	-56.50	389.97	-69.70
44000	0.152715	2.24430	323.180	15473.86	4.56943	0.203115	0.0004828	0.248816	0.75187	216.650	-56.50	389.97	-69.70
45000	0.145549	2.13899	308.014	14747.73	4.35500	0.193584	0.0004601	0.237140	0.75187	216.650	-56.50	389.97	-69.70
46000	0.138719	2.03861	293.560	14055.68	4.15064	0.184499	0.0004385	0.226012	0.75187	216.650	-56.50	389.97	-69.70
47000	0.132209	1.94295	279.785	13396.10	3.95587	0.175842	0.0004180	0.215406	0.75187	216.650	-56.50	389.97	-69.70
48000	0.126005	1.85177	266.656	12767.47	3.77023	0.167590	0.0003983	0.205298	0.75187	216.650	-56.50	389.97	-69.70
49000	0.120092	1.76487	254.142	12168.34	3.59331	0.159726	0.0003797	0.195664	0.75187	216.650	-56.50	389.97	-69.70
50000	0.114457	1.68206	242.216	11597.32	3.42469	0.152230	0.0003618	0.186482	0.75187	216.650	-56.50	389.97	-69.70
51000	0.109086	1.60312	230.850	11053.10	3.26398	0.145087	0.0003449	0.177731	0.75187	216.650	-56.50	389.97	-69.70
52000	0.103967	1.52789	220.017	10534.42	3.11081	0.138278	0.0003287	0.169391	0.75187	216.650	-56.50	389.97	-69.70
53000	0.099088	1.45620	209.693	10040.08	2.96484	0.131789	0.0003133	0.161442	0.75187	216.650	-56.50	389.97	-69.70
54000	0.094438	1.38786	199.853	9568.94	2.82571	0.125605	0.0002986	0.153866	0.75187	216.650	-56.50	389.97	-69.70
55000	0.090006	1.32273	190.474	9119.90	2.69311	0.119711	0.0002845	0.146646	0.75187	216.650	-56.50	389.97	-69.70
56000	0.085783	1.26066	181.536	8691.94	2.56673	0.114093	0.0002712	0.139764	0.75187	216.650	-56.50	389.97	-69.70
57000	0.081757	1.20151	173.017	8284.06	2.44628	0.108739	0.0002585	0.133206	0.75187	216.650	-56.50	389.97	-69.70
58000	0.077921	1.14512	164.898	7895.32	2.33149	0.103637	0.0002463	0.126955	0.75187	216.650	-56.50	389.97	-69.70
59000	0.074264	1.09139	157.160	7524.82	2.22208	0.098773	0.0002348	0.120997	0.75187	216.650	-56.50	389.97	-69.70
60000	0.070779	1.04017	149.785	7171.71	2.11781	0.094138	0.0002238	0.115319	0.75187	216.650	-56.50	389.97	-69.70
61000	0.067458	0.99136	142.756	6835.17	2.01842	0.089721	0.0002133	0.109908	0.75187	216.650	-56.50	389.97	-69.70
62000	0.064292	0.94484	136.057	6514.42	1.92371	0.085510	0.0002032	0.104750	0.75187	216.650	-56.50	389.97	-69.70
63000	0.061275	0.90050	129.673	6208.72	1.83344	0.081498	0.0001937	0.099835	0.75187	216.650	-56.50	389.97	-69.70
64000	0.058400	0.85825	123.588	5917.37	1.74740	0.077673	0.0001846	0.095150	0.75187	216.650	-56.50	389.97	-69.70
65000	0.055659	0.81797	117.788	5639.69	1.66540	0.074028	0.0001760	0.090685	0.75187	216.650	-56.50	389.97	-69.70
65617	0.054033	0.79407	114.346	5474.90	1.61674	0.071865	0.0001708	0.088035	0.75187	216.650	-56.50	389.97	-69.70

Unit length conversion ft = .3048 m

Defined lapse rate L = -6.5 K/Km = -0019812 K/ft

Gas constant R* = 8314.32 N*m/Kmol*K

std sea level g_o' = 9.80665 m/s^2

M_o = 28.9644 Kg/Kmol

T_o = 288.15 K

P_o = 101325 HPa

Generalized eq'n for linear lapse rate $P = P_b[T_{M,b}(T_{M,b} + L_{M,b}(H-H_b)]^n$

Base values (b) below tropopause $P_b = P_o$, $H_b = 0$, $T_{M,b} = T_o$, $L_{M,b} = L$

where $n= [g_o'M_o/(R^* L_{M,b})] = 5.255876$

$T_a = T_o + L^*H_p = 288.15*(1-0.0000068755856*H_p)$

simplified calculations $\theta = T_a/T_o = [T_o + L^*H_p]/T_o = 1-H_p*0.0000068755856$

$\delta = \theta^{[5.255876]}$

$\sigma = \delta/\theta = \theta^{[n-1]} = \theta^{[4.255876]} = 288.15*\delta/Ta$

Resulting Tropopause [11 Km] values T = 216.65 K

δ = .223361

σ = .297076

H_p = 36089.24 ft

Generalized eq'n for zero lapse rate $P = P_b \exp[-g_o'M_o(H_p-H_b)/(R^*T_{M,b})]$

base values at tropopause P_b = .223361*(101325 HPa), H_b = 36089.24 ft, $T_{M,b}$ = 216.65 K

Simplified Troposphere [11 - 20 Km] calculations $\delta = 0.223361*EXP(-0.000048063*(H_p-36089.24))$

$\sigma = \delta/\theta = 288.15*\delta/T_a = 1.330025*\delta$

T_a = 216.65 K

θ = 216.65 K / 288.15 K = .751865347